



# Environmental Statement

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## Environmental Statement – Volume 2: Abbreviations and Glossary

# ABBREVIATIONS

AADT	Average Annual Daily Traffic
AFA	Access for All
AGL	Above ground level
ALC	Agricultural Land Classification
ALO	Any Line Open
AOD	Above Ordnance Datum
AP	Access Points
AQMA	Air Quality Management Area
AQS Objective	Air Quality Strategy Objective
AR	Access Roads
ARA	Active Recreation Area
AS	Assessment Scenario
AS1	Assessment Scenario 1: Peak Construction Year
AS2	Assessment Scenario 2: Year 0 following completion
AS3	Assessment Scenario 3: Year 15 following completion
AURN	Defra's Automatic Rural and Urban Network
AZ	Astra Zeneca
BAP	Biodiversity Action Plan
BESI	Department for Business, Energy and Industrial Strategy
BGs	British Geological Survey
BPM	Best Practicable Means
mBGL	Meters Below Ground Level
UK BAP	UK Biodiversity Action Plan
BNG	Biodiversity net gain
BMV	Best and Most Versatile
BRE	Buildings Research Establishment
BREEAM	Building Research Establishment Environment Assessment Method
BTO	British Trust for Ornithology
CA	Conservation Area
CA	Character Area
CAU	Conservation Archaeological Unit
CBC	Cambridge Biomedical Campus
CBCTS	Cambridge Biomedical Campus Transport Strategy
CC	Construction Compound
CCC	Committee on Climate Change
CCiC	Cambridge City Council
CCoC	Cambridge County Council
CCRA	UK Climate Change Risk Assessment
CD&E	Construction, Demolition and Excavation
CFA	Continuous Flight Auger
CH <sub>4</sub>	Methane
CHER	Cambridge Historic Environment Record
CIEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CGB	Cambridge Guided Busway
CIGBBS	Cambridge Inner Green Belt Study (2015)
CITB	Construction Industry Training Board
CLOCS	Construction Logistics and Community Safety
CL: AIRE	Contaminated Land: Applications in Real Environments
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalent
CoCP	Code of Construction Practice
COP	Code of Practice

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CPASI	Cambridgeshire and Peterborough additional species of interest
CPERC	Cambridgeshire and Peterborough Environmental Records Centre
CPS	Cambridgeshire Priority Species
CRT	Contract Requirements – Technical
CSET	Cambridge South East Transport
CSIE	Cambridge South Infrastructure Enhancements
CTMP	Construction Traffic Management Plan
CWS	County Wildlife Sites
CiWS	City Wildlife Sites
dB	decibel, unit of vibration amplitude or energy
DBA	Desk Based Assessment
DCLG	Department for Communities and Local Government
DCMS	Department for Digital, Culture, Media and Sport
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DNO	Distribution Network Operator
DOO	Driver Only Operation
DOW	Definition of Waste
EA	Environment Agency
EcIA	Ecological Impact Assessment
ECOW	Environmental Clerk of Works
eDNA	Environmental DNA
EIA	Environmental Impact Assessment
EMC	Electromagnetic Compatibility
EMF	Electromagnetic Field
EPA	Environmental Protection Act
EPR	Environmental Permitting Regulations
EPS	European Protected Species
EQS	Environmental Quality Standards
ES	Environmental Statement
EFT	The Emissions Factors Toolkit
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
GCN	Great Crested Newt
GCP	Greater Cambridge Partnership
GCSP	Greater Cambridgeshire Shared Planning
GGBS	Ground Granulated Blast furnace Slag
GHG	Greenhouse gas
GI	Ground Investigation
GPA	Good Practice Advice (in Planning)
GRIP	Governance for Railway Investment Projects
GSM-R	Global System for Mobile Communications – Railway
GWP	global-warming potential
HCT	Hobson's Conduit Trust
HDV	Heavy Duty Vehicle
HE	Historic England
HER	Historic Environment Record
HET	Historic Environment Team
HFCs	Hydrofluorocarbons
HGV	Heavy Good Vehicle
HoPI	Habitat of Principal Importance
HSI	Habitat Suitability Assessment
Hz	Hertz, the unit of frequency
IAQM	The Institute of Air Quality Management
ICE	Inventory of Carbon and Energy

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ICCI	In-combination climate change impact
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICOMOS	International Council on Monuments and Sites
ID	Identification
IEF	Important Ecological Features
IEMA	Institute of Environmental Management and Assessment
ILP-GNROL	Institution of Lighting Professionals – Guidance Notes for the Reduction of Obtrusive Light (2020)
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LAQM. TG16	Local Air Quality Management Technical Guidance 16
LB	Listed Building
LDV	Light Duty Vehicle
LiDAR	Light Detection and ranging
LNR	Local Nature Reserve
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LTP	Local Transport Plan
LTTS	Long-Term Transport Strategy
LULUFC	Land Use, Land Use Change and Forestry
MAGIC	Multi-agency Geographic Information for the Countryside
MEWPs	Mobile Elevated Work Platforms
MOC	Method of Control
MRC	Medical Research Council
MWDP	Minerals and Waste Development Plan
MWLP	Minerals and Waste Local Plan
MSA	Mineral Safeguarding Area
NAP	National Adaptation Programme
NCA	National Character Area
NCN	National Cycle Route
NDC	Nationally Determined Contribution
NERC	Natural Environment and Rural Communities Act
NEWT	not environmentally worse than
NHLE	National Heritage List for England
NF <sub>3</sub>	nitrogen trifluoride
NPPF	National Planning Policy Framework
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Nitrogen oxides
N <sub>2</sub> O	Nitrous oxide
NRC	Network Rail Contractor
NR	Network Rail
NRMM	Non-road mobile machinery
NTM	National Traffic Model
NTS	Non-Technical Summary
NVC	National Vegetation Classification
NVZ	Nitrate Vulnerable Zone
OBC	Outline Business Case
OCC	Oxford County Council
OLE	Overhead Line Equipment
OS	Ordnance Survey
PAS	Publicly Available Specification
PAVA	Public Address and Voice Alarm
P & C access	pedestrian and cycle access
PFCs	Perfluorocarbons
PFRA	Preliminary Flood Risk Assessment

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PM	Particulate matter 10 or 2.5
PPG	Planning Practice Guidance
PRoW	Public Rights of Way
PPV	Peak particle velocity
PECAP	Cambridge and Peterborough Waste Partnership
RRAP	Road Rail Access Point
RBD	River Basin District
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathway
RCT	Rail Carbon Tool
RPG	Registered Park and Garden
RSC	Railway Systems Compound
RCT	RSSB Rail Carbon Tool
RRV	Road Rail Vehicle
SAC	Special Area of Conservation
SAMS	Staff Attendance Monitoring System
SCDC	South Cambridgeshire District Council
S&T	Signalling and Telecom
SIA	Simple Index Approach
SIP	Structural Insulated Panel
SF <sub>4</sub>	Sulphur Hexafluoride
SFRA	Strategic Flood Risk Assessment
SM	Scheduled Monument
SM4	Song Meter 4
SMARTWaste	Site Methodology to Audit, Reduce and Target Waste
SOBC	Strategic Outline Business Case
SoPI	Species of Principal Importance
SoS	Secretary of State
SSSI	Site of Special Scientific Interest
STP	Station Travel Plan
SPA	Special Protection Area
SuDS	Sustainable Drainage Systems
TA	Transport Assessment
TAG	Transport Analysis Guidance
TEMPro	Trip End Model Presentation Program
TOC	Train Operating Company
TSC/TSL	Track Section Cabin/ Track Section Location
TSR	Temporary Speed Restriction
TTC	Twin Track Cantilevers
TWAO	Transport and Works Act Order
UK	United Kingdom
UKCP18	UK Climate Projections 2018
UoC	University of Cambridge
UTX	Under Track Crossing
UXB/O	Unexploded Bomb/Ordnance
VC curves	Vibration Criteria curves
VDV	Vibration Dose Value
VP	Viewpoint
WAML	West Anglia Main Line
WCA	Wildlife and Countryside Act 1981, as amended
WFD	Water Framework Directive
WRAP	Waste Resources and Action Programme
WRI	World Resources Institute
WSI	Written Scheme of Investigation
WWI/WWII	World War One/World War Two



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Zol	Zone of Influence
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# GLOSSARY

Accelerometer	Instrument used for measuring vibration
Additionality	Additionality is the extent to which something happens as a result of an intervention that would have occurred in the absence of the intervention.
Agricultural Land Classification	A framework to determine the quality of agricultural land.
Ancient Woodland	A woodland that has existed continuously since 1600 or before in England, Wales and Northern Ireland (or 1750 in Scotland)
Amenity	The pleasantness or attractiveness of a place. Amenity may be affected by a combination of factors such as: sound, noise and vibration; dust/air quality; traffic/congestion; and visual impacts
Above Ordnance Datum	Height above the Ordnance Datum (average sea level)
AQMA	Air Quality Management Area: an area, declared by a local authority, where air quality does not meet Defra's national air quality objectives.
AQS Objective	Air Quality Strategy Objective: Objective set by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland to improve air quality in the UK in the medium term. Objectives are focused on the main air pollutants to protect health.
Aquifer	A body of rock and/or sediment that contains groundwater
AURN	Defra's Automatic Rural and Urban Network: the UK's largest automatic monitoring network and the main network used for compliance reporting against the Ambient Air Quality Directives.
Badger Survey	Standard survey technique involving a walkover survey to determine the presence of badger setts as well as other signs (latrines, paths, footprints, hairs and feeding signs).
Bat Emergence Survey	Bat emergence survey is a standard technique used to help determine presence/likely absence of roosting bats within a suitable feature such as a building or tree. It usually involves observing potential bat access points prior to dusk for approximately two hours to see if any bats emerge.
Bat Activity Survey	Bat activity survey is a standard technique used to assess how bats use a particular site. Some of the information sought includes the distribution and relative extent of the activity, as well as the bat species and their behaviour.
Biodiversity Action Plan Priority Habitat	UK BAP priority habitats cover a wide range of semi-natural habitat types and were those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP).
Biodiversity Net Gain	Biodiversity Net Gain is an approach to development that leaves beneficial effects on biodiversity and in a better state than before
Best and Most Versatile	Agricultural land defined within the National Planning Policy Framework as Grades 1,2 and 3a.
Best Practicable Means	Refers to Section 72 of the Control of Pollution Act 1974 as those measures which are "reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implication".
Breeding bird survey and Wintering Bird survey	Bat activity survey is a standard technique used to assess how bats use a particular site. Some of the information sought includes the distribution and relative extent of the activity, as well as the bat species and their behaviour
Construction Compound	An area used by the contractors during construction. These can be principal (main) or satellite construction compound areas which will

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	be used for civil engineering works, railway installation works and the storage of materials
Contaminated Land	Defined under the Part 2A of the Environmental Protection Act 1990 as 'any land which appears to the local authority in whose area it is situated to be in such a condition by reason of substances in, on, or under the land, that: a) Significant harm is being caused or there is significant possibility of such harm being caused; or b) Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.'
Code of Construction Practice	Standards and procedures a developer or contractor must adhere to in order to manage the potential environmental impacts of construction works. Typically used to deliver construction mitigation identified in Environmental Statements.
County Wildlife Sites	A designation recognising areas of biological or ecological significance at a local scale
City Wildlife Sites	A designation recognising areas of biological or ecological significance at a local scale.
dB	Decibel, unit of vibration amplitude or energy
Desk-Based Assessment	Assessment using existing sources of published data.
Designation [landscape]	Internationally or nationally valued landscape recognised on a formal statutory basis and through planning policy. Locally valued landscape recognised by local authorities through planning policy
Department for Environment, Food and Rural Affairs	The government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
Diffusion Tube	A simple, single-use sampling device that absorbs the pollutant directly from the ambient air with no requirement for a power source. Diffusion tubes are exposed at a monitoring location for a period of time (normally one month) and are then sent to a laboratory for analysis.
Down/Up Loop	Loop : An additional track typically past an obstruction such as a platform to provide additional capacity. Down is northbound (from London), Up is southbound (toward London)
Down/Up Main	Main: The primary track carrying through services. Down is northbound (from London), Up is southbound (toward London)
EIA	Environmental Impact Assessment is the process by which the likely significant effects on the environment of a proposed development or project are measured and mitigated.
Emission	Pollution discharged into the atmosphere, such as from industrial stacks, cars and aeroplanes.
Embedded mitigation	Measures proposed as part of the design that will avoid or reduce environmental effects
Environmental Quality Standards	Set out by the Environment Agency for hazardous chemicals and elements in freshwaters and estuaries and coastal waters.
Environmental Statement	The report setting out the process and findings of an Environmental Impact Assessment
EFT (Emission Factor Toolkit)	The Emissions Factors Toolkit is published by Defra and the Devolved Administrations and allows users to calculate road vehicle pollutant emission rates for a specified year, road type, and vehicle speed and vehicle fleet composition.
Exchange Land	Where development proposals necessitate the compulsory purchase of 210 square metres or more of common or open space coming within section 19 of the Acquisition of Land Act 1981, the

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	applicant should seek suitable land of comparable quality to give in exchange. Any exchange land must be no less in area than the common or open space to be acquired and must also be equally advantageous, normally to existing users or in some cases to the wider public.
Extended Phase 1 Habitat Survey	Phase 1 habitat survey is a standard technique for rapidly obtaining baseline ecological information over a large area of land. Habitats are mapped based on the vegetation present. The technique is often extended to give further consideration to the potential of habitats to support protected species and species of conservation concern
Flood Zone	Categorisation of annual flood risk according to National Planning Policy. Flood Zone 1 – annual chance of flooding from rivers less than 1 in 1,000 (0.1%). Flood Zone 2 – an annual chance of flooding from rivers between a 1 in 100 (1%) and 1 in 1,000 (0.1%). Flood Zone 3 – annual chance of flooding from rivers greater than 1 in 100 (>1%).
Frequency	The number of cycles of vibration oscillations per second, expressed in Hertz (Hz)
Ground Investigation	Intrusive ground investigation works involving the drilling of exploratory hole locations and the recovery of soil samples.
Great Crested Newt HSI Survey	The Habitat Suitability Index (HSI) for the great crested newt was as a means of evaluating habitat quality and quantity. Ponds with higher index more likely to support great crested newts
Great Crested Newt eDNA Survey	eDNA is a recognised method for establishing the presence or absence of great crested newts in ponds during the breeding season. The survey method involves collecting 20 water samples from the pond which is analysed within a laboratory.
Great Crested Newt population class estimate surveys	Population class estimate surveys for great crested newt comprises six survey visits using conventional survey methods (bottle trapping and torching). This method determines the likely size of the great crested newt population within the pond.
Global System for Mobile Communications – Railway	It is an international wireless communications standard for railway communication and applications.
Hobson's Conduit Trust	Registered charity responsible for the upkeep of Hobson's Brook from Nine Wells to the Conduit Head, and the underground channels originally built through Cambridge.
Heavy Duty Vehicle	Goods vehicles and buses >3.5t gross vehicle weight
The Institute of Air Quality Management	Professional body for air quality professionals. It occasionally produces guidance that is widely used and accepted by consultants and councils (dependent on the nature of the project).
Local Air Quality Management	A system through which local authorities are required to assess air quality in their area and designate Air Quality Management Areas.
LAQM. TG16	Local Air Quality Management Technical Guidance 16: A technical guidance document designed to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (Northern Ireland) Order 2002 and subsequent regulations.
Light Duty Vehicle	Cars and small vans <3.5t gross vehicle weight
Local Nature Reserve	A designation recognising areas of biological or ecological significance at a local scale
LLFA	Lead Local Flood Authority LLFAs prepare and maintain a strategy for local flood risk management in their areas and are country councils and unitary

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	authorities. They lead in managing risks of flooding from surface water, ground water and ordinary (smaller) watercourses.
Local Plans	Plans prepared by a Local Authority, in accordance with National planning policy, which set out a vision and a framework for the future development of the area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure – as well as providing a basis for safeguarding the environment, adapting to climate change and securing good design. As such, Local Plans are also a critical tool in guiding decisions about development proposal.
Mitigation Hierarchy	The mitigation hierarchy sets out the order in which mitigation actions should be considered, from most desirable to least desirable, to address likely effects identified during an EIA. The hierarchy is to first avoid, then minimise or reduce, or restore or compensate
Mitigation measures	Measures identified to reduce likely significant effects arising from the construction or operation of the proposed Development
Mineral Safeguarding Area	The national planning policy framework (NPPF) defines a mineral safeguarding area as: 'An area designated by Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development
National Character Area	Subdivisions of England that are based on a combination of landscape, biodiversity, geodiversity and economic activity. These broad divisions form the basic units of cohesive countryside character, giving each a distinct 'sense of place'. There are 159 National Character Areas in England, each uniquely numbered
Neutral section	Neutral section is a section of overhead line that is not energised
National Planning Policy Framework	The NPPF sets out government's planning policies for England and how these are expected to be applied.
Nitrate Vulnerable Zone	NVZs are areas designated by the EA as being at risk from agricultural nitrate pollution. Waters are defined as polluted if they contain or could contain, if preventative action is not taken, nitrate concentrations greater than 50mg/l.
1/3 Octave Band Frequency	Frequency band expressed as a one-third fraction of an octave
Operational Phase	The period when the proposed development is in operation
Otter and water vole survey	Standard survey technique used to determine the presence/likely absence of otter and water vole within suitable habitat. Two survey visits were undertaken at each waterbody to identify signs of otter (holts, lying-up sites, spraints, etc.) or water vole (burrows, feeding signs, latrines, etc.).
Perfluorooctane sulphonate	A priority hazardous substance monitored under the Water Framework Directive
Permanent land take	The land that is acquired for an indefinite period of time.
Permitted development rights	Certain types of development are permissible under The Town and Country Planning (General Permitted Development) (England) Order 2015, whereby no planning permission is required from the local authority for the works (covered by GDPO) to proceed.
PM <sub>10</sub>	Particulate matter (in this example, particulates smaller than 10µm that can cause health problems).
PM <sub>2.5</sub>	Particulate matter (in this example, particulates smaller than 2.5µm that can cause health problems).
Planning Practice Guidance	Supports the National Planning Policy Framework.

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Peak particle velocity	The highest vibration velocity level recorded during an assessment period
Proposed Development	The Cambridge South Infrastructure Enhancements project
River Basin District	Unit of management for river basins under the Water Framework Directive
River Basin Management Plan	Plans produced for River Basin Districts under the Water Framework Directive that set out how organisations, stakeholders and communities will work together to improve the water environment.
Receptor	Refers to living organisms or materials which are affected by an impact.
RSSB Rail Carbon Tool	A carbon calculation tool selected through an RSSB working group to be used for embodied carbon accounting across the UK rail sector.
Special Area of Conservation	A designation recognising areas of biological or ecological significance at an international scale
Satellite Compound	Smaller compound from which construction for that section is managed, comprising small offices and welfare facilities, areas for the storage of plant and materials and some material processing
Schedule 1	Species protected under Schedule 1 to the WCA
Scoping Opinion	The formal opinion of the relevant determining authority in relation to information that should be in an Environmental Statement
Scoping Report	A formal request for a Scoping Opinion
Simple Index Approach	Provides a high-level assessment of the adequacy of proposed Sustainable Drainage Systems in mitigating pollution hazards from a proposed development.
Single track	A railway where trains travelling in either direction share the same section of track.
Strategic Flood Risk Assessment	Carried out by Local Planning Authorities to help various parties consider flood risk when making planning decisions about the design and location of any development and flood risk management features and structures
Site of Special Scientific Interest	A designation recognising areas of biological or ecological significance at a national scale
Station Buildings	The proposed station buildings, the covered cycle parking areas, the platforms and their canopies and the southern footbridge
Study Area	The identified spatial scope over which the assessment has been undertaken. The study area is topic-specific and varies by technical chapter.
Special Protection Area	A designation, specifically relating to birds, recognising areas of biological or ecological significance at an international scale
Sustainable Drainage Systems	SuDS are a collection of water management practices which use natural processes to manage drainage
Switched and Crossings	Railway track components that exist to provide a means for trains to be directed from one track or route to another track or route
Track Section Cabin/ Track Section Location	At the neutral section between the feeder stations, a Track Section Location (TSL) or a Track Section Cabin (TSC) can be found. These are in place to measure and transform the current and the voltage to the overhead line.
Velocity	Velocity is the rate of change in position, measured in distance per unit of time, typically in metres per second
Vibration	Small oscillations (or movements) occurring as part of the ambient environment conditions caused by various sources, including trains moving on railway tracks.

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Vibration Criteria curves	industry standard defining the levels of vibration that various classes of equipment are sensitive to, named alphabetically as VC-A, VC-B, etc
Vibration Dose Value	a measure of vibration used for assessing intermittent vibration based on a cumulative measurement of the vibration level received over an 8-hour daytime or 16-hour night-time period
Vibration monitoring	the measurement of vibration
Visual Receptor	The places that people may occupy where people's views or visual amenity will be affected by changes in those views or places.
Water Framework Directive	A European Union Directive which introduced a single system of water management across the European Union based on the principle of river basin management. Implemented in England and Wales and became retained European Union law at the end of the Brexit transition period.
Zone of Influence	The areas/resources that may be affected by the biophysical changes caused by activities associated with the proposed development.



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### **Chapter 1 – Introduction**

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# **1 Introduction**

## **1.1 Background to the Environment Statement**

- 1.1.1 This Environmental Statement (ES) has been prepared to accompany a Transport and Works Act Order (TWAo) application by Network Rail ('the applicant') for the redevelopment of land located in southern Cambridge. The site is proposed to be developed with a new railway station with four platforms, connecting pedestrian overbridge, access road, landscaping and ancillary track improvement works. Further details of the proposed Development are provided in Chapter 4 of this ES.
- 1.1.2 Due to the nature of the proposed works, the applicant intends to apply for a TWAo in accordance with the Transport and Works Act 1992 (Ref. 1.1) and its associated Rules (Ref 1.2) and Guidance (Ref. 1.3) provided by the Department for Transport (DfT) TWA Order Unit. In addition, the applicant will be making a simultaneous request for deemed planning permission to the Secretary of State.
- 1.1.3 This ES presents the information that the applicant is required to provide as part of the process of environmental impact assessment (EIA) in accordance with Rules 7 and 10 of the Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 as amended (the TWA Rules) (Ref 1.2). Further details of statutory requirements for EIA are set out in Chapter 2 EIA Methodology.

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## 1.2 References

Reference	Title
Ref 1.1	Transport and Works Act 1992
Ref 1.2	Transport and Works Act (Applications and Objections Procedure) (England and Wales) Rules 2006 [SI 2006 No.1466] as amended, particularly by The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 [SI 2017 No. 1070] <a href="https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made">https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made</a>
Ref 1.3	Department for Transport, A Guide to TWA Procedures 2006

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## 2 EIA Methodology

### 2.1 Introduction

- 2.1.1 This chapter describes the approach taken to the Environmental Impact Assessment (EIA) methodology. It sets out information on consultation undertaken and presents the approach adopted to identify the baseline situation, and to assess the potential likely significant environmental effects as a result of the proposed Development. It also describes how the level of significance of that effect has been determined. In addition, an explanation of cumulative effects is provided.

### 2.2 Need for EIA and the EIA process

- 2.2.1 The relevant environmental impact assessment regime for the proposed Development is in accordance with *The Transport and Works (Applications and Objections procedure) (England and Wales) Rules 2006* as amended (hereafter referred to as ‘the TWA Rules’) (Ref 2.1). This Environmental Statement (ES) has therefore been prepared in accordance with the TWA Rules.
- 2.2.2 Under Rule 7, when making an application, the TWA Rules require submission of ‘an applicant’s environmental statement’ for works which constitute a project which is of a type mentioned in Annex I or Annex II to the EIA Directive (European Council Directive 2011/92/EU (as amended)). This project requires an Environmental Statement under Annex II.
- 2.2.3 Environmental Impact Assessment is mandatory for developments of a type falling within Annex I of the Directive and may be required for developments of a type falling within Annex II, dependent on factors such as size, location, nature or likelihood of generating significant environmental effects. The proposed Development is not of a type described in Annex I of the Directive. However, it can be described as an Infrastructure Project under Annex II, namely, 10(c) – Construction of railways. The works required for the proposed Development are likely to generate potential significant environmental effects and therefore an EIA has been carried out for the proposed Development.
- 2.2.4 This EIA has been carried out in accordance with Rule 7A of the TWA Rules, and the ES has been prepared in accordance with Rule 11 and Schedule 1 of the TWA Rules.
- 2.2.5 Schedule 1 to the TWA Rules sets out ‘information to be included in Environmental Statements’. The requirements of Schedule 1, and where these requirements are covered in this ES are set out in Table 2-1 below.

*Table 2-1 Rule 11 and Schedule 1 requirements and corresponding locations in the ES*

Schedule 1 requirements (TWA Rules)	Location in this ES
‘A description of the proposed project...’	Chapter 4: The Site and the Proposed Development
‘A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the applicant, ... and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.’	Chapter 3: Consideration of Alternatives
‘A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution of the environment without implementation of the proposed works...’	Each ES topic chapter describes the existing baseline conditions, including sensitive receptors

Schedule 1 requirements (TWA Rules)	Location in this ES
<p>‘The cumulation of effects with other existing or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources’.</p>	<p>Each ES topic chapter includes an assessment of likely cumulative effects</p>
<p>‘A description of the factors specified in rule 7A(2) likely to be significantly affected by the project:</p> <p>population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.’</p>	<p>The scope of the ES covers factors (i.e. aspects of the environment) which are likely to be significantly affected by the project</p>
<p>‘The description of the likely significant effects on the factors specified in rule 7A(2) must cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development...’</p>	<p>Each ES topic chapter describes the likely significant effects (both beneficial and adverse).</p>
<p>‘A description of the forecasting methods or evidence used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.’</p>	<p>Where relevant, this information is captured in the ES topic chapters.</p>
<p>‘A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis)...’</p>	<p>Each ES topic chapter describes topic-specific mitigation.</p>
<p>A non-technical summary</p>	<p>A standalone non-technical summary is submitted as part of the application submission</p>
<p>2.2.6 The EIA has been undertaken in accordance with the Institute of Environmental Management and Assessment (IEMA) guidelines for EIA, and legal standards as well as best practice in order to comply with Rule 7A of the TWA Rules. Assessments for the environmental topics have been undertaken in accordance with the relevant Government, professional institution, or best practice guidelines, as detailed in chapters 5 to 18 of this ES.</p>	
<p>2.2.7 EIA is an iterative process. The aim of the EIA process is to identify, and avoid and minimise where possible, any likely significant adverse environmental effects of the proposed Development. In general terms, the main stages in the EIA process are as follows:</p> <ul style="list-style-type: none"> <li>• Data Review - drawing together and reviewing available data;</li> <li>• Screening - determining the need for EIA;</li> </ul>	



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- Scoping - identifying potential significant issues, both positive and negative, and determining the scope of the EIA, including issues that are not deemed significant;
- Baseline surveys - undertaking baseline surveys and monitoring to identify existing baseline conditions;
- Consultation - seeking feedback from technical consultees and the general public in relation to key environmental issues, design approaches and methodologies to be adopted for the EIA;
- Assessment and design iteration - assess likely effects of the proposed Development (during construction and operation phases), evaluate alternatives, provide feedback to design team on any adverse effects, incorporate mitigation into the scheme and assess the effects of the mitigated Development. During the EIA process, opportunities to deliver enhancements have been explored in consultation with appropriate stakeholders; and
- Preparation of the ES and the Non-Technical Summary (NTS) and submission to the decision-makers.

## Consultation

- 2.2.8 Consultation with technical stakeholders and the general public has been key to the evolution of the proposed Development.
- 2.2.9 The topic chapters of this ES each contain a description of the consultation undertaken specific to that topic, the feedback received and how that feedback has been addressed.
- 2.2.10 Network Rail (“the applicant”) has undertaken two pre-application public consultations with regards to the proposed Development.
- 2.2.11 As per Rule 10(2)(d), the applicant shall submit with the application, a report summarising all the consultations undertaken, including confirmation that the applicant has consulted with all the relevant bodies named in Schedules 5 and 6 to the TWA Rules.

## Scoping

- 2.2.12 Scoping is an important, albeit voluntary, component of the EIA process. The aim of scoping is to identify all the potentially significant effects of the Development in order to focus the scope of an EIA and to enable the preparation of a proportionate and robust ES.
- 2.2.13 An EIA scoping request was made to the Department for Transport (DfT) on 1<sup>st</sup> December 2020 under the TWA Rules (Rule 8). The request was accompanied by a Scoping Report which is included at Appendix 2.1.
- 2.2.14 The DfT received the following consultee responses to the Scoping Report:
- Natural England
  - The Environment Agency
  - Historic England
  - Cambridgeshire County Council
  - Greater Cambridge Shared Planning (“GCSP”, on behalf of Cambridge City Council and South Cambridge District Council)
- 2.2.15 A Scoping Opinion was issued by the DfT on 22<sup>nd</sup> January 2021 and is included as Appendix 2.2. Attached to the Scoping Opinion are copies of the full responses received by the statutory consultees and stakeholders to the Scoping Report.
- 2.2.16 A summary of responses to the Scoping Report from the statutory consultees and stakeholders listed above is included in each technical assessment chapter, as applicable. This includes reference to how comments raised have been addressed in the ES.
- 2.2.17 The scope of the Environmental Statement is set out in Table 2-2. The rationale for scoping out particular aspects is set out in the Scoping Report (see Appendix 2.1).

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Table 2-2 Scope of the EIA/ES

Topic	Construction phase assessment	Operation phase assessment
Acoustics Assessment Part 1 – Noise	✓	✓
Acoustics Assessment Part 2 – Vibration	✓	✓
Air Quality	✓	✓ (partial)
Biodiversity	✓	✓
Climate Change Adaptation	✓	✓
Climate Change – GHG Emissions	✓	✓
Cultural Heritage	✓	✓
Ground Conditions and Contamination	✓	x
Landscape and Visual Impact	✓	✓
Materials and Waste	✓	x
Population and Human Health	✓	✓
Socio-economics	✓	✓
Transport	✓	✓
Water Resources and Flood Risk	✓	✓

## Electromagnetic Compatibility ('EMC')

2.2.18 Correspondence has been received from several stakeholders during informal scoping with respect to the possibility of electromagnetic interference having an effect on sensitive equipment as a result of the siting of new overhead line electrification (OLE) equipment and/or new track associated with the proposed Development. The responses to date from stakeholders are set out below.

### Medical Research Council laboratory

2.2.19 The MRC responded to the scoping request to confirm that there would be no impact of the proposed Development on their building's laboratory equipment.

### Abcam

2.2.20 Abcam responded to confirm that there would be no adverse implications of the scheme on their property's equipment.

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## Astra Zeneca

- 2.2.21 Astra Zeneca responded to confirm that whilst there would be no impact on internal equipment, further discussion is needed to understand the implications of the proposed Development on external control devices. Further engagement with Astra Zeneca is planned in due course.

## Cancer Research UK Institute

- 2.2.22 The Institute responded to state that they do not believe there to be impacts on their property or equipment. However, final confirmation of this is being sought at the time of writing.

## University of Cambridge Estates

- 2.2.23 The University of Cambridge Estates division responded with respect to the following properties:

Heart and Lung Research Institute (Under construction).

- 2.2.24 There has been no correspondence from the Estates division with respect to the consented scheme (LPA Reference 16/1523/REM, Appendix 2.3). Further correspondence will be undertaken to clarify the position.

Anne McLaren Building

- 2.2.25 Details of sensitive equipment was provided to NR and further engagement with the Estates division is planned in due course.

## Royal Papworth Hospital NHS Trust

- 2.2.26 The Royal Papworth Hospital NHS Trust responded to recommend further engagement with the Trust.

## Further study

- 2.2.27 There remains a risk that the proposed Development would have EMC effects on the above receptors that have not to date confirmed whether there would be implications for EMC effects on their building assets.
- 2.2.28 In light of this conclusion, an immunisation study will be undertaken during Governance for Railway Investment Projects (GRIP) 4 (April to December 2021). The purpose of the immunisation study is to provide an assessment of the proposed Development design to fulfil the following requirements:
- Verify the earthing and bonding proposed design and demonstrate that the design will mitigate the risks of touch voltages and compliance with the requirements of BS EN 50122 and G12/4 standards;
  - Assess the impact of the proposed design on Signalling and Telecom (S&T) cables and equipment by calculating longitudinal induced voltages, both in normal conditions (steady state) and under short circuit conditions;
  - Determine the expected magnetic fields along the line in normal conditions (steady state) and under short circuit conditions.
- 2.2.29 Three scenarios will be considered in this Immunisation Study:
- Normal feeding with booster transformers from Milton Feeder Station
  - Normal feeding without booster transformers from Milton Feeder Station
  - First emergency feeding arrangement without booster transformers
- 2.2.30 This study will form part of the wider proposed Development's EMC demonstration of compliance. The simulation results to be presented in the study will aim at demonstrating that the proposed design is satisfactory in normal operation and degraded/emergency modes.
- 2.2.31 The proposed immunisation study report ("Network Rail's ELSSA-equivalent report") will be limited to the electrical section that is normally fed from Milton with only conducted and

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induced voltages, and magnetic fields at the supply 50Hz frequency will be considered. The study will include:

- The assessment of touch voltages and induced voltages at 50Hz which addresses the safety of personnel against hazardous touch voltages in normal and short circuit conditions.
- The assessment of the levels of magnetic fields at 50Hz which addresses the long-term effects of these fields on public and staff and compliance with the international ICNIRP Electromagnetic Field (EMF) limits. Wherever needed, the level of magnetic field shall be provided at the front of the impacted buildings.

2.2.32 The approach to the Immunisation Study will be set out in the Code of Construction Practise (CoCP) Part A (Appendix 2.4) and the detailed assessment delivered through the contractor's CoCP Part B.

## Baseline

2.2.33 In order to evaluate likely significant environmental effects, information relating to the existing environmental conditions has been collected. This forms the baseline, alongside a projection of these conditions into the future without the proposed Development in place (the “future baseline”) where relevant. A description for the future baseline is included in each ES topic chapter.

2.2.34 A significant amount of baseline information has been obtained, as identified within each topic chapter. Current existing baseline data has been obtained from desktop reviews, consultations, and from field surveys commissioned specifically for the proposed Development.

## Assessment

2.2.35 In accordance with the TWA Rules (Ref 2.1), this ES must include ‘a description of the likely significant effects of the project on the environment resulting from, amongst other things—

- the construction and existence of the project, including, where relevant, demolition works;
- the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;
- the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;
- the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);
- the cumulation of effects with other existing or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;
- the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;
- the technologies and the substances used.

2.2.36 ‘The description of the likely significant effects on the factors ... must cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives which are relevant to the project.’

## Spatial scope

2.2.37 The geographical extent of the EIA is referred to as the 'spatial scope'. The spatial scope of the assessment varies depending on the type of environmental receptor. Also, the area over which impacts could occur can often be wider than the area of land directly taken by the proposed Development.

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- 2.2.38 The study areas for the EIA are individually defined for each environmental topic based on the spatial scope of the potential impacts on receptors or resources and relevant topic-specific criteria. The study areas for each topic are further described in specialist topic chapters of this ES.

### Temporal scope

- 2.2.39 This ES details the assessment of the significant environmental impacts of the proposed Development during its construction and operation. The infrastructure is expected to have a design life of 120 years and would be maintained and upgraded as required, in accordance with Network Rail maintenance programmes. Therefore, the EIA does not cover the decommissioning of the proposed Development. In addition, the likely impact of any maintenance and upgrade works would be no worse than those discussed for the construction phase of the proposed Development and therefore is not considered necessary to be assessed.
- 2.2.40 In order to assess the environmental impacts on receptors that would be caused by the proposed Development, and to identify any potential significant effects, a comparison of the current environmental conditions would be required. This would be immediately before the proposed Development is implemented (baseline) and then a prediction of how environmental conditions are likely to change in the absence of the proposed Development (future baseline) has been established.
- 2.2.41 The assessment has been conducted for specific years, as appropriate, for each topic:
- Updated baseline (2018 – present)
  - Future baseline 2020 – 2031
  - Assessment years for construction – 2023 – 2025
  - Assessment years for operation – 2026, 2031, 2041 as appropriate to the topic.

### Significance Criteria

- 2.2.42 Generally, significance of effect is determined through combining the value (or sensitivity) of a resource or receptor with the magnitude of the predicted change (or impact). Each technical chapter in the ES explains how value and magnitude is determined.
- 2.2.43 The criteria for determining significance varies across topics, but gives regard to some or all of the following:
- The existence of the development;
  - Extent, magnitude and reversibility of the effect;
  - Duration of the effect (whether short, medium or long-term);
  - Nature of the effect (whether direct or indirect, adverse, neutral or beneficial, temporary effects);
  - Likelihood of effect occurring;
  - Whether the effect occurs in isolation, is cumulative or interactive;
  - Performance against environmental quality standards or other relevant pollution control thresholds; and
  - Sensitivity of the receptor.
- 2.2.44 Figure 2-1 presents an assessment matrix which has informed the determination of significance (if appropriate for the topic under consideration). The significance of effects may be described as either adverse or beneficial. A combined assessment of sensitivity of receptor or resource and magnitude of impact is undertaken to determine the significance of an effect. Effects that are usually considered to be significant, and therefore likely to be material in the decision-making process, have been shaded in Figure 2-1. It should be noted that bespoke sensitivity, impact and significance criteria have been generated based on the general

approach, as appropriate to the topic and in accordance with relevant policy, guidance and using professional judgement.

Impact Magnitude	Sensitivity of Receptor			
		High	Medium	Low
	High	Major adverse/ beneficial	Major adverse/ beneficial	Moderate adverse/ beneficial
	Medium	Moderate adverse/ beneficial	Moderate adverse/ beneficial	Minor adverse/ beneficial
	Low	Moderate adverse/ beneficial	Minor adverse/ beneficial	Negligible
	Negligible/ Neutral	Minor adverse/ beneficial	Negligible	Negligible

Figure 2-1 General approach for determining significance (shaded cells denote Significant Effect)

- 2.2.45 The methodologies described within each topic chapter therefore do not always use the same terminology, and the matrix in Figure 2-1 has been adapted where appropriate. However, the general principle will be that higher magnitude impacts on important and sensitive resources are regarded as Significant with respect to the TWA Rules (Ref 2.1). Lower magnitude impacts on less important and sensitive resources are generally regarded as Not Significant with respect to the TWA Rules. The Conclusions section of each ES topic chapter clearly identifies those effects considered to be significant.
- 2.2.46 Some professional institutions have published guidance or bespoke methodologies for assessing significance of effects. Where these topic-specific methodologies are available they have been applied to derive the significance of effects. These methodologies are outlined in detail in the topic-specific chapters of the ES. In addition, some topic areas have guidance to help determine the value of receptors.
- 2.2.47 There are, however, some topics (e.g. Waste) where no standard methodology has been established for determining the significance of effects. Where this is applicable, the advice on typical descriptors of environmental value, magnitude of impact and significance of effects set out in IEMA Waste Guidance criteria will be used as a basis, along with professional judgement.

## Mitigation

- 2.2.48 The mitigation hierarchy is as follows: avoidance (most desirable), reduction, amelioration and compensation. Mitigation measures fall into two broad categories:
- Mitigation measures embedded in the design of the proposed Development (hereinafter referred to as 'embedded design measures' or 'primary mitigation'). These are measures that have been incorporated into the design of the proposed Development to prevent, reduce and offset any likely significant adverse effects.
  - Additional mitigation measures are legal measures or standard practices which will be implemented as part of the proposed Development. This includes any proposals for monitoring, where appropriate.
- 2.2.49 The assessment considers the proposed Development including the mitigation measures that are part of the scheme. This also includes the provision of a Code of Construction Practice

(CoCP) Part A, which has been submitted as part of the TWA0 application. Each ES topic chapter has set out the mitigation measures which are considered to be part of the proposed Development.

## Cumulative Effects

2.2.50 The TWA Rules require that, in assessing the effects of a particular development proposal, consideration is also given to the cumulative effects.

2.2.51 Cumulative effects can occur in two ways as a result of development activities:

- Intra-project cumulative effects (also known as ‘impact interactions’ or ‘interactive effects’): the combined effects of an individual development – for example, noise, dust and visual on one particular receptor; and
- Inter-project cumulative effects (also known as ‘in-combination effects’): the combined environmental effects of the proposed Development and other planned developments on a single resource/receptor.

### Intra-project cumulative effects

2.2.52 The consideration of intra-project cumulative effects is discussed in Chapter 9 Climate Change Adaptation and Chapter 15 Population and Health.

### Inter-project cumulative effects

2.2.53 In assessing in-combination cumulative effects, major developments within the zone of influence of the proposed Development (‘committed schemes’) have been identified through the EIA Scoping process with Greater Cambridge Shared Planning (GCSP), Cambridgeshire County Council (CCoC) and other relevant consultees on the basis of those that are:

- Permitted and under construction; and
- Permitted application(s), but not yet implemented.
- Known forthcoming applications as agreed with GCSP, i.e. Cambridge South East Transport scheme.

2.2.54 Consideration has also been given to developments identified in the adopted and emerging development plans.

2.2.55 The committed schemes list includes:

- All residential applications proposing +10no. houses, or more submitted in the last 5 years within 2km of the Scheme
- All residential applications proposing +50no. houses, +5000m<sup>2</sup> commercial and major new transport infrastructure within 2 to 3.5km of the Scheme
- All mixed-use and employment applications proposing +5000m<sup>2</sup> of development submitted in the last 5 years within 2km of the Scheme
- All infrastructure projects (roads etc) submitted in the last 5 years within 2km of the Scheme.

2.2.56 The details of the committed schemes have been identified through interrogating GCSP and CCoC websites are presented on a map and presented in a table in Appendix 2.3.

2.2.57 The ‘in-combination’ cumulative effects are considered in the respective ES topic chapters. Topic specialists have identified which committed schemes fall within the zone of influence of that topic. The committed schemes to be included as part of the cumulative assessment for each topic are set out in the respective chapters 5-18, providing reasons for their inclusion.

## Major Accidents and Disasters

2.2.58 The need to consider major accidents and/or disasters in an Environmental Statement is set out in Paragraph 8 of Schedule 1 of the Rules as amended.



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- 2.2.59 Key hazards and risks have been reviewed and for those considered relevant, the potential impacts on any receptors within and outside of the proposed Development have been taken into account when determining whether the aspect should be scoped in to the EIA. Table 4-1 in the Scoping Report (Appendix 2.1) presents the proposed scope and justification for this.
- 2.2.60 Table 2-3 below summaries the scope and takes into account the comments in the Scoping Opinion.

*Table 2-3 Scope of the consideration of major accidents and disasters within this ES*

Hazard	Scope in / Scope out (✓/×)
Flooding	✓
Adverse weather (long term, from storms, snow, gales and heatwaves)	✓
Transport accidents or industrial action	×
Terrorist attack	×
Utility failure, including gas explosion or urban fire	×

- 2.2.61 The issues of flood risk, and adverse weather patterns affecting the proposed Development's infrastructure, associated with major accidents and disasters, would be respectively addressed in the Water resources and flood risk ES chapter 18 and the Climate change adaptation ES chapter 9.

## 2.3 Environmental Statement Contents

- 2.3.1 The structure of the ES is set out below. This has been based upon the TWA Rules, current best practice, and the outcome of the scoping exercise.
- 2.3.2 The full application submission, including this ES, is publicly available to view via Network Rail's website. Subject to Covid-19 restrictions, Network Rail may provide access to a standalone PC in a local public library for those without internet access.

## ES Volume 1 – Non-Technical Summary

- 2.3.3 A Non-Technical Summary has been produced. This provides a concise summary, in non-technical language, i.e. plain English, of the key information in the ES. The Non-Technical Summary is produced as an illustrated standalone document in a format suitable for public dissemination.

## ES Volume 2 – Main Environmental Statement

- 2.3.4 This contains the full text of the EIA. The chapter numbers and titles are set out below.

*Table 2-4 Structure of the ES*

Chapter number	Chapter title
1	Introduction
2	EIA Methodology
3	Development Need and Consideration of Alternatives



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Chapter number	Chapter title
4	The Site and the Proposed Development (including the Concise Statement of Aims)
Specialist topic chapters	
5	Acoustics assessment (noise)
6	Acoustics assessment (vibration)
7	Air quality
8	Biodiversity
9	Climate (climate change adaptation)
10	Climate (GHG emissions)
11	Cultural heritage
12	Ground conditions and contamination
13	Landscape and visual
14	Materials and waste
15	Population and human health
16	Socio-economics
17	Transport
18	Water resources and flood risk

2.3.5 Each specialist topic chapter (indicated above) would present the assessment of the effects associated with that topic and be structured as follows:

- Introduction;
- Methodology (including regulatory and policy framework and assessment approach;
- Baseline (including future baseline scenarios, and identifying and evaluating sensitive receptors, including those that can be scoped out);
- Design and Mitigation (including embedded design)
- Assessment of residual effects (impact assessment with embedded design and other mitigation in place);
- Cumulative effects (this would address cumulative effects with other committed schemes i.e. in-combination effects); and
- Assessment Summary - this includes a table summarising the significance of residual effects.

## ES Volume 3 – ES Appendices

2.3.6 These provide detailed supporting data, supporting figures and the full text of any technical assessments.

## Supporting TWAO Application Documents

2.3.7 The following key documents have supported the preparation of this ES:

- Draft TWA Order
- Scoping Report (Appendix 2.1)
- Scoping Opinion from the Secretary of State for Transport (Appendix 2.2)
- Statement of Aims (see Chapter 4)
- Strategic Outline Business Case
- Parameter plans for approval
- Deemed planning drawings
- Design and Access Statement
- Consultation Report
- CoCP Part A (Appendix 2.4)
- Flood Risk Assessment (Appendix 18.2)
- Transport Assessment (Appendix 17.2)
- The Consideration of Green Belt Matters Report
- Planning Statement

2.3.8 In addition to the TWAO submission, Network Rail will also request a deemed planning direction from the Secretary of State. The request would be supported by further standalone documents which will address other sustainable design aspects of the proposed Development.

## 2.4 The EIA Team

2.4.1 Network Rail has appointed Arcadis to produce this ES in accordance with the TWA Rules and other associated legislation and guidance.

2.4.2 Arcadis is a registrant of the Institute of Environmental Management and Assessment's (IEMA) EIA Quality mark scheme. Arcadis is committed to excellence in EIA activities and has the IEMA accreditation verified through an independent review of ESs, EIA managers and specialists on a regular basis.

2.4.3 This ES has been prepared by a team of competent experts (see Appendix 2.5). The team comprises technical specialists who have extensive experience in the field of EIA. The individual experts can demonstrate their competence through academic qualifications, memberships of relevant professional institutions and practical experience in undertaking EIAs.

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## 2.5 References

Reference	Title
Ref 2.1	The Transport and Works (Applications and Objections procedure) (England and Wales) Rules 2006 as amended, particularly by The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 [SI 2017 No. 1070] <a href="https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made">https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made</a> <a href="https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made">https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made</a>

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Environmental Statement – Volume 2:  
Chapter 3 – Development Need and Consideration of Alternatives



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 3 – Development Need and Consideration of Alternatives**

JUNE 2021

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## APPENDICES

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## 3 Development Need and Consideration of Alternatives

### 3.1 Introduction

- 3.1.1 In accordance with The Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 as amended ('the TWAO Rules') (Ref 3.1), this Chapter sets out the need for the development and provides details of the reasonable alternatives studied by the applicant.

### 3.2 Need for the Development

- 3.2.1 Cambridge is one of the UK's fastest growing cities. As stated in the Cambridge Local Plan (Ref 3.2), Cambridge's accomplishments include a thriving hi-tech and biotech industry, which has developed since the 1960s and is known as the Cambridge Phenomenon. More people in Cambridge than anywhere else in the UK are likely to use sustainable modes of transport to travel to work. The need for new housing in Cambridge is high.
- 3.2.2 The Cambridge Local Plan 2018 (Ref 3.2) identifies the Cambridge Biomedical Campus (CBC) (see Policy 17), an internationally significant health and life sciences cluster, and the Cambridge Southern Fringe (see Policy 18) as two of eight areas of major change in Cambridge.
- 3.2.3 The CBC is the largest centre of medical research and health science in Europe (Ref 3.3). Planned growth of the CBC up to 2031 will lead to an employment level of 26,000 jobs. In 2019, the Royal Papworth Hospital relocated to the CBC and AstraZeneca's new strategic research and development centre became operational in 2020.
- 3.2.4 It is envisaged that by 2031, new housing developments across the Cambridge Southern Fringe comprising an estimated 4,000 new homes will have been constructed (Ref 3.4). The Southern Fringe area comprising (Ref 3.2) Clay Farm, Trumpington Meadows, Bell School and Glebe Farm, is proposed to deliver high quality new neighbourhoods for Cambridge. It is noted in the OBC report (2021) (Ref 3.5) that the Southern Fringe development will be integrated with the adjacent Cambridge Biomedical Campus.
- 3.2.5 This urban growth is needed to meet the high demand for housing and support the local economy, however future development is also expected to place significant pressures on the transport system.
- 3.2.6 The growth taking place necessitates excellent transport infrastructure. Taking into consideration the scale and type of the development taking place within the Southern Fringe and Cambridge Biomedical Campus, the 2021 Outline Business Case (OBC) report (Ref 3.5) identified a range of existing and future transport problems as follows:
- Lack of long-distance public transport opportunities to the Cambridge Biomedical Campus and the Southern Fringe;
  - Indirect public transport connectivity to international gateways;
  - Indirect public transport accessibility, with a dependence on public transport infrastructure within Cambridge city centre;
  - Highway congestion and associated environmental concerns; and
  - Parking availability.
- 3.2.7 The strategic objectives for this project are set out below:
- Improve sustainable transport access to housing, services, and employment within the Cambridge Southern Fringe and Biomedical Campus area, to fulfil existing and future demands.
  - Contribute to minimising highway congestion associated with the Southern Fringe and Cambridge Biomedical Campus by increasing the mode share for sustainable transport modes.

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- Reduce reliance on Cambridge city centre transport infrastructure for serving the Southern Fringe and Biomedical Campus.
  - Be capable of integrating with and enhancing the opportunities presented by Thameslink and East West Rail, to support development of the Biomedical Campus as part of the Golden Triangle life sciences cluster.
  - Increase public transport connectivity between the Cambridge Biomedical Campus and international gateways, in recognition of its international significance.
- 3.2.8 The proposed Cambridge South station is expected to bring about large benefits in relation to sustainable transport access, reducing reliance on Cambridge city centre transport infrastructure, integrating and enhancing Thameslink and potential East West Rail opportunities, and increasing connectivity to the area including to and from international gateways. The proposed station is also expected to give rise to moderate benefits with regards to minimising highway congestion (Ref 3.5).
- 3.2.9 The (now superseded) Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy (Ref 3.6) identified the need for a new station at Addenbrooke's to serve the CBC (see page 4-12 of the Strategy). The Strategy highlighted the growth in rail patronage in recent years and forecast demand for accessibility to the CBC. The Strategy stipulated that the station would be "necessary to provide new capacity for growth and to address existing problems on the transport network".
- 3.2.10 The Cambridgeshire and Peterborough Combined Authority published a Local Transport Plan (LTP) (Ref 3.3) in February 2020, which replaces the Interim Local Transport Plan published in June 2017. The ultimate aim of the Cambridgeshire and Peterborough Combined Authority's LTP is to reduce 'car dependency'. It is noted in the Plan that rail usage has risen considerably over the Combined Authority area of Cambridgeshire and Peterborough and continues to increase; therefore, the Combined Authority are promoting a range of schemes to help encourage, maintain and accommodate this trend. This includes the proposal for the new Cambridge South station.
- 3.2.11 The Combined Authority's LTP identifies Cambridge South Station as one of the Combined Authority's priority transport schemes. The LTP states that the station 'will support development at the CBC, expected to generate over 30,000 additional journeys by 2031, and relieve congestion in and around the campus by providing greater sustainable transport options'. Commuting into Cambridge by rail will become more attractive, allowing residents to switch from car use.

## 3.3 Consideration of Alternatives

- 3.3.1 In accordance with the TWAO Rules, this chapter describes the reasonable alternatives considered by Network Rail (the Applicant) and provides an indication of the main reasons for selecting the preferred option, taking into account the likely significant environmental effects of the proposed works.
- 3.3.2 The consideration of feasible alternatives is a key part of the process of scheme evolution. This consideration is usually based on engineering feasibility; environmental effects (both positive and negative) and economic considerations to deliver the most appropriate scheme.
- 3.3.3 In summary, the alternatives considered during the development stages were:
- No development
  - Three alternative means of public transport
  - Six station locations and layouts
  - Four Shepreth Branch Junction layouts

### The 'No Development' Alternative

- 3.3.4 As mentioned above, the Cambridgeshire Local Transport Plan (LTP) 2011-2031 has been superseded by the Combined Authority Local Transport Plan. The current Plan identifies



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Cambridge South Station as one of the Combined Authority's priority transport schemes. It is recognised that the new station would support development at the CBC and would help to relieve congestion in and around the campus.

- 3.3.5 The (now superseded) Cambridgeshire Local Transport Plan (LTP) 2011-2031 (Ref 3.7) identified the need for a new station to serve the Addenbrooke's Hospital, the Cambridge Biomedical Campus and the Cambridge Southern Fringe residential development. The LTP Long Term Transport Strategy (Ref 3.2) recognises that 'additional track capacity is likely to be needed between Cambridge Station and Shelford junction [referred to as Shepreth Branch Junction within this ES] to facilitate this work'. The 'No Development' option would therefore not be in line with planning policy.
- 3.3.6 Overall, the 'No Development' alternative would result in a local public transport network that could not accommodate the expected level of employment and housing growth in this area of Cambridgeshire. There would likely be additional pressure on an already congested highway network, should the 'No Development' alternative be adopted.
- 3.3.7 As set out in the Outline Business Case for the Cambridge South Rail Station (2021) (Ref 3.5), the 'No Development' alternative would likely result in:
- Increased pressure on an already constrained Cambridge Station, as all rail trips associated with the Southern Fringe and Biomedical Campus currently route through the main city centre station.
  - Increased levels of highway congestion on radial routes, and local routes throughout the Southern Fringe, and for longer periods of the day. Increased congestion is likely to reduce the attractiveness and viability of later development phases.
  - Accessibility problems for employees based at the Biomedical Campus, due to highway congestion, constrained parking availability, and indirect public transport journeys; and
  - Increased emissions and reduced air quality within the Cambridge Air Quality Management Area, which would additionally have adverse climate change implications.
- 3.3.8 In combination, these issues have the potential to affect the ability of businesses at the CBC to retain their highly skilled and globally mobile employees, and ultimately the success of the entire CBC.
- 3.3.9 Supporting the workforce with good connectivity between key employment and residential sites will continue to be important for Cambridge's current and future economic competitiveness on an international scale (Outline Business Case for the Cambridge South Rail Station, 2021).
- 3.3.10 The 'No Development' alternative would not meet the strategic objectives set out in paragraph 3.2.7.

## Public Transport Options

- 3.3.11 Four public transport options were considered for meeting the objectives set out in section 3.2 of this chapter. These were:
- New Cambridge South rail station and associated rail line improvements
  - New longer distance direct bus or coach services
  - Busway service enhancement
  - Expanded Park and Ride sites
- 3.3.12 Each of the options were scored against the scheme objectives (see section 3.2) using a seven-point scale – large, moderate, slight beneficial / adverse, or neutral. The options were also awarded a red, amber or green rating for deliverability, financial affordability, and stakeholder acceptability risks.

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3.3.13 Cambridge South Station has the potential to bring about large beneficial impacts aligned to four of the five objectives, and therefore achieves the highest rating. The SOBC (2017) (Ref 3.5) reports as follows:

- A new Cambridge South rail station would connect the Biomedical Campus directly to international airports including London Stansted and London Gatwick, via the rail network. Long distance coach services could also be beneficial, but only if direct services were provided from multiple airports to the Biomedical Campus. The other options would not lead to a noticeable benefit for international travellers.
- All options improve sustainable transport accessibility, but Cambridge South Station is rated above other options because it represents a substantial upgrade in provision.
- Three of the four options would help to minimise highway congestion associated with the development areas. However, Park and Ride expansion received an adverse rating as this would be likely to encourage higher traffic volumes in the Southern Fringe area.
- To effectively reduce reliance on city centre transport infrastructure, the scheme must provide direct access to the Biomedical Campus from the national transport network. Long distance coach services could contribute to this. Cambridge South Station would contribute the most by connecting the Southern Fringe area to London and in future the East West Rail link could connect the area to other parts of the Golden Triangle.
- The Cambridge South Station proposal is designed to integrate with and complement the Thameslink and potential future East West Rail schemes. The other options have less of an ability to integrate.
- Deliverability risk is considered to be higher for options requiring a significant level of new infrastructure.

3.3.14 Although the Cambridge South Station option is likely to be the most challenging option in terms of deliverability and is the highest cost option, the assessment that forms part of the SOBC shows that the station is the most effective way to deliver the scheme objectives. This is largely because it provides the most substantial improvement in public transport accessibility between the Biomedical Campus and the Southern Fringe and the largest potential catchment area.

## Site Constraints and Opportunities in South Cambridge

### Site Constraints

3.3.15 Project constraints were identified as part of the Governance for Railway Investment Projects (GRIP) 2 process (the project feasibility stage). Key engineering and environmental constraints are outlined below. An environmental constraints figure is provided in Appendix 3.1.

#### Key engineering constraints

- 3.3.16 A number of structures or civil assets, including bridges, culverts and a Global System for Mobile Communications-Railway (GSM-R) mast, were identified along the proposed route. It is noted in the Cambridge South Infrastructure Enhancements – Feasibility Report for Outline Business Case Designs (GRIP 2) that within the proposed extents (i.e. just south of Shepreth Branch Junction to Cambridge Station) there are a number of assets that shall require consideration when producing the design options. Mainly, these are structures that are identified as constraints or would need to be modified, removed or replaced.
- 3.3.17 A review of the existing buried services identified several buried services present within the project boundary. A schedule of the assets and whether the service is likely to be impacted by various layout options is included in Cambridge South Infrastructure Enhancements – Feasibility Report for Outline Business Case Designs (GRIP 2).
- 3.3.18 Existing overhead line equipment constraints between Shepreth Branch Junction and Cambridge Station are identified in Cambridge South Infrastructure Enhancements – Feasibility Report for Outline Business Case Designs (GRIP 2) as:

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- Position of the Neutral section<sup>1</sup> and Track Sectioning Cabin<sup>2</sup>
- Overbridge electrical clearances
- Overbridge parapet heights

#### *Green Belt*

- 3.3.19 Some of the western portion of the site lies within Hobson's Park, which forms part of the Cambridge Green Belt, and contains Hobson's Park Nature Reserve.

#### *Flood risk*

- 3.3.20 The Environment Agency (EA) 'Flood Map for Planning (Rivers and Sea)' (see Figure 7 in the FRA) shows that the majority of the proposed Development is located in Flood Zone 1 (low probability). Land where the station is proposed is designated as Flood Zone 2 (medium probability) and Flood Zone 3 (high probability). The source of flood risk is identified by the EA as the North Ditch.
- 3.3.21 A study has been undertaken to qualify fluvial flood risk to the proposed Development from the North Ditch. The modelling results showed that no out-of-bank flooding is predicted for the 1 in 100 year or 1 in 1,000 year events.
- 3.3.22 There are areas of elevated surface water flood risk and a surface water flow path in the vicinity of the proposed station. These have been taken into account in the drainage design for the proposed station, as detailed in section 6 of the FRA (Appendix 18.2). Similarly, areas of elevated surface water flood risk along the railway line have informed the drainage proposals for the rest of the proposed Development.
- 3.3.23 Further details are provided in Chapter 18: Water Resources and Flood Risk.

#### *Historic environment*

- 3.3.24 There is one designated asset within the site boundary, the Scheduled Monument west of White Hill Farm. There are several Listed Buildings within 200m of the site boundary, including Nine Wells Monument, located within the Nine Wells Local Nature Reserve.
- 3.3.25 The land within the site boundary and the surrounding landscape demonstrates significant archaeological potential, with all periods represented in the archaeological resource from the Mesolithic through to the Modern. The focus of activity in the study area occurred during the Iron Age and Roman periods when the landscape was more actively used by human settlement.

#### *Biodiversity*

- 3.3.26 Eversden and Wimpole Wood Special Area of Conservation is located approximately 11km from the site. There is also a number of Local Nature Reserves of county importance within 2km of the site, including the Nine Wells Local Nature Reserve. There are City Wildlife Sites within the site boundary, namely Hobson's Brook, as well as adjacent to the site boundary, namely Long Road Plantation. There are also a number of City Wildlife Sites and County Wildlife Sites within 2km of the site. Further detail is provided in Chapter 8: Biodiversity.

### Site Opportunities

- 3.3.27 Key site opportunities are set out below.

#### *Sustainable travel*

- 3.3.28 As part of the Transport Assessment, a gap analysis of the existing walking and cycling infrastructure was undertaken to identify opportunities to improve provision, connections,

<sup>1</sup> Neutral section is a section of overhead line that is not energised.

<sup>2</sup> Track sectioning cabin - At the neutral section between the feeder stations, a Track Section Location (TSL) or a Track Section Cabin (TSC) can be found. These are in place to measure and transform the current and the voltage to the overhead line.



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3.3.34 The key purpose of this work was to anticipate future railway layouts running through Shepreth Branch Junction to the south, a new station at Cambridge South, Cambridge Station and onwards to the north to the Coldham's Lane Junction.

Three options were identified and developed **Operational Concepts 1, 2 and 3**. The Cambridge South Infrastructure Enhancements project is not seeking powers for the 4-track railway described in these options. The Concept Design solutions were used to demonstrate that the Cambridge South Infrastructure Enhancements project solutions can be integrated with the 4-track railway in the future.

### Outline Business Case Design (GRIP2) for the Cambridge South Station

3.3.35 GRIP 2 designs were limited to the railway infrastructure required to support a new station at Cambridge South.

### Track layouts

3.3.36 Track and signalling layouts were designed to accommodate a new station for Cambridge South to deliver the 2020 Indicative Train Service Schedule. The key objective is that the new Cambridge South station does not preclude concept layouts in the future.

### Station Locations

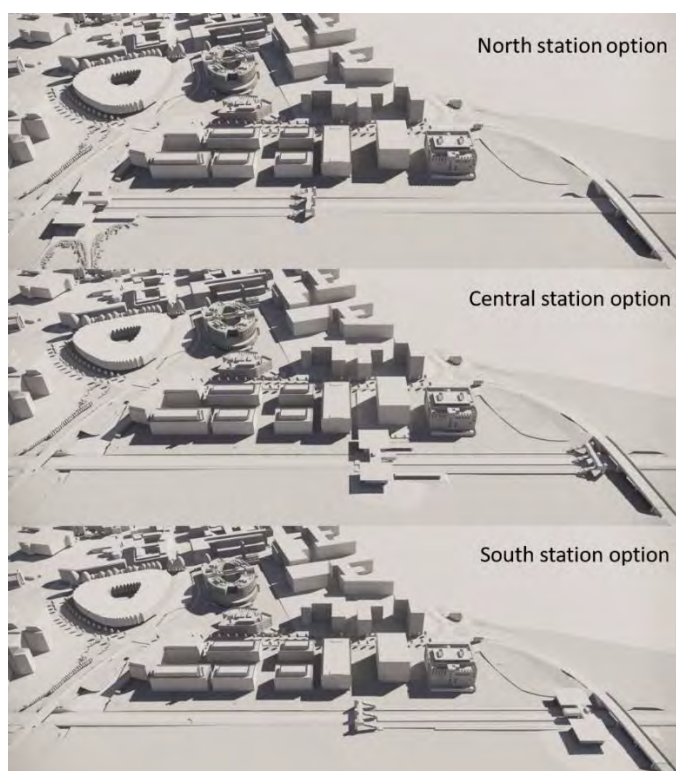
3.3.37 At GRIP 2 stage, station design was primarily associated with location and these were referred to as South, Central and North options. These being a reflection of the proposed location of the station between Addenbrookes Road (Nine Wells bridge) in the south and the Guided Busway bridge (Addenbrookes Bridge) to the north.

3.3.38 The 3 alternatives considered were:

- North – close to the Guided Busway bridge
- South – close to the Addenbrookes Road bridge
- Central – located almost equidistant between the two bridges

3.3.39 Images of these station options are provided in Figure 3-2.

*Figure 3-2 Station options*





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3.3.40 There was no preference made at this stage as to whether the main station facilities would be focussed to the west of the railway or the east, or both. The options proved the high-level feasibility of the proposals.

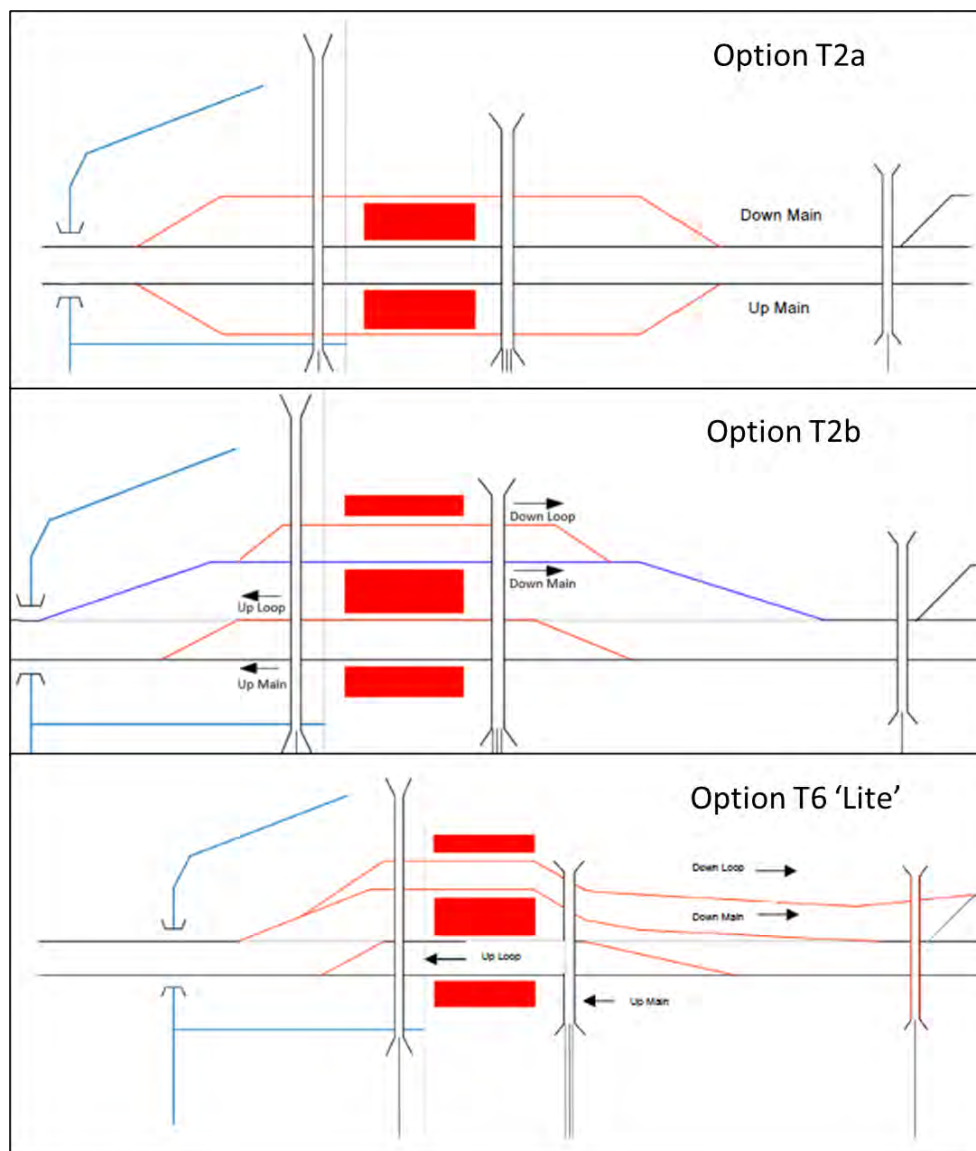
## Operational layouts

3.3.41 Track and signalling high level designs and footprint for a station were developed for the three Operational Layouts (see Figure 3-3) with tweaks for each of the three station location options. Layouts also included layouts with curved platforms to avoid the Scheduled Monument to the south - all were considered to be feasible.

3.3.42 The three Operational Layouts were:

- Option T2a – a four-platform station with two island platforms with loops either side
- Option T2b – a four-platform station with three island platforms
- Option T6 'Lite' – a hybrid of T2a/T2b, and T6 (i.e. four-platform layout with additional platforms constructed to the site) with less infrastructure

Figure 3-3 Operational Layouts (T2a, T2b and T6 'Lite')



NB: Platforms are shown in red.

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#### First Round of Consultation

3.3.43 This level of design information was used to inform the first round of consultation with statutory and non-statutory consultees. The feedback received concerning the location options was as follows:

- The Northern station option was favoured by the majority of stakeholders as it is closest to the centre of the CBC, offers best opportunity for interchange between services on the Busway and bus stops. However, there are concerns that this location could cause the most disruption to Addenbrooke's Bridge (Guided Busway) during construction.
- The Central station location option poses spatial constraints for the University of Cambridge's developments adjacent to the railway track.
- The Southern station location option was favoured by a small number as it would better serve the future proposed expansion of the Campus which is proposed to the south.

3.3.44 Where environmental concerns were raised during the first round of consultation, these have been taken into account during the process of option selection and in the EIA, as appropriate (please refer to the Consultation Report submitted as part of this application submission for further information). Each ES topic chapter has outlined how consultation feedback has been addressed.

#### GRIP3 Options

##### Operational concept development

3.3.45 Early operational modelling of the railway in GRIP 3 predicted that Option T6 Lite layouts offered additional benefits, but the additional cost and environmental impact was not justified. This option extended a third track to the north of the proposed Cambridge South station connecting to the Down Loop line at Long Road (see Figure 3-3). The project team took a decision to stop the development of T6 Lite options.

##### Track and Signalling development

3.3.46 Moving into the GRIP 3 study, track layouts were prepared for individual station locations.

3.3.47 An opportunity was also identified to modify the T2b layout to support an option for a northern station that both obviated the need to demolish and reconstruct Addenbrookes Bridge carrying the Guided Busway and which had a reduced footprint in Hobsons Park. This became known as T7.

##### Operational concept sift

3.3.48 Track layouts associated with the T2a, T2b, T6 Lite and T7 operational layouts were sifted at a workshop on 24 February 2020. The workshop concluded that T7 options were preferred.

##### Station location options

3.3.49 Conceptual station arrangements were considered for each of the Southern, Central and Northern locations between the Nine Wells and Addenbrookes bridges.

3.3.50 An initial sift was undertaken, rationalising the conceptual arrangements to six feasible station access options. The six options were:

- North – 2 (West = Full access; East = pedestrian and cycle (P&C) access)
- North – 4 (West = P&C access; East = Full access)
- Central – 2 (West = Full access; East = P&C access)
- Central – 4 (West = P&C access; East = Full access)
- South – 2 (West = Full access; East = P&C access)
- South – 4 (West = P&C access; East = Full access)

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3.3.51 These options all met Network Rail's key criteria, which were:

- Provide access for passenger & emergency vehicles to one side of the railway only.
- Provide pedestrian and cyclist access to both sides of the railway.

3.3.52 However, these options did not all perform equally well with regards to Network Rail's 'additional development objectives', which are set out below:

- To ensure there is likely to be no significant detrimental impact upon the purposes of the Cambridge Green Belt in this area.
- To ensure there is likely to be no significant detrimental impact upon purposes and character of the adjacent Hobson's Park.
- To ensure there is likely to be no significant detrimental impact upon the route, character, hydrology and biodiversity of Hobson's Conduit and its tributaries.
- Avoid a significant impact upon the purpose biodiversity of the surface water attenuation features between Addenbrooke's Bridge and Nine Wells Bridge.
- Provides a legible transport interchange within the Southern Fringe between the CBC and Clay Farm.
- To ensure there is likely to be no significant detrimental impact upon the local road network and parking.
- Avoid a significant detrimental impact upon the scheduled monument and its setting.

3.3.53 North - 4, Central - 4 and South - 4 performed well; no significant detrimental impacts upon the additional development objectives were predicted. While North - 2 and Central - 2 did not perform well. These options were considered likely to bring about significant detrimental impacts upon the Green Belt and Hobson's Park due to the imposition of the station's full vehicular access requirements. This was also applicable to South - 2, but just in terms of the likely impact on the Green Belt.

3.3.54 These six layouts were then developed forming localised responses to acknowledge key site constraints and opportunities. Although it has been identified above that three of the options would likely bring about significant negative environmental effects, those options met the key criteria. There are other factors to take into account, for example, operational performance and cost. In addition, the iterative design process presents an opportunity to mitigate the risks identified.

### Sifting Station Location and Access Options

3.3.55 Two separate sift workshops were conducted to reduce the number of station location and access options. Initially, the list of six options was reduced to three at a sift workshop on 1 April 2020. These were:

- North – 4 (West = P&C access; East = Full access)
- Central – 4 (West = P&C access; East = Full access)
- South – 2 (West = Full access; East = P&C access)

3.3.56 Generally, the provision of full access via routes through Hobsons Park was not preferred due to the environmental impact. However, it was judged that a western highway access for a southern station had less impact on the park directly, albeit this was still in the Green Belt. The southern station was further developed to move the station building further to the south alongside the Addenbrookes Road embankment to further reduce the visual impact.

### Option selection

3.3.57 An option selection sift workshop was held on 28 May 2020 where the three options were considered. These three options all share a track layout (T7) and a comparable station building concept and size. The track layout has been chosen to minimise impact on the Green



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Belt and existing infrastructure and the station building has not yet been developed in significant detail. The three options considered are summarised below:

Table 3-1 Key advantages and disadvantages of the three station options

Station option	Road Access	Key Advantages	Key Disadvantages
Northern	East	<ul style="list-style-type: none"> <li>- Preferred by most stakeholders and public</li> <li>- Closest to key destinations/greatest passenger journey time benefit</li> <li>- DfT/funder preference</li> <li>- Smaller land take requirement than Southern option</li> <li>- Avoids High Pressure Gas main</li> <li>- Least operational noise impacts</li> </ul>	<ul style="list-style-type: none"> <li>- Site is most constrained (adjacent to Astra Zeneca and drainage structures)</li> <li>- Marginal journey time impact (c. 2 seconds) for some non-stopping trains</li> <li>- Possible need for TSR during construction (c.2seconds of journey time impact)</li> <li>- More complex and slightly longer construction programme</li> <li>- Highway works at FCA/Guided Busway junction</li> <li>- Slightly higher air quality impacts at the New Papworth Hospital</li> <li>- Possible archaeological remains</li> <li>- Complexity of integration with busway extension (CSET)</li> </ul>
Central	East	<ul style="list-style-type: none"> <li>- More space on eastern side</li> <li>- No marginal journey time impact for some non-stopping trains</li> </ul>	<ul style="list-style-type: none"> <li>- Conflict with land to East identified for future lab development.</li> <li>- Traverses High Pressure Gas Main</li> <li>- Significant Landowner security concerns over sharing access roads</li> <li>- Concerns around visual and access impact on Hobson's Park</li> <li>- Potential higher operational noise impacts at the Anne McLaren Building</li> <li>- Least popular at public consultation</li> </ul>
Southern	West	<ul style="list-style-type: none"> <li>- No marginal journey time impact for some non-stopping trains</li> <li>- Sufficient space for bus turnaround facilities etc.</li> <li>- Avoids High Pressure Gas Main</li> <li>- Least constrained option for construction and future growth</li> </ul>	<ul style="list-style-type: none"> <li>- Strong stakeholder objections to western road access (including council planning department) impacting Hobson's Park</li> <li>- Greatest use of green belt</li> <li>- Furthest away from campus destinations so smallest journey time benefit.</li> </ul>

3.3.58 The sift considered many factors, but the key differentiators are shown in the table above. In general, there were no significant differences in the overall environmental impact of the Northern, Central and Southern options. The conclusion reached in the sift workshop was that the Southern option was preferred from a technical perspective (as it has the least engineering, programme and cost risk due to lesser complexity and the greater amount of space). However, it was clear that stakeholders had to a great extent expressed a preference for the northern option, and that progressing this option would likely make the future of the project far more challenging due to the concerns previously raised by key stakeholders. Further design work on Shepreth Branch Junction, to increase the line speed, has removed the journey time impacts associated with the Northern option.

3.3.59 Therefore, the project team discussed this with the Department for Transport, as lead client, which confirmed (that as the options were expected to be of similar cost, and because of the strength of support for the Northern option as well as level of stakeholder concerns regarding

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the Southern option) it was most prudent to proceed with the option which would retain the greatest level of local support. This led to the selection of the northern option.

- 3.3.60 This option is expected to have the simplest passage through the TWAO process, and also provides the best access to key destinations, which is evidenced by OBC work on journey time savings undertaken by DfT.

## Additional Track and Signalling Works to Enhance Operational Performance

- 3.3.61 Network Rail reviewed the operational performance of the proposals at each stage of option development. The final iteration of operational modelling identified some concerns that the proposed track and signalling layouts could have a negative impact on some services. This was a key project requirement and opportunities to develop additional capability were explored.
- 3.3.62 Primarily, this looked to increase the operational speed of Shepreth Branch Junction, which is currently 30mph and which needed to be increased to 50mph. In addition, a new crossover was proposed at Hills Road just outside Cambridge Station to support parallel moves into and out of Platform 7&8. Some modifications to signal locations were also proposed to reduce headways (i.e. space between trains).
- 3.3.63 Whilst the signalling works and the works at Hills Road are contained entirely within the railway boundary, the modifications to Shepreth Branch Junction needed to be more extensive and options were explored and are summarised in the following section.

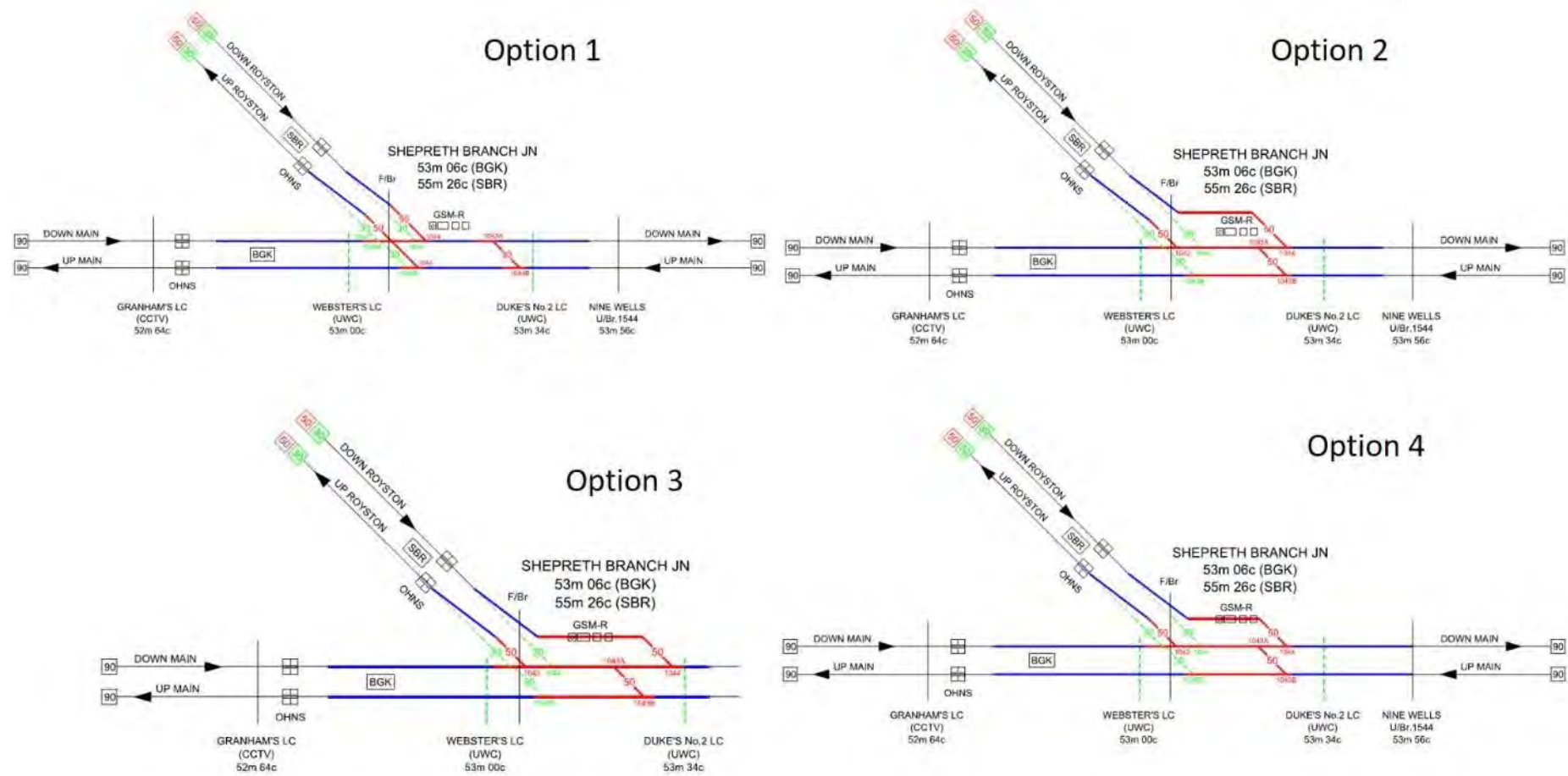
## Shepreth Branch Junction

- 3.3.64 The junction remodelling would be achieved by means of an 'opened out' double junction. Options considered in order to deliver a junction speed of 50mph, in terms of their impacts upon the area of the existing junction and surrounding infrastructure, constructability, maintainability and prevalence of any non-preferred geometry or componentry (see Figure 3-4).
- **Option 1:** This is what could be argued as a 'standard' double junction in that it consists of 2 number turnouts and a diamond (in this case, switched). All S&C is fit for 50mph. Whilst this layout provided the minimum of reverse running. The use of non-preferred layouts and components was deemed unacceptable by Network Rail Route Asset Manager because of the difficulty in accessing parts to maintain this and was discounted.
  - **Option 2:** This is a variation of the 'opened out' double junction currently in use, however faster S&C units are used and the Down Royston is extended – effectively elongating the entire layout and permitting more space for the higher speed and shallower angles. It is possible to install a 50mph switch on the Down Main to the Up Royston and a 50mph crossover from the Up Main to Down Main (in direction of travel). In extending the Down Royston, all S&C is fit for 50mph. This option takes the Down Royston to the west of the existing Global System for Mobile Communications-Railway (GSM-R) mast which is subsequently 'rail locked' between the Down Royston and Down Main in its extant position. This presented an ongoing maintenance safety concern and was not preferred.
  - **Option 3:** This is as per Option 2, but the Down Royston does not avoid the GSM-R mast and indeed displaces it. It is also extended further than in Option 2 to allow the creation of an additional signalling section on the approach to Cambridge South station, increasing the capacity of the railway network in this section and converges with the Down Main approx. 30m on approach to the location of Duke's No 2. Level Crossing. All S&C is fit for 50mph. Option 3 is the preferred solution for the remodelling of Shepreth Branch Junction. This was the option chosen.
  - **Option 4:** This is as per Option 3 (i.e. displaces the GSM-R mast) but with the Down Royston truncated to be of a length identical to Option 2. All S&C is fit for 50mph. The option required significant slues on the Main Lines and was discounted from a constructability perspective.

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Figure 3-4 Shepreth Branch Junction Options



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- 3.3.65 Option 3 was selected as the preferred layout for the proposed modifications to Shepreth Branch Junction. This decision was predominantly safety and engineering driven since one option was not acceptable to the route asset engineer and another would have introduced additional safety risks to maintenance staff seeking to access the GSMR mast. Of the two remaining options, the one with the lowest impact on non-railway land was chosen. Option 3 was the minimum operationally acceptable solution.

#### Conclusion of option selection process

- 3.3.66 The project identified that a northern station location with vehicular access from Francis Crick Avenue provides the best solution for a Cambridge South Station. Additional infrastructure is required to ensure that there are no service disbenefit for passengers resulting from the new station. These works are in the form of a new higher speed extended double junction at Shepreth Branch Junction along with a new crossover immediately south of Cambridge Station at Hills Road.
- 3.3.67 The environmental impacts for all options for the station location and Shepreth Branch Junction works were assessed but were not the deciding factor during the option selection process as the decision was made against cumulative impact when considering all categories equally.

#### Second Round of Consultation

- 3.3.68 This selected single option for the proposed Cambridge South station and associated infrastructure was used to inform the second round of consultation with statutory and non-statutory consultees.

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### 3.4 References

Reference	Title
Ref 3.1	<p>The Transport and Works (Applications and Objections procedure) (England and Wales) Rules 2006</p> <p><a href="https://www.legislation.gov.uk/ukxi/2006/1466/schedule/1">https://www.legislation.gov.uk/ukxi/2006/1466/schedule/1</a></p> <p>as amended, particularly by The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 [SI 2017 No. 1070]</p> <p><a href="https://www.legislation.gov.uk/ukxi/2017/1070/schedule/4/made">https://www.legislation.gov.uk/ukxi/2017/1070/schedule/4/made</a></p>
Ref 3.2	<p>The Cambridge Local Plan 2018</p> <p><a href="https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf">https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf</a></p>
Ref 3.3	<p>Cambridgeshire &amp; Peterborough Combined Authority, The Cambridgeshire &amp; Peterborough Local Transport Plan (February 2020)</p>
Ref 3.4	<p>Cambridge South Station: Strategic Outline Business Case 13 November 2017 (Mott MacDonald)</p>
Ref 3.5	<p>Strategic Case Outline Business Case - Cambridge South Rail Station February 2021 (Mott MacDonald)</p>
Ref 3.6	<p>Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy (2015)</p> <p><a href="https://www.cambridgeshire.gov.uk/asset-library/imported-assets/R-TP-The_Long_Term_Transport_Strategy.pdf">https://www.cambridgeshire.gov.uk/asset-library/imported-assets/R-TP-The_Long_Term_Transport_Strategy.pdf</a></p>
Ref 3.7	<p>Cambridgeshire Local Transport Plan 2011-2031(2015)</p> <p><a href="https://www.cambridgeshire.gov.uk/asset-library/imported-assets/The_Local_Transport_Plan_3%20(1).pdf">https://www.cambridgeshire.gov.uk/asset-library/imported-assets/The_Local_Transport_Plan_3%20(1).pdf</a></p>

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Environmental Statement – Volume 2:  
Chapter 4 – The Site and the Proposed Development



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 4 – The Site and the Proposed Development**

JUNE 2021

The Network Rail (Cambridge South Infrastructure Enhancements) Order  
Environmental Statement – Volume 2:  
Chapter 4 – The Site and the Proposed Development



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Appendix 4.1 Site Boundary Plan
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## 4 The Site and the Proposed Development

### 4.1 Introduction

- 4.1.1 This Chapter of the Environmental Statement (ES) provides a description of the proposed Development forming the basis of the assessments presented in Chapters 5 to 18. It provides an overview of the existing site and surrounding area, a description of the layout and physical characteristics of the proposed Development and the land use requirements during the construction and operation phase. This Chapter also describes the construction programme and anticipated construction activities.

### 4.2 The Site and Surrounding Area

- 4.1.2 The site boundary covers an area of approximately 46.5ha. and lies within and adjacent to the existing railway corridor from Hills Road overbridge in the north (located at British National Grid TL 46109 57019) and Shepreth Branch Junction to the south (located at British National Grid TL 46360 52552) (see Figure 4-1 below and Figure 4.1 in Appendix 4.1). The site is centred around British National Grid TL 45856 54825 in the area immediately west of the Cambridge Biomedical Campus (CBC). The proposed Development is located in the administrative areas of Cambridge City Council and South Cambridgeshire District Council. The southern part of the site is also located within the parish of Great Shelford.

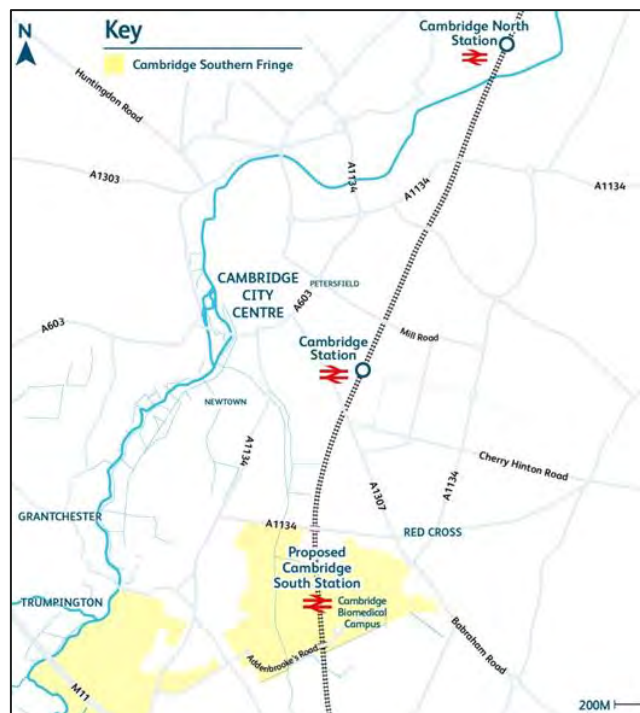


Figure 4-1 Location Plan

- 4.1.3 The proposed Development site is generally flat and contains the existing railway line. The eastern portion of the site is bordered by the CBC masterplan area and is mainly occupied by associated buildings, hard standing areas and car parks. The central eastern fringe is connected by Francis Crick Avenue. To the south of the CBC lies Addenbrookes Road which forms the junction of Francis Crick Avenue and Dame Mary Archer Way. Within adjacent land, south of Dame Mary Archer Way is Abcam Plc, associated storage yards and car parking. The area further to the south is occupied by arable farmland.
- 4.1.4 The majority of the western portion of the proposed Development site lies within Hobson's Park which is greenfield in nature and contains Hobson's Park Nature Reserve. Arable farmland lies to the south west of Addenbrookes Road, which contains a Scheduled Monument with all periods

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represented in the archaeological resource from the Mesolithic through to the Modern. Hobson's Brook is also located within the site's western boundary and lies in a north-south orientation.

- 4.1.5 At Shepreth Branch Junction, residential properties lie along the east of A1301 Cambridge Road and adjacent to Davey Crescent. There are two Grade II Listed Buildings, Four Mile House, located west of Cambridge Road on the north of the railway and De Freville Farmhouse located west of Cambridge Road on the south side of the railway.
- 4.1.6 The northern area of the site predominantly comprises existing railway infrastructure. This area is bordered by large educational and industrial buildings. Along the Cambridgeshire Guided Busway (CGB) route, which crosses over the northern portion of the site, there are stretches of national cycle route, public rights of way (PRoWs), and minor roads which frame the site and create connectivity to surrounding areas.
- 4.1.7 The geology beneath the site is identified as: chalk of the Zig Zag Chalk Formation; Totternhoe Stone Formation, and the West Melbury Marly Chalk Formation over the Gault Formation. This is overlain by superficial deposits of sand and gravel River Terrace Deposits.
- 4.1.8 The site is predominantly located in Flood Zone 1 but small areas along both sides of the railway line are located in Flood Zone 2 and 3.
- 4.1.9 The surrounding area contains significant archaeological potential, including rich Prehistoric and Roman activity. Key areas have previously been investigated through archaeological excavations east of the site including: the Addenbrooke's Hospital and the Addenbrooke's Link Road; the AstraZeneca site; Clay Farm excavations, works at Trumpington Meadows and around Granham's Farm. Potential for archaeology presents a key constraint, as it surrounds the site boundary on all sides.
- 4.1.10 Within the site boundary and surrounding area, there are a range of transport infrastructure in the form of roads, the CGB, railway lines and cycle paths. Public footpaths, permissive paths and cycle routes also cross the area.
- 4.1.11 Within the site boundary, Hobson's Brook, a partially natural watercourse, rises from Nine Wells Local Nature Reserve. The Brook is an important ecological feature and wildlife corridor and comprises grassland, ruderal species and a number of ponds. Beyond the western boundary the area is characterised by the River Cam which flows north to south approx. 2km parallel to the west of the railway.
- 4.1.12 There are two Sites of Special Scientific Interest (SSSI) within 2km of the proposed Development: Gog Magog Golf Course besides Babraham Road and Cherry Hinton Pit alongside Limekiln Road. There are a number of listed buildings adjacent to the eastern fringe, the closest is the Dovecote at Granhams Farm which is a Grade II listed building at a distance of approximately 30m from the Development boundary.

## 4.2 The Proposed Development

- 4.2.1 The aim of the Cambridge South Infrastructure Enhancements (CSIE) scheme (hereafter referred to as the proposed Development) is to provide infrastructure necessary to deliver a new station adjacent to the Cambridge Biomedical Campus whilst maintaining capacity and improving capability of the network. The proposed Development would provide facilities to accommodate 240m length trains at the new station, additional track infrastructure to allow services to stop at the station whilst protecting train capacity and performance.
- 4.2.2 The proposed Development comprises these three main components:
  - A new connection between existing lines at Hills Road (to improve the southern access to Cambridge Station)
  - A new Cambridge South station
  - Junction improvements at Shepreth Branch junction

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- 4.2.3 The design development has been undertaken in three phases including initial concept design to adopt a holistic approach to the wider transport needs, Governance for Railway Investment Projects (GRIP) 2 study developing several feasible options and at GRIP 3 stage confirming the Northern station location preferred option which has been taken forward for the environmental impact assessment. Further details of the options selection process are included in Chapter 3 of this ES.
- 4.2.4 Four alignment options were reviewed for the Shepreth Branch Junction Re-modelling. All options were considered in order to deliver a junction speed of 50mph in terms of their impacts upon the area of the existing junction and surrounding infrastructure, constructability and maintainability.
- 4.2.5 During the development of the preferred option, environmental and design constraints related to the station location and Shepreth Branch Junction were taken into account.
- 4.2.6 Table 4-1 shows the current anticipated key dates of the programme for the proposed Development, construction programme improvements will be considered during the detailed design phase. A first full operational year of 2026 has been assumed for assessment purposes.

Table 4-1 Anticipated Duration and Key Dates

Project stage	Anticipated duration/key dates
Pre-construction and enabling works	Autumn 2022
Start of construction	Spring 2023
Construction period	115 weeks
Station opening date	Summer 2025

## Development Specification

- 4.2.7 The proposed Development comprises the construction of a new railway station with four passenger platforms including a shared island platform, a two-storey station building at each side of the railway with space for ticket vending machines, automatic ticket barriers, station forecourt, main footbridge and lifts as well as an emergency evacuation footbridge and stairs. There will be step-free access with lifts on each platform covered by canopies. In addition, there will be taxi and passenger drop-off facilities, cycle parking, pedestrian and cycle paths into the station as shown in the Illustrative Station Layout Plans, drawing numbers: 158454-ARC-ZZ-ZZ-DRG-LEP-000081, 158454-ARC-ZZ-ZZ-DRG-LEP-000082 and 158454-ARC-ZZ-ZZ-DRG-LEP-000083; and the Proposed Site Plans, drawing numbers: 158454-ARC-ZZ-ZZ-DRG-LEP-000041 and 158454-ARC-ZZ-ZZ-DRG-LEP-000042.
- 4.2.8 The station is proposed to be built out in phases, whilst maintaining a live operational railway.
- 4.2.9 The proposed Development will also incorporate some improvements to Shepreth Branch Junction as indicated on the Proposed Plan, drawing number: 158454-ARC-ZZ-ZZ-DRG-LEP-000055.
- 4.2.10 Additional track and signalling works will be installed in the area of Hills Road.
- 4.2.11 Space for 1,000 cycles arranged on both sides of the railway is proposed and includes a variety of “Sheffield stands”, two-tier racks and parking for non-standard cycles. The precise configuration of the cycle stands will be finalised during detailed design of the station.
- 4.2.12 The anticipated construction works will require up to 5.12 ha of temporary land take, and up to 30.26ha of permanent land take. Regarding the latter, the development proposals will include the permanent loss of approximately 2ha of Hobson’s Park to allow for the station building, access paths and landscape works on the western side of the site. Exchange land located in the southern part of the main site south of Addenbrooke’s Road is proposed as part of the TWAO submission to replace the open space that will be lost. A Section 19 application under the Acquisition of Land Act 1981 will be made simultaneously with the TWAO submission, requesting a certificate under section 19(1)(a)

of the 1981 Act be granted by the Secretary of State for the proposed provision of replacement land in exchange for the loss of open space.’

## 4.3 Demolition and Construction

### Demolition

- 4.3.1 Demolition works would involve removal of existing track, lineside equipment and drainage. Works to extend Tibbets culvert below the Down side (western side) of the west station building will involve the demolition of the existing headwalls.
- 4.3.2 In addition, two agricultural level crossings will be decommissioned and removed.

### Construction

- 4.3.3 The main construction activities would include the following:
- Construction of the station buildings, stairs, connecting footbridges, lift shafts, forecourts and access paths;
  - Installation of new tracks and platforms and associated infrastructure including new signalling, Overhead Line Equipment (OLE) structures and associated utility diversions;
  - Temporary diversion and reinstatement of National Cycle Network (NCN) Route 11 including a temporary bridge crossing Hobson's Brook; and
  - Changes to the intersection of the Guided Busway and Francis Crick Avenue to create a station forecourt entrance.
- 4.3.4 Drainage works would require excavation of new attenuation basins and outfalls prior to the commencement of the main construction works.
- 4.3.5 Long Road and Nine Wells bridges will not need to be reconstructed or altered. The southern embankment of the Guided Busway on the east side of the railway will be modified to accommodate cycle parking.
- 4.3.6 All works that will take place within the nationally designated Scheduled Monument will be carried out following consultation with Historic England and, where applicable, Scheduled Monument Consent will be applied for prior to works taking place. Works that require Scheduled Monument Consent include the archaeological evaluation and any mitigation works, as well as the construction of the haul road.
- 4.3.7 A number of construction compounds are required in order to facilitate and manage construction. The proposed siting of compounds has considered public consultation responses, initial engagement with landowners, environmental features, topography and ownership of land for access. Each compound will act as a point of access off the highway network to the proposed Development for each sub-section of the site. There are two strategic main compounds and seven satellite compounds proposed to support the different elements in the vicinity of the new station. Each compound will require utilities to be supplied. Where local services are available this will be from mains provided connections. Connections will be determined on a site-by-site basis.

### Existing Infrastructure

#### Utilities

- 4.3.8 A review of the existing buried services within the affected project area was undertaken within the Statutory Utilities Management Checklist. Services were identified that would be close to the works or which were likely to need diversion, protection or similar. Further detailed work will be undertaken as the design develops in GRIP 4 (Single option development) from April to December 2021.



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**Overhead lines catenary**

4.3.9 Existing overhead line equipment will need to be replaced to fit the new track alignments required for the station, Shepreth Branch Junction and Hills Road shunt spur works.

**Construction Access Points (AP)**

4.3.10 Identified access points to the site from the public highway are required as follows and shown on Figure 4-2 below:

- **AP1:** From Addenbrookes Road to east of the railway on the Addenbrookes Road/Dame Alice Way roundabout at the end of Francis Crick Avenue.
- **AP2:** From Addenbrookes Road to west of the railway via a track just east of Hobson's Brook just south of Nine Wells Bridge, 1544C. The junction entrance will be required to be widened to accommodate passing vehicles in the entrance.
- **AP3:** From Long Road, between the railway and the guided busway corridor. In the southern verge. It is not anticipated that this will be a heavily used access.
- **AP4:** From Francis Crick Avenue north of the adjacent Guided Busway corridor to the east of the railway. It is not anticipated that this will be a heavily used access and could accommodate the anticipated levels of use with traffic marshalls.
- **AP5:** From Francis Crick Avenue south of the adjacent Guided Busway corridor to the east of the railway.

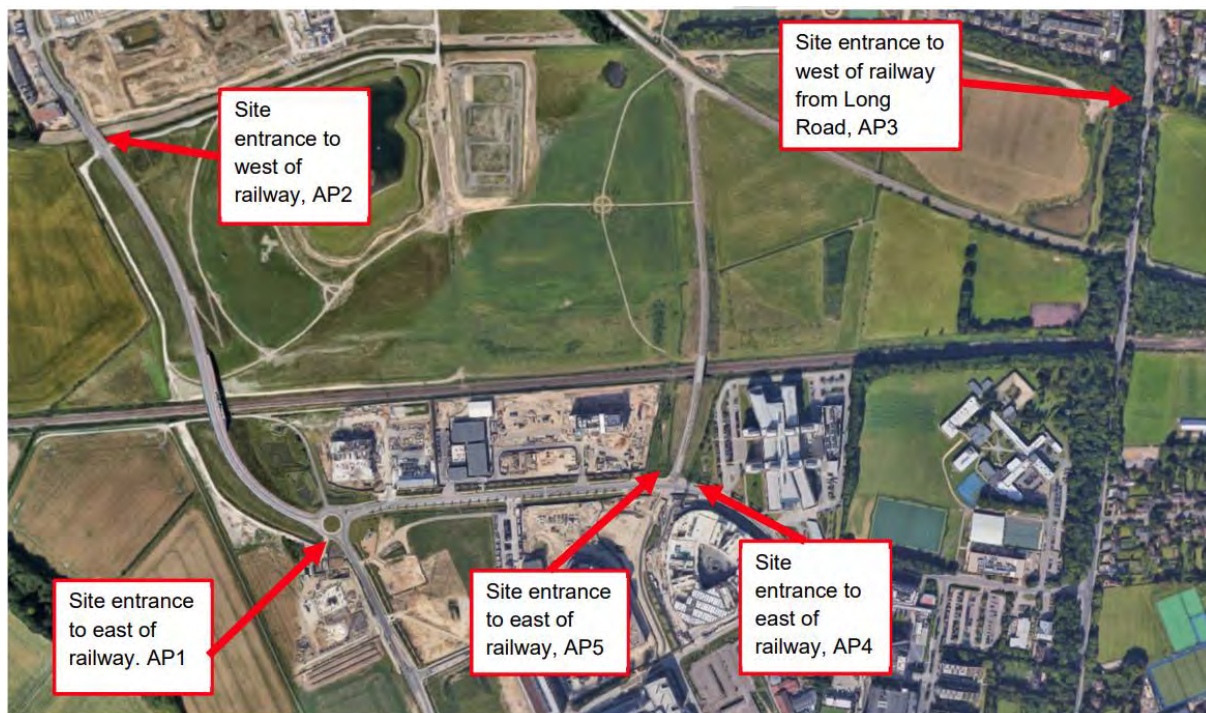


Figure 4-2 Proposed Construction Access Points

4.3.11 The proposed access points will be shown in detail in Appendix 17.1 of the Transport Chapter of this ES (Chapter 17).

**Temporary Construction Access Roads (AR)**

4.3.12 The following identified access roads are required between the access points and compounds and/or haul roads, shown on Figure 4-3 and Figure 4-4 below:

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- **AR1:** From AP1 via a track from Addenbrookes Road/Dame Alice Way roundabout at the end of Francis Crick Avenue.
- **AR2:** From AP2 via a track just north of Hobson's Brook just south of Nine Wells Bridge.
- **AR3:** From AP3, via an existing access into the St Mary's School playing fields.
- **AR4:** From AP4 along the northern toe of the Guided Busway Embankment.
- **AR5:** From AP5 along the southern toe of the Guided Busway Embankment.
- **AR6:** From the connection with AP2 just off Addenbrookes Road, crossing Hobson's Brook and then following the field boundary east and then south to the railway boundary to meet the temporary haul road (HR7)
- **AR7:** From Granham's Lane to the Shepreth Branch Junction eastern construction compound

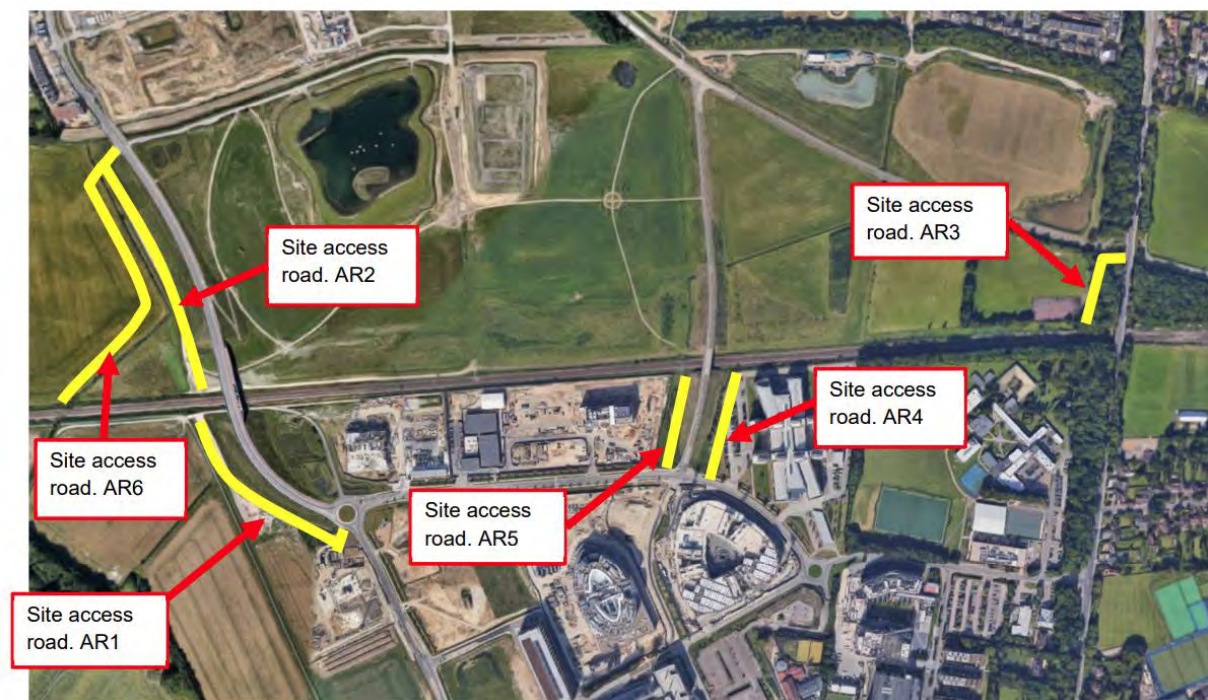


Figure 4-3 Proposed Construction Access Roads – Station Area



Figure 4-4 Proposed Construction Access Roads - Shepreth Branch Junction Area



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## Haul Routes

4.3.13 There are works to either side of the railway and so access would be required along both sides of the railway along the extents of the proposed works.

4.3.14 Figure 4-5 and Figure 4-6 show the following identified haul routes:

- **HR1:** From Nine Wells Bridge, along the Up side (eastern) railway boundary to the east of the railway, south to Nine Wells springs/Hobson's Brook
- **HR2:** From Nine Wells Bridge along the Down side (western) railway boundary to the west of the railway south to Nine Wells springs/Hobson's Brook.
- **HR3:** From Nine Wells Bridge, along the Down side railway boundary to Addenbrooke's Bridge carrying the Guided Busway. This is through Hobson's Park.
- **HR4:** On the Down side, from Long Road across the field to the west of the Guided Busway
- **HR5:** Along the Up side of the railway to the rear of the MRC Laboratory of Molecular Biology
- **HR6:** Along the Up side railway boundary at the rear of the Biomedical Campus between Nine Wells Bridge and Addenbrooke's Bridge carrying the Guided Busway
- **HR7:** Along the Down side of the railway boundary from Nine Wells springs/Hobson's Brook to Shepreth Branch Junction.

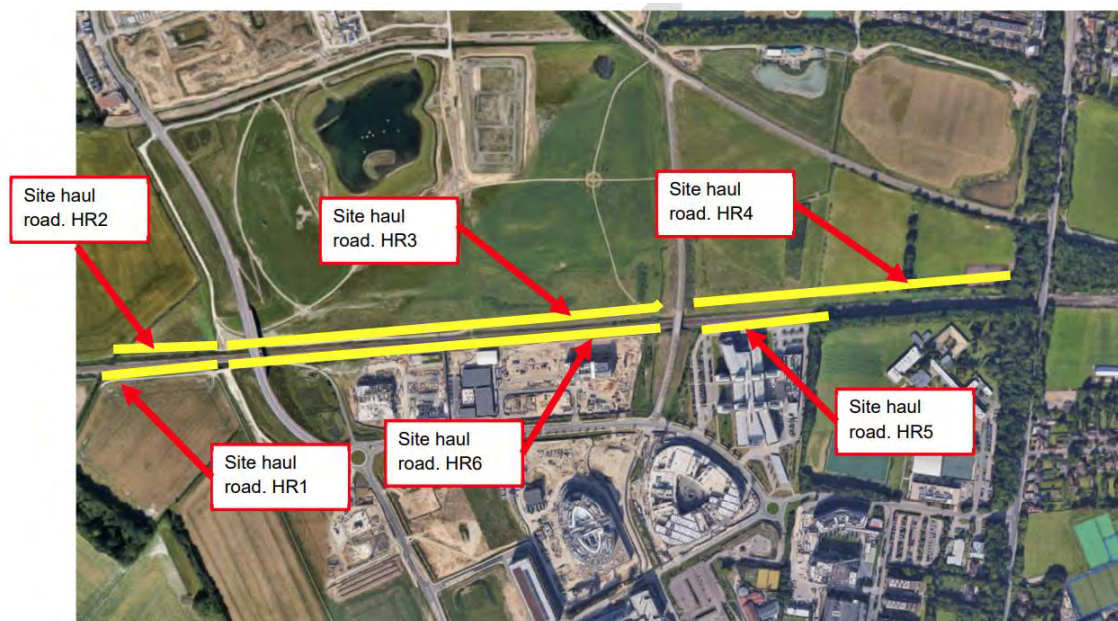


Figure 4-5 Proposed Site Haul Roads – Station Area



Figure 4-6 Proposed Site Haul Roads – Shepreth Branch Junction Area

## Plant

- 4.3.15 This section identifies the type and size of plant required to deliver the works. This is not based on a detailed construction planning exercise and should be taken as indicative of the type of plant that could be used. During GRIP 4 and GRIP 5, a Main Works Contractor and supply chain would develop a methodology and sequence for the works including selection of plant; this could be different to that stated at GRIP 3 stage, providing any change in construction methodology is 'not environmentally worse than' (NEWT) the methodology assessed in this ES and implemented in accordance with the Code of Construction Practice Part A (see Appendix 2.4).

### Site Plant

#### **Haulage**

- 4.3.16 The site would be serviced by a fleet of 8-wheel, 20 tonne tipper wagons to ferry materials from quarry to site and to remove surplus materials to landfill where materials cannot be sourced from or retained on site.
- 4.3.17 It is anticipated that each of the large site compounds will have wheel wash facilities for use by the tipper fleet before they leave the unmetalled site roads to keep the public highway free of mud and dust.
- 4.3.18 Satellite sites would be serviced by a road broom to keep the public highway free of mud and dust.

#### **Excavation and Filling**

- 4.3.19 A smaller backhoe machine is envisaged for trenching and drainage works and for working in more confined areas of the site. There would be fill material stockpiles at each of the main compounds that would be serviced by a large tracked backhoe machine.
- 4.3.20 These machines will also be required to undertake some of the landscaping activities. There would be a small to medium sized all terrain dumper to ferry spoil away from each work face alongside the railway and to import engineering fill materials.
- 4.3.21 Works to excavate, trim and fill the track formation would be undertaken by a large-tracked backhoe machine and scraper.
- 4.3.22 All imported fills will need to be compacted to prescribed dry densities. This may also include the track ballast when it is placed across the formation.
- 4.3.23 The new plain line and switches and crossing (S&C) will need to be tamped by a main line tamper ahead of entry into service and again shortly afterwards.



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**Lifting**

- 4.3.24 A telescopic forked handler would possibly be used for general site lifting activities and for some planned lifts associated with the station platforms and building construction.
- 4.3.25 It is envisaged that there will be a city crane adjacent to each station building during the erection of the building frame and to lift in roofing and walling systems. A larger mobile telescopic crane would be required for the planned lifts for the station footbridge spans, lift shafts and stairs. It is anticipated that the building and bridge works would be piled using small to medium diameter Continuous Flight Auger (CFA) piles using a CFA piling rig.
- 4.3.26 OLE and canopy foundations may also be piled although a mini piling rig is more likely to be suited to works along the platform areas. In addition, a retaining wall alongside the Guided Busway would be constructed using temporary tubular piles (in lieu of sheet piling) in a multi-level tied configuration to support top-down construction. A mini piling rig is anticipated to be used to install the tubular piles from a scaffold deck. In areas where excessive vibration or noise is likely to be problematic, rotary or reaction stand piling techniques will be favoured over vibration or percussive piling techniques. Works will where possible be limited to daytime hours.

**On Track Plant**

- 4.3.27 Overhead line work would require wires to run following the construction of track panels and railing up. The wires would also need to be fine lined ahead of entry into service. This work will be undertaken using Road Rail Vehicle (RRV) and Mobile Elevated Work Platforms (MEWPs) to run out the new cables and access the overhead line structures for fixing of the brackets which hold the wires.

**Construction Compounds**

- 4.3.28 Identified compound locations (see Figure 4-7) are as follows:

- **CC1:** adjacent to Addenbrookes Road to the east of the railway alongside the track from Addenbrookes Road/Dame Mary Archer Way roundabout. It is anticipated that this would be the main construction compound for the site with all of the associated site infrastructure including car parking, offices, welfare, stores, materials handling, waste handling.
- **CC2:** south of Addenbrooke's Road. This area would service works on the Down side (west side) of the railway and would be a main compound. In addition, signalling, E&P and telecoms equipment buildings are proposed at this location;
- **CC3:** a satellite compound to support station construction;
- **CC4:** adjacent to Addenbrooke's Bridge carrying the Guided Busway to facilitate construction of the Down Loop (west of the railway) and to crane in elements of the S&C for the Up Loop (east of the railway). This will be a satellite compound;
- **CC5:** (The requirement for this compound has now been removed); and
- **CC6:** At the north east of the Astra Zeneca car park/service yard to support construction of the station. This would be a temporary/transient compound, i.e. it would only take space for identified construction activities.

- 4.3.29 To service the works at Shepreth Branch Junction, it is proposed to install four compounds: three on the west, accessed via a haul road from Addenbrooke's Road parallel to the railway; and one compound on the east, accessed via Granham's Road. These are set out below and shown in Figure 4-8:

- **CC7:** On the west side of the railway near to Dukes No. 2 Level Crossing to support construction of the turnout onto West Anglia Main Line (WAML). This would be a satellite compound;

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- **CC8:** On the west side of the railway midway between Dukes No. 2 Level Crossing and Websters Level Crossing to support construction of a crossover. This would be a satellite compound;
- **CC9:** On the west side of the railway at Websters Level Crossing to the junction re-modelling. This would be a main compound; and
- **CC10:** On the east side of the railway at Websters Level Crossing to the junction re-modelling. This would be a satellite compound.

Compound Facilities

4.3.30 Both main compounds (CC1 and CC2) would require utilities supplies. Where local services are available this would be from mains provided connections. A new Distribution Network Operator (DNO) supply may be required to service some compounds. A review will be completed during GRIP 4 and GRIP 5 to understand the feasibility of establishing new mains connections for each compound. Where this is not possible for smaller satellite compounds, temporary supplies will be required in the form of water bowzers, wastewater tanks/ chemical toilets and low-carbon generators.

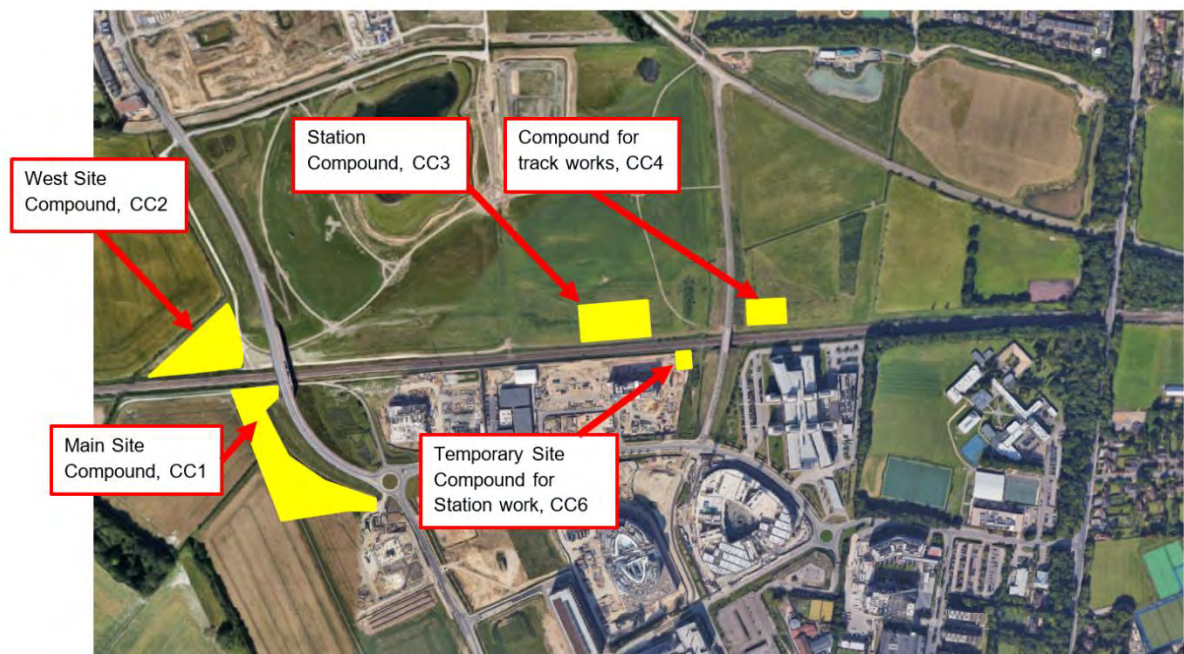


Figure 4-7 Proposed Construction Compounds, Station Area

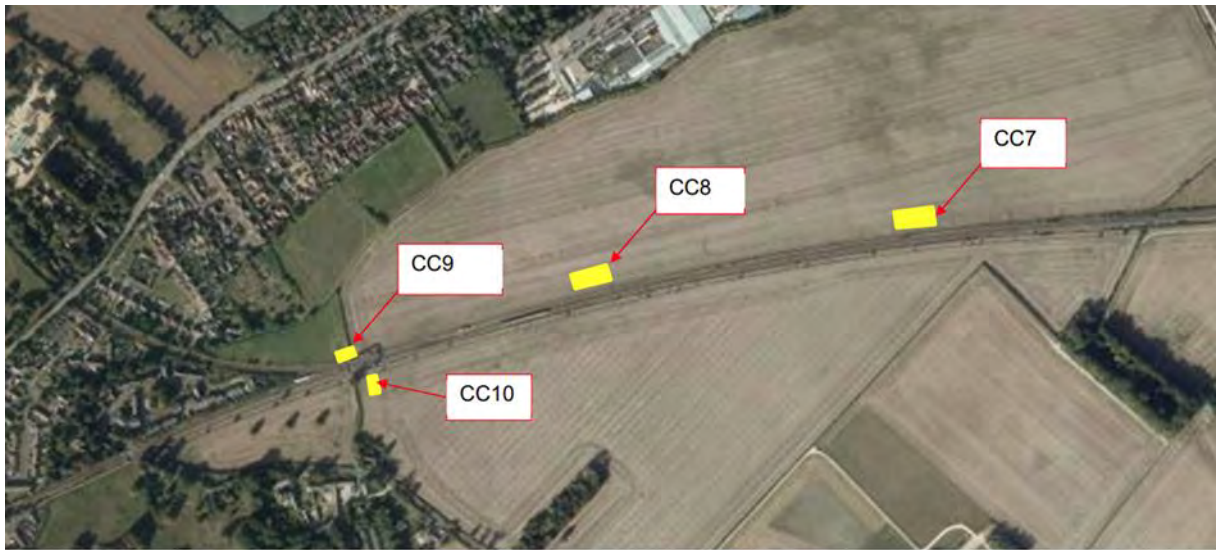


Figure 4-8 Proposed Construction Compounds, Shepreth Branch Junction Area

### Construction Hours and Workforce

- 4.3.31 The construction works will take place over approximately a two-year period. Further detail is given in the Construction Programme section below.
- 4.3.32 Working hours will differ depending upon the nature of the activity, the location and constraints imposed by existing railway operations. Broadly speaking:
- Where work takes place under 'greenfield' conditions (i.e. no restrictions in place as a result of operational railway), working hours would be 07.00 to 18.00 on weekdays and 08.00 to 13.00 on Saturdays;
  - Where work takes place under possessions of the operational track, there are three further arrangements into which working hours can be divided:
    - from 22.00 on Saturdays to 08.00 on Sundays (for typical weekend possessions);
    - from 22.00 to 06.00 (for typical mid-week night possessions);
  - Disruptive possessions taking place over a full weekend duration, which can include Bank Holidays (Saturday, Sunday and Monday). Typically, these would include 24-hour working for the duration of the possession.
- 4.3.33 As a high-level estimate, the proposed Development is likely to have an average of 150 -200 workers and staff on site during the construction phase.

### Green Travel Plan

- 4.3.34 A Green Travel Plan will be prepared by the site contractor and will set out Network Rail's strategy for limiting the use of single occupancy car travel. The plan will help to reduce congestion/parking issues as well as reduce environmental impacts associated with transport and travel.
- 4.3.35 A crew bus could service local park and ride facilities to encourage staff to park away from the area.
- 4.3.36 Staff and workers would need to pass through Staff Attendance Monitoring System (SAMS) arrangements at the main compound before commencing daily duties. There would be some car parking at the two main compounds. At present, site compounds have been envisaged to have a total of around 75 car parking spaces.

### Material Deliveries

- 4.3.37 Material deliveries for the proposed Development would be from a number of primary sources:

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- Imported engineering fill material from local and regional quarries;
- Ballast and other track materials supplied by Network Rail;
- Surplus suitable fill materials heading to recycling centres;
- Unsuitable fill materials heading to landfill for disposal under licence;
- Concrete from local batching plants;
- General building materials probably sourced from local merchants;
- Pipework and associated drainage products, catch pits, etc.;
- Specialist building components; and
- Modular elements of design manufactured off site including:
  - Access for All (AfA) bridge structures, lift shafts, stairs;
  - Platform canopies including building services cassettes;
  - Waiting room systems;
  - Platform elements, typically precast concrete riser wall and block systems; and
  - Concrete storage tanks required for elements of attenuation.

### Quarried Materials

- 4.3.38 There are 6 operational quarries within a 1-hour haul of the site. This includes a number of sand and gravel quarries. It is possible that materials would be hauled across longer distances to provide access to graded engineering fill materials.
- 4.3.39 The majority of any hauled materials from quarries will access the site from the M11 to the west of Cambridge and will traverse Addenbrooke's Road. This is ideal from the perspective of routing construction deliveries away from the campus area and Francis Crick Avenue.

### Ready Mix Concrete Vehicles

- 4.3.40 There are 4 north concrete batching plants within a 20-minute haul of the site. Reliability of journey time is important for the delivery of concrete and this would influence the choice of origin.
- 4.3.41 The majority of concrete deliveries will access the site from the M11/A14 to the west of Cambridge and will traverse along Addenbrooke's Road to the site.

### Construction Traffic

- 4.3.42 It is a reasonable assumption that the site will be able to import, process and place 1,000 tonnes of material split between the two halves of the railway. This is benchmarked against major railway earthwork projects. This equates to approximately 50 HGVs a day at the busiest times within the programme.
- 4.3.43 There will be traffic associated with moving materials around the site although this will be undertaken on internal haul routes where possible.
- 4.3.44 At the end of the project, there will be materials to remove from site.
- 4.3.45 In total, this is a modest amount of haulage traffic.
- 4.3.46 There will be other site deliveries and internal site traffic to manage and it is reasonable to assume at this stage that outside the start and end of shift periods, the main site compounds will generate no more than 10-20 deliveries each hour. These will be a mixture of HGVs and Vans.



## Construction Programme

### Assumptions

- 4.3.47 It is assumed that the longer 78-hour blockades are limited to Christmas and the shorter 54-hour blockades are available in any bank holiday period. As the ground conditions are described as river terrace gravels overlaying chalk, all ground movements during construction have been assumed to occur instantaneously, i.e. no periods for settlement or have been considered in the sequence and programme at this stage.

### Overview of programme

- 4.3.48 This section provides a high-level overview and rationale of the sequencing to construct the infrastructure required for the proposed Development. The sequencing is indicative at this stage until the Main Works Contractor validates the construction sequencing and final access arrangements with the Train Operating Companies have been reached. Any change in construction sequence will only be implemented if it is 'not environmentally worse than' (NEWT) the sequence assessed in this ES and implemented in accordance with the Code of Construction Practice Part A (see Appendix 2.4).
- 4.3.49 The key challenge is to identify a work sequence that enables the construction of an island platform on the footprint of the existing railway lines, yet still allows the railway to remain fully operational except for changeover possessions.
- 4.3.50 The performance enhancement measures, namely, Hills Road shunt spur works and Shepreth Branch Junction works, must be undertaken during the same timescales so that when the station opens the infrastructure can deliver the required performance.
- 4.3.51 The Project Team has identified fourteen key stages required to open the new station and complete performance enhancements. This covers the following:
- Preconstruction and enablement activities, Sep 2022 – Jun 2023
  - Site Mobilisation, Mar 2023 – Jun 2023
  - Drainage, Mar 2023 – Nov 2023
  - Early Works, Apr 2023 – Dec 2023
  - OLE Works, May 2023 – Jul 2023
  - August Bank Holiday Possession, 2023
  - Constructing the Up Lines and Up Loop Platform, May 2023 – Apr 2025
  - Christmas 2023 Blockade – Construct and Commission Temporary Track Alignment Plus Hills Road Crossover
  - Island Platform Works and Down Loop Platform (west side of the station), Dec 2023 – Jun 2025
  - Easter 2024 Possession – Works at Shepreth Branch Junction
  - Station Public Realm Works, Dec 2023 – Jun 2025
  - Christmas 2024 Blockade - Move Down Lines (lines travelling towards Cambridge) plus Works at Shepreth Branch Junction
  - Easter Blockade 2025 - Move Up Lines (lines travelling towards London)
  - Demobilise, open station, works complete, Apr 2025 – Jul 2025
- 4.3.52 Current assumptions around these dates are:
- Procurement in 2022

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- Commencement of GRIP 5 design in 2022 with prefabrication of long lead items in 2023
- Commencement of work on site in April 2023 assuming AstraZeneca gas main diversion already undertaken
- Rules of the Route Possessions are generally available
- A disruptive summer bank holiday possession is required in 2023 and is available
- A disruptive Christmas possession is required in 2023 and is available
- A disruptive Easter possession is required in 2024 and is available
- A disruptive Christmas possession is required in 2024 and is available
- A disruptive Easter possession is required in 2025 and is available

4.3.53 For impact assessment purposes, the first full operational year of 2026 has been assumed.

Stage 1 – Pre-Construction and Enablement Activities**Pre-construction**

4.3.54 Whilst the procurement route for the proposed Cambridge South station and associated infrastructure enhancements has not yet been established, a constructability assessment has been undertaken on the premise that a single design and construct contract will be awarded to a Tier 1 contractor, following completion of GRIP 4 design. The work scope will include GRIP 5 design for which a long lead period must be programmed. At this stage, a design period of 45 weeks is estimated to develop detailed designs and to complete the assurance process ahead of the issue of Approved for Construction drawings.

4.3.55 It is assumed that this would be substantially complete ahead of the commencement of construction. There may be a small overlap between the commencement of construction work and the completion of design whilst the contractor is mobilising on site.

**Enabling Works**

4.3.56 The mobilisation stage also includes early works to divert the existing NCN Route 11 clear of the proposed main construction compound. In addition, the diversion would need to be re-routed across Francis Crick Avenue and across to re-join NCN Route 11.

4.3.57 A gas main within the AstraZeneca site would likely be diverted.

Stage 2 – Site Mobilisation**Site Infrastructure for Station Area**

4.3.58 At present, the construction programme envisages approximately 3 months programme time to erect site hoardings, scrape topsoil clear and stone up access roads and haul routes alongside the railway boundary.

4.3.59 As this is a major element of work, temporary welfare arrangements will support early site work until fixed welfare establishments are created.

4.3.60 As works are required either side of the track, a significant construction compound (CC1) is proposed on the east and another construction compound (CC2) is on the west of the railway line. This solution serves to minimise the volume of construction plant on Addenbrooke's Road and Francis Crick Avenue during the works.

4.3.61 On the east side, the access off the Dame Mary Archer Way roundabout to the south will be upgraded and a main compound is established.

4.3.62 A slightly smaller compound (CC2) is proposed on the west side; accessed from Addenbrooke's Road adjacent to Hobson's Brook; and the existing unbound access track will need to be upgraded.

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- 4.3.63 A small compound (CC3) is identified within Hobson's Park to service the construction of the west side station building.
- 4.3.64 The track works extend north beyond the Guided Busway. Accessing these northern areas at track level below the Guided Busway bridge is considered restrictive to the programme and direct access to the track from the north is recommended to complete the track works.
- 4.3.65 On the western side of the track, access to the side of the railway corridor north of the Guided Busway is possible via the existing access off Long Road. This access road could be used with marshalled plant movements and would need to be coordinated with users of the playing fields at St Mary's School.
- 4.3.66 A compound (CC4) is identified on the western side and to the north of the Guided Busway. This area will accommodate mobile welfare facilities and will not be required continuously during the construction period. This compound is designed to be opposite the Down line S&C and will accommodate a crane to service the construction of the switch panels.
- 4.3.67 The compound will also stable plant required to construct the Down Loop line. The existing access off Long Road is relatively narrow with a right-angled bend and has been assessed using Auto TRACK for 8-wheel tippers. Delivery of other plant must also be assessed as required.
- 4.3.68 On the western side, access to the side of the railway corridor north of the Guided Busway is possible from Francis Crick Avenue within the extents of the existing traffic signalised junction. It may be possible to marshal vehicle movements within all red periods.
- 4.3.69 It is judged that separate welfare arrangements for this working area will not be required as there are accessible alternatives close by.
- 4.3.70 A compound (CC6) to the south of Addenbrooke's Bridge is also proposed. This is in the footprint of the proposed east station building and station forecourt.

**Site Infrastructure for Shepreth Branch Junction Area**

- 4.3.71 The works at Shepreth Branch Junction will be accessed from Addenbrooke's Road. A bridge will be required to span Hobsons Brook to form the access. There is also an identified need for a bridge to enable the closure of Dukes No.2 Level Crossing and Websters Level Crossing and this could form a dual purpose. This would require the early construction of the farm accommodation bridge crossing.
- 4.3.72 A temporary access road (AR6) will run from Addenbrooke's Road across the new bridge, where it will connect with a haul road (HR7) which will be created down the western boundary of the railway to Shepreth Branch Junction. This avoids creating an access through The Hectare, Great Shelford residential area.
- 4.3.73 Whilst a matter for detailed design, there are proprietary systems in the market to reduce the carbon and wider environmental impact of temporary access roads using surface armouring to reduce the structural depth and volume of unbound materials. A haul road of this length delivered in a proprietary stabilised solution would deliver cost benefits; in particular the length of haul road which traverses the Scheduled Monument would benefit from a system which does not require breaking ground thereby avoiding extensive heritage investigation, potential disruption to the heritage site and unnecessary costs.

**Southern approach into Cambridge Station**

- 4.3.74 The works at the southern approach into Cambridge Station under Hills Road bridge will be delivered from the railway corridor as far as possible minimising the need for specific mobilisation work or a construction compound. The most critical element of mobilisation is the construction of a project Road Rail Access Point (RRAP) at Nine Wells to allow the main site compound to service the works including accessing and loading facilities for Road Rail Vehicle (RRV) plant. This will avoid the need for possessions of Platform 8 at Cambridge Station for access from the north.
- 4.3.75 The majority of the work is in the east side cess in the area behind the existing shunt spur buffer. This is an area that used to carry an operational line.

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4.3.76 The shunt spur will need to be taken out of service for the duration of the works and a possession may be possible to support this.

Stage 3 – Drainage**Station Area**

4.3.77 As with any project in the ground, drainage works are envisaged to commence as early as possible with the excavation of new attenuation basins and outfalls. There are six primary elements:

- A new attenuation basin to the south of Addenbrooke's Road with an outfall to Hobson's Brook to the east of the railway.
- A new swale with an outfall to Hobson's Brook to the west of the railway.
- Swales to the south of Guided Busway bridge (Addenbrooke's Bridge) connected with an outfall to North Ditch to the west of the railway.
- An enlarged/re-located attenuation basin to Addenbrooke's Bridge with an outfall to North Ditch/Tibbets Culvert as existing.
- Tank storage within the proposed station forecourt area to the east of the railway.
- Works to extend Tibbets Culvert below the western station building. This will involve the demolition of the existing headwalls and the construction of the downstream end of a new length of precast concrete culvert which will eventually run all the way back to Hospital Culvert on the east of the railway. This piece of work is in readiness to replace Tibbets Culvert below the railway in possession in Stage 6.

4.3.78 These elements of work enable the construction of other land and railway drainage.

4.3.79 It is highly likely that the excavation of swales will be deferred until the construction works are complete as this will obstruct access for construction plant and temporary piped systems will be used to drain the site for shorter duration, lower intensity rainfall events.

4.3.80 Following the completion of continuous haul routes/working areas alongside the railway, permanent track drainage will be installed to both sides of the railway. This work is clear of the operational lines. At the same time, new land drainage along the CBC boundary will be installed.

4.3.81 Drainage is constructed from the downstream end of drainage runs working upstream. There is a watershed halfway between Addenbrookes' Road and Addenbrooke's Bridge and so track and land drainage will fall in either direction from that high point.

4.3.82 At present, it is assumed that sections of track drainage along the west side that will fall with the track towards the north will require a connection into flood storage via interceptors.

4.3.83 It is also noted that an additional Under Track Crossing (UTX) will be required at the southern end of the platforms to take water off the island platform. It is likely that this UTX will be constructed outside possession prior to those tracks becoming operational.

**Site Infrastructure for Shepreth Branch Junction**

4.3.84 Once access is created, there is a requirement to construct a new headwall and connected pipework to widen the existing structure at Websters Level Crossing.

4.3.85 This would be a precast concrete Althon type headwall and concrete pipe sections. A Rules of the Route possession may be required to undertake works to break down the existing brick headwall. These works will require consent through the TWAO application.



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Stage 4 – Early Works**Station Area**

- 4.3.86 Works to construct the new equipment enclosure within the west side construction compound (CC2) adjacent to Hobson's Brook have been identified relatively early in the programme but there is flexibility around this.
- 4.3.87 The embedded retaining wall alongside Addenbrooke's Bridge is also an early activity as this enables the construction of the Hospital Culvert Extension and allows the site to be levelled.
- 4.3.88 This is envisaged to be a multi-level anchored contiguous retaining wall installed using small piling rigs operating from a scaffold built onto the side of the embankment. Whilst subject to detailed design, it is envisaged that sectional casings can be installed at the back of verge. Working top down, temporary ground anchors are proposed at multiple levels as the embankment material is removed in front of the wall. The temporary wall could also be designed to protect the later excavation for the Hospital Culvert extension.
- 4.3.89 Working bottom up, a permanent retaining wall would be constructed in reinforced concrete. This later stage could be deferred until other concreting activities are in full flow. This wall would be permanently anchored, probably with a single level of ground anchors.

**Shepreth Branch Junction**

- 4.3.90 The existing Global System for Mobile Communications-Railway (GSM-R) mast and Hot Axle Box Detection equipment must be moved clear of the proposed northbound Royston line and so a large equipment base will be required. There is currently no ground investigation at this location and so the working assumption is that the mast foundation will be piled, but this can be confirmed at a later GRIP stage. Piling can be undertaken during normal working hours and the base and structure installed due to the distance to the existing track.

**Southern approach into Cambridge Station**

- 4.3.91 There is space in the east side cess to undertake some of this work during Any Line Open (ALO) working but access is restricted and plant and materials will need to be brought into the work area in possession and stabled. This may not prove to be sufficiently advantageous and the works may be easier to construct through essentially possession working with the Up line closed.
- 4.3.92 Whilst the area behind the existing railway siding on the shunt spur will have carried tracks in the past, it is considered appropriate to remove the existing ballast and lay new ballast. The design of the new railway sidings will be determined in the next GRIP design stages. There is approximately 100m of railway siding that could require the removal of up to 200 tonnes of potentially contaminated material if excavated and which will need to be disposed of.
- 4.3.93 As described above, there is limited space for this activity, and it may be best undertaken in Rules of the Route possessions serviced by RRV and Trailers to remove spoil and bring in ballast. Some plant could be stabled in the work area and it is possible that some activities could take place during normal daytime working with careful planning.

Stage 5 – OLE Works**Station Area**

- 4.3.94 OLE modifications are key to the wider construction sequence.
- 4.3.95 The programme requires the earliest erection of Twin Track Cantilevers (TTC) structures across the eastern platform and portals across the extents of the new OLE overlaps.
- 4.3.96 New portal structures and extended arm TTCs along the east side are required to allow the removal of the existing (eastern) OLE structures which obstruct the new Up Main Line (the far eastern track) and must be removed before that work can be completed.

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- 4.3.97 For all options, a temporary track alignment is suggested that will allow the existing Up Main (towards London) to travel right way along the proposed Up Loop (adjacent to the Up Main) at the same time that the existing Down Main (western track towards Cambridge) will travel wrong way along the proposed Up Main.
- 4.3.98 There will be approximately 25 new structures.
- 4.3.99 At this stage of design, the OLE structures will be supported on concrete side-bearing foundations. Whilst this is not preferred for a number of reasons including cost, programme, productivity and sustainability/carbon, various CBC stakeholders have identified that driven piling is not preferred for reasons of noise and vibration and so standard 610mm diameter driven tubes are not considered. It is possible that this can be reconsidered in the later GRIP stages with agreed vibration limits and the use of pre-augering to loosen ground.

**Shepreth Branch Junction**

- 4.3.100 New OLE foundations and structures are required across the existing junction area and along the new section of Down Royston line (west of the Junction).
- 4.3.101 The junction remodelling works will require that approximately 30 new portal and single-track cantilever structures are provided. Some of these will replace existing structures.
- 4.3.102 Within the junction area, it is assumed that foundations and structures will be constructed over a series of Rules of the Route Possessions. The structures alongside the extended Down Royston can be constructed during normal daytime working.
- 4.3.103 There will be a new portal structure in close proximity to the existing footbridge BGK/1543B which forms part of the public right of way, Great Shelford FP1. The footpath will require to be closed during certain stages of the works with exclusions zones for the general public justified on safety grounds.
- 4.3.104 In addition, the west side staircase of the footbridge will require to be modified to incorporate additional screening to the OLE structure. There are a number of ways to undertake this activity including removing the stairs to enable modifications and repainting in a fabrication shop. This would reduce the risk to as low as reasonably practical and so must be preferred. Again, a footpath closure would be required to enable this work. A temporary staircase could be used as an interim solution if a 4-week closure of the footpath is problematic.

**Southern approach into Cambridge Station**

- 4.3.105 Foundations for approximately seven single track cantilever and portal structures will be required. The form of foundation will be finalised during the following GRIP stages based on ground investigation. Piling remains an option at this location but has been assumed as a worst-case for assessments. Piling platforms will need to be created around each foundation. Side-bearing foundations are also a possibility to mitigate noise and vibration although this method cannot be removed entirely.
- 4.3.106 OLE structures will be erected in Rules of the Route possessions. The materials can be delivered by RRV on trailers.

Stage 6 – Disruptive Possession, August Bank Holiday 2023**Station Area**

- 4.3.107 A disruptive possession is required to complete critical activities:
- The existing conductor wires must be transferred from the east side cantilever structures onto the newly installed OLE structures. This enables the removal of the existing east side OLE structures and foundations to allow the completion of the new track formation for the eastern Main and Loop lines. The west side OLE works would be undertaken in a similar approach in the same possession.

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- Tibbets Culvert should be replaced below the main lines. This is desirable but not essential and enables the construction of Hospital Culvert from downstream to upstream.

Stage 7- Constructing the Loop Lines and eastern and western Platforms**Station Area – Platform Works**

- 4.3.108 Works to construct the eastern Main and Loop lines along with the eastern platform are on the critical path. Whilst there is some logic in mirroring this work on the west side as it has to be completed at some point, it is judged that this work is best partly deferred to be undertaken in parallel with the Island Platform in Stage 9. The western station building works would be commenced on their own during this stage.
- 4.3.109 It should be noted that work on the west side at this stage is closer to the operational Main lines than the work on the east side and may require additional Rules of the Route possessions.
- 4.3.110 It is a working assumption at this stage that structures will be piled whereas the platforms will not. Canopies will be supported from riser walls on the outer platforms or a separate precast support in the island platform.
- 4.3.111 Once the piles are installed for the station building piled raft, the suggested sequence runs through the emergency access bridge and staircase supports. The duration of this work is driven by the number of piling rigs employed. At present a single rig is envisaged on each of the flanking platforms. The rig on the west side will operate for a shorter period than the others and therefore would be demobilised until Stage 9.
- 4.3.112 Reinforced concrete pile cap/raft structures can then be completed once pile heads are prepared. The use of Recipeaux has been presented at Network Rail's Safe by Design Forum. It is a four-step process using the expansive power of polyethylene foams introduced to the pile section using breaker tubes to avoid the noise, dust and vibration of more mechanical methods.
- 4.3.113 The lift pit and building ground slab is also a reinforced concrete structure. Once completed, the building steelwork erection can then commence although this is not a critical activity at this time.
- 4.3.114 Platform elements are anticipated to be precast concrete riser and rear wall units and these works can commence part way through the pile cap construction for other elements.
- 4.3.115 At this stage of design, platform canopy steelwork will be erected along the entire length of the platform. Special rear wall units are envisaged.
- 4.3.116 Staircase and bridge supports for the emergency access structure will be the final activity in this area.
- 4.3.117 Although subject to an ALO assessment, at least some of the lifting activities for various elements on the eastern platform are likely to be completed alongside the open lines.
- 4.3.118 Lifting activities for various elements on the western platform will be required to be completed in possession and Rules of the Route Possessions are likely to be adequate albeit inefficient. This includes:
- Erection of OLE steelwork
  - Erection of elements of the building steelwork
  - Canopy support columns, canopy steelwork and sheeting
  - Some of the precast platform elements
  - Erection of staircase and bridge supports for the emergency access structure
- 4.3.119 Once platform construction is substantially complete, the largest single remaining activities are:
- Installation and commissioning of the lift cars
  - Installation of lighting

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- Installation station systems, Station Information and Security Systems (SISS), Public Address and Voice Alarm (PAVA), Driver Only Operation (DOO) if required etc. These works would be held back and coordinated with works to the island platform and Down line platform.

4.3.120 It is also a preference that the platform copers are set once the eastern railway line geometry is fixed although this is not essential and will be resolved by the Design and Build contractor. If this is the case, then this work could be undertaken in Rules of the Route Possessions in Stage 9 following the completion of tamping works in Stage 8.

**Earthworks and Track Works**

4.3.121 In parallel with the works to the platforms, the formation for the new eastern Main and Loop lines must be constructed. This will include the removal of ground in the cess and on the lineside requiring replacement with engineering fill. As with other works in this stage, there are strong arguments to mirror this on the western side. This work cannot be completed until the existing overhead line supports are removed.

4.3.122 The formation will be ballasted and new track panels laid out along the eastern side for the new Main and Loop lines. These will be laid out along the temporary alignment. In addition to this, there will be sections of the permanent eastern Loop line that can be laid out, although these will remain unused for approximately 15 months.

**Building Works**

4.3.123 As described, the building works are not a critical activity at this point in Stage 7, but the early commencement will allow the use of disruptive possessions to support some of the activities that cannot be completed ALO.

4.3.124 It is assumed that the station building will be a steel frame with beam and block flooring systems, modular Structural Insulated Panel (SIP) type curtain walling and standing seam roofing systems although green roofs are also a consideration.

4.3.125 The frame may be erected by city crane or a telescopic handler. Erection will generally be in the sequence of:

- Columns and bracing
- Floor beams
- Lift Shafts
- Precast Floor elements
- Precast Stairs
- Roof steelwork
- Roof sheeting
- Curtain walls/glazing

4.3.126 Once the floor slabs are completed and the first fix is in place, the finishes can be commenced ahead of second fix. However, the building will not be completely weatherproof until the AfA spans are lifted into place. This will require further consideration when the building is designed.

4.3.127 Once building construction is substantially complete, the largest single remaining activities are:

- Installation and commissioning of the lift cars.
- Installation station systems, SISS, PAVA, DOO if required etc.

4.3.128 These works would be commenced to be substantially completed ahead of the platform systems to provide continuity of work.

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**Shepreth Branch Junction**

- 4.3.129 The cutting can be widened from the crest of the small cutting slope with a catch fence at the toe. It is likely that the majority of the work can be undertaken during ALO working.
- 4.3.130 At this location, the railway corridor is narrower, and the widened section of embankment will need to be benched onto the existing slope. Possessions will be required for the upper benches and on the shoulder in much the same way that a standard embankment regrade project is planned. Early disruptive possession for this activity should be considered at the detailed planning stage.
- 4.3.131 Once the track formation is widened, to the north of Websters level crossing and the footbridge, it can be ballasted and new track panels laid with a ten foot interval to the existing western line. This work would be completed during ALO working. To the south of Websters level crossing, the existing track will be moved across into final position at a later stage.

**Southern approach into Cambridge Station**

- 4.3.132 The track along the shunt spur extension would be completed next. The switch and crossing for the points would be installed as part of this work. Materials are assumed to be delivered by road. Some of these activities are suited to daytime working behind a Vortok fence.

Stage 8 – Christmas Blockade 2023 – Construct and Commission Temporary Track Alignment**Study Area**

- 4.3.133 A 54-hour Christmas Possession is required to adjust the OLE overlaps and to move the operational railway on to the temporary alignment. A main line tamper will be required. The new temporary lines and overhead line equipment will be brought into service. A temporary speed restriction will be required for two weeks before a follow-up tamp.

**Shepreth Branch Junction**

- 4.3.134 No works are identified at Shepreth Branch Junction during this possession to avoid taking valuable resources in what will be a busy working period in Anglia.

**Southern approach into Cambridge Station**

- 4.3.135 In a disruptive possession, a section of the eastern Main will be lifted and it will be necessary to skim dig and ballast the area through the cross over and form ballast ramps. The switch and crossing for the points will be installed.
- 4.3.136 As the crossover does not need to be brought into service at this stage, some welds could be omitted and works to wire up the crossover can be deferred to a later possession to de-risk the disruptive possession. The new infrastructure would not be brought into service at this stage. The points would be scotched and clipped.
- 4.3.137 It is judged advantageous to undertake this work earlier in the programme and Christmas 2022 has been identified within the proposed construction programme outlined in this Chapter. There is some flexibility around this. Entry into Service of the crossover can be deferred as this amounts to an interim operational stage. It is recommended that the crossover is brought into service at the same time that the new loops through the station are brought into service.

Stage 9 – Island Platform works and western Platform**Station Area**

- 4.3.138 Once the Mains railway lines are diverted to run along the new temporary alignment, the island platform can be constructed. The western platform would also be completed in parallel.
- 4.3.139 Whilst not critical, the suggested sequence commences with piling works starting with the AfA bridge, staircase supports and lift pits on the Island platform followed by the emergency access bridge and associated staircase supports. The duration of this work is driven by the number of rigs.

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At present a single rig is envisaged on the island and western platforms. Rules of the Route possessions are likely to be required for the Island Platform piling works.

- 4.3.140 Reinforced concrete pile cap structures follow. The lift pits for the island platform are also a reinforced concrete structure and will be completed in similar timescales.
- 4.3.141 The lift pit steelwork, staircase and bridge supports for the AfA structure can be relatively early activities.
- 4.3.142 There are some merits in lifting in the main AfA bridge spans “as early as possible” as this essentially weatherproofs the station buildings and unlocks work to first fix, finishes and second fix.
- 4.3.143 Piling for the secondary means of escape footbridge on the western platform can be undertaken during normal working hours. Alternatively, these piles could be installed through the completed platform fill at a later date.
- 4.3.144 Platform elements are anticipated to be precast concrete riser wall structures and these works can commence part way through the pile cap construction. For the Island Platform, the eastern platform face will need to be installed in Rules of the Route Possessions although Easter 2023 may present an opportunity to accelerate this activity. The Island Platform riser wall works would be serviced from the west side of the railway and there may be some advantages in deferring the construction of the western platform until this is complete.
- 4.3.145 At this stage, it is an aspiration to backfill the island and western platforms using arisings from the track bed which would be removed and stored on the west side of the railway. Whilst this requires double handling, it is judged to be more a sustainable approach than to remove this material from site and import new fill. Temporary space must be provided for this material.
- 4.3.146 It is noted that the northern end of the island platform is likely to be obstructed by the temporary alignment and must wait until the temporary alignment of the western railway line is removed in Stage 14.
- 4.3.147 At this stage, platform canopy steelwork will be erected along the entire length of the Island and western platforms. Special rear wall units are envisaged on the western platform. A central precast foundation unit is envisaged for the Island Platform.
- 4.3.148 Staircase and bridge supports for the secondary means of escape footbridge will be later in the programme.
- 4.3.149 Lifting activities for various elements on the Island platform will be completed in possession and Rules of the Route Possessions are likely to be adequate, albeit inefficient. This includes:
- Erection of lift pit steelwork and staircase and bridge supports for the AfA structure
  - Erection of the main spans and staircases for the AfA structure
  - Canopy support columns, canopy steelwork and sheeting
  - Some of the precast platform elements
  - Erection of staircase and bridge supports for the emergency access structure
- 4.3.150 It is likely that lifting activities for the western platform are clear of the operational lines at that point. Once platform construction is substantially complete, the largest single remaining activities on all platforms are:
- Installation and commissioning of the lift cars.
  - Installation of lighting
  - Installation station systems, SISS, PAVA, DOO if required etc.

**Track works**

- 4.3.151 The west side formation will be ballasted and new track panels laid out for the new western Main and Loop lines. These will be laid out along the permanent alignment.

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Stage 10 – Easter 2023 possession - Works at Shepreth Branch Junction**Station Area**

- 4.3.152 A longer disruptive possession may afford an opportunity to complete activities on the Island Platform otherwise targeted at Rules of the Route Possession. This includes the works to lift in the eastern platform riser wall units.

**Shepreth Branch Junction**

- 4.3.153 In a disruptive possession, targeted at Easter 2023, the turnout onto the western Main with points can be installed, as can the crossover between western and eastern Main railway lines. Track bed investigation has not yet been undertaken and it is assumed that this work will require that the track formation across the crossover is excavated, profiled and re-ballasted. Ballast ramps will need to be installed in the main line at the limits of the crossover work. There is a separate stage of signalling design required for this layout. The western Shepreth Branch railway line will be slewed across the new alignment.
- 4.3.154 This is a temporary operational layout with some potential performance benefits associated with the higher speed S&C to offset the elongation of the junction. This will require more detailed consideration of stagework designs during the next GRIP stage.
- 4.3.155 A TSR will be required for a period of time before the speeds are taken up to line speed on both the western Main and the eastern Shepreth Branch railway lines.

**Southern approach into Cambridge Station**

- 4.3.156 There is no work identified in this area at this stage.

Stage 11 – Station Public Realm Works

- 4.3.157 Works in the public realm are not considered to be on the critical path. It is noted that the station incorporates a retaining structure within the adjacent southern embankment of Addenbrooke's Bridge. This significant civil engineering work will be an earlier activity.
- 4.3.158 This phase includes completion and commissioning of modifications to the traffic signalised junction to include the eastern station entrance access.

Stage 12 – Christmas Blockade 2024- Move western railway Lines Plus Works at Shepreth Branch Junction**Station Area**

- 4.3.159 It is considered that there is too much work to install all S&C, complete the permanent main line alignments and bring the loop lines into operation in a single disruptive possession and so it is judged at this stage that this work will be divided into two possessions.
- 4.3.160 The west side works must be undertaken first as the temporary western line alignment clashes with the permanent eastern Main alignment.
- 4.3.161 In a 54-hour Christmas Possession, the central section of the temporary western Main line must be removed (at least in part) and the turnouts into the west Loop line will be installed. The retained sections of the western Main are also required to be slewed in this possession.
- 4.3.162 The OLE works required for this section are complex and require the re-modelling of the overlaps. With the current level of design maturity, this is beyond the scope of detail required currently, but will likely complicate the work in the possession. This justifies the decision to half the work content in the possession.
- 4.3.163 The new western Main and overhead line equipment will be brought into service. A temporary speed restriction will be required for two weeks before a follow-up tamp. The west Loop line will remain clipped out of use.

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**Shepreth Branch Junction**

- 4.3.164 The existing turnout with the eastern Shepreth Branch railway line will be recovered and replaced with a new turnout. The eastern Shepreth Branch railway line will be slewed into the final design alignment.
- 4.3.165 This is the final layout with the eastern Shepreth Branch railway line upgraded to 50mph through the junction.
- 4.3.166 A TSR will be required for a period of time before the speeds are taken up to line speed on both the western Main and the eastern Shepreth Branch railway line.

Stage 13 – Easter Blockade 2025 – Move eastern Lines**Station Area**

- 4.3.167 The outer extents of the temporary eastern Main are designed on the final alignment.
- 4.3.168 In a 54-hour Easter Possession, sections of the temporary eastern Main must be slewed onto the permanent alignment and the turnouts into the east Loop line will be installed. Again, the OLE works required for this section are complex and require the remodelling of the overlaps.
- 4.3.169 The new eastern Main and east Loop and overhead line equipment will be brought into service. The west Loop line will also be energised and brought into service. A temporary speed restriction will be required for two weeks before a follow-up tamp.
- 4.3.170 At this stage, there is a short section at the north end of the eastern island platform that must be completed, and a series of Rules of the Route possessions will be required before the platform can be brought fully into service.

**Shepreth Branch Junction**

- 4.3.171 The works at Shepreth Branch are already completed at this stage although the possession does afford a contingency for this work.

**Southern approach into Cambridge Station**

- 4.3.172 The cross over in this area could be brought into service at this stage to coincide with the opening of the new station and Loop lines. This would limit the number of screen changes at the signal box.

Stage 14 – Open Station and Demobilise**Station Area**

- 4.3.173 The programme takes the earliest opportunity to de-mobilise working areas following the completion of works. CC4 is required until the S&C works for the east Loop is completed.
- 4.3.174 CC3 is no longer required once the west side station building is substantially complete and the compound and haul road can be removed in conjunction with works to landscape Hobson's Park.
- 4.3.175 The west side works can be completed in advance of the east side and that can trigger the removal of CC2 and allow the completion of landscaping works. At this later stage of the programme, the project can be serviced by a single compound.
- 4.3.176 It is judged that CC1 is required until the east Loop line is brought into service. At this point, it must be removed before NCN Route 11 is restored to its original alignment. It is this reinstatement work that drives the completion date for all options.

**Removal of Scrap**

- 4.3.177 It is a project requirement that the proposed Development will remove all existing scrap on the lineside within the footprint of the works and will manage the removal and disposal or recovery of items no longer required as a consequence of the design. This will be written into the Contract Requirements – Technical (CRT) for the delivery contractor.



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**Code of Construction Practice**

- 4.3.178 An outline Code of Construction Practice (CoCP) (Part A) (see Appendix 2.4) has been prepared to describe the high-level environmental management and mitigation requirements to be implemented for the delivery of the proposed Development. The CoCP Part A describes best practice measures and mitigation to be implemented and assumed in place during the EIA and provide a mechanism for securing additional mitigation measures specifically identified during the EIA.
- 4.3.179 The CoCP Part A presents an outline of the general provision for environmental management for the construction of the proposed Development.
- 4.3.180 The draft plans provided as part of the CoCP Part A include (but are not limited to) the following:
- Dust Management Plan
  - Construction Traffic Management Plan
  - Construction Noise Management Plan
  - Pollution Control Plan
  - Materials Management Plan
- 4.3.181 The CoCP Part A is submitted as part of the TWAO application. The preparation of a more detailed CoCP Part B and supporting management plans will be required to be carried out by the appointed contractor and be agreed with the Local Planning Authority before work commences.

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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 5 – Acoustics Assessment Part 1 - Noise**

JUNE 2021

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## 5 Acoustic Assessment Part 1- Noise

### 5.1 Introduction

- 5.1.1 This chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to noise. This section presents a summary of relevant consultations undertaken to date, details of the baseline noise surveys undertaken, and the methodology used to assess the possible construction and operational effects.
- 5.1.2 Due to the inherent complexities of both noise and vibration on the proposed Development, possible construction and operational effects of vibration are covered in the dedicated section, Chapter 6 Acoustics Assessment Part 2 – Vibration.
- 5.1.3 The noise assessment incorporates relevant design and other mitigation measures identified as necessary during construction that would be employed during the construction and operational phases of the proposed Development.

### Relevant Aspects of the Proposed Development

- 5.1.4 A description of the proposed Development is provided in Chapter 4: The Site and the Proposed Development, of this ES. The proposed Development has the potential to generate noise impacts during the construction and operational phase. The construction phase assessment focused on three key areas:
- Proposed construction works to form the new station building, new track and signalling configuration and associated infrastructure works supporting these.
  - The proposed track re-alignment works at Shepreth Branch Junction include piled foundation works for new columns that support the overhead line electrification system.
  - Proposed extension of shunt line beyond the position of its fixed buffer stop and providing a crossover with trap/shunt capability near Hills Road.
- 5.1.5 The operational phase assessment focused on:
- Proposed track changes for the new station area where the existing two-line track will be replaced with a four-platform station served by two mainline tracks and two platform tracks. These changes will introduce switches and crossings on the track that will be used to switch trains from the mainline to the platform tracks and vice-versa.
  - Proposed line speed change at Shepreth Branch Junction for trains travelling to and from Royston. The change will be from 30mph to 50mph through the Junction.

### 5.2 Assessment Methodology

#### Legislation, Policy and Guidance

##### Legislation

- 5.2.1 This impact assessment has been undertaken in accordance with current national legislation and guidance as well as regional and local plans and policies relating to noise in the context of the proposed Development. A summary of the relevant legislation and policies, the requirements of these policies and the project response is provided below.
- 5.2.2 The following legislation is relevant to the assessment of noise effects and will inform the assessment as appropriate:
- The Transport and Works (Applications and Objections procedure) (England and Wales) Rules 2006 as amended (Ref. 5.1)
  - The Control of Pollution Act 1974 (Ref. 5.2)
  - The Environmental Protection Act 1990 (Ref. 5.3)
  - The Noise Insulation Regulations 1975 (Ref. 5.4)

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- The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 (Ref. 5.5)

## Policy

5.2.3 The following policy will be considered in the assessment of noise:

- Noise Policy Statement for England (NPSE) 2010 (Ref. 5.6)
- Cambridge City Council (CCiC) Cambridge Local Plan (October 2018) Policy 35: Protection of human health and quality of life from noise and vibration (Ref. 5.7)
- South Cambridgeshire District Council (SCDC) District Design Guide Supplementary Design Guide (SPD) 2010 Appendix 6: Noise: Supplementary Design Guide (Ref. 5.8)
- South Cambridgeshire Local Plan (September 2018) Policy HQ/1: Design Principles (Ref. 5.9)

## Guidance

5.2.4 The following National Standards and Guidance will be considered in the assessment of noise associated with the proposed Development:

- BS4142 2014 + A1:2019 Method for Rating and Assessing Industrial and Commercial Sound. (Ref. 5.10)
- BS 5228:2009 +A1:2014: Code of practice for noise and vibration control on construction and open sites; Part 1 Noise. (Ref. 5.11)
- BS7445-1:2003 & 2:1991 Description and measurement of environmental noise. (Ref. 5.12)
- BS8233:2014: Guidance on sound insulation and noise reduction for buildings. (Ref. 5.13)
- Calculation of Rail Noise (CRN) Technical Memorandum 1995. (Ref. 5.14)
- Calculation of Road Traffic Noise (CRTN) 1988. (Ref. 5.15)
- Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration 2020. (Ref. 5.16)
- Design and Installation Requirements for Public Announcement, Voice Alarm and Long Line Public Announcement Systems (NR-L2-TEL-30134-PAVA). (Ref. 5.17)
- Network Rail document NR/L2/ENV/121 ISSUE 1 Managing Environmental and Social Impact of Noise and Vibration 2019. (Ref. 5.18)
- World Health Organisation (WHO): Guidelines for Community Noise 1999. (Ref. 5.19)
- WHO: Night Noise Guidelines for Europe 2009. (Ref. 5.20)
- WHO: Environmental Noise Guidelines for the European Region 2018. (Ref. 5.21)
- Ministry of Housing, Communities & Local Government (MHCLG): Planning Practice Guidance Noise 2019 (Ref. 5.22)

## Consultation and Scoping

## Consultation

5.2.5 Table 5-1 provides a summary of consultee issues raised with respect to noise and how they have been addressed. Consultation has been undertaken separately for noise and vibration as a result of the parties delivering the assessment:

Table 5-1 Summary of Consultation - Noise

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Cambridge City Council (CCiC) – Environmental Health Officer (EHO) – 18.06.19	EHO confirmed acceptance of the baseline noise survey as proposed.	Baseline noise survey methodology detailed in paragraphs 5.2.17 – 5.2.19

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
South Cambridgeshire District Council (SCDC) – EHO – 19.09.19	EHO confirmed acceptance of the baseline noise survey as proposed.	and measurement locations shown in Figure 5.1 of Appendix 5.1
Greater Cambridge Shared Planning & CCiC – Planning team including EHO – 19.06.20	Following changes to the scheme design, a presentation was made setting out the approach to the noise assessment proposed to form part of the environmental impact assessment.  Broadly positive verbal feedback was received with regards to the proposals presented.	Noise assessment approach detailed in Methodology for Assessment Impacts (paragraphs 5.2.3 – 5.2.41)
CCiC, Environmental Planning – EHO – 16.10.20	Details and plans were provided of the revised scheme design setting out noise monitoring locations and survey methodology based upon the most recent project design information that had changed from that previously consulted on. The information provided included the area over which CCiC has jurisdiction.  Confirmation was received from the EHO confirming there were no particular issues with scope in terms of monitoring locations within the CCiC boundary area.  It was noted by the EHO that there were no proposed baseline monitoring locations at or near the closest residences at Trumpington Meadows. It was acknowledged by the EHO that these are quite some distance from the proposed activities. However, as these residential properties are the nearest residential premises with unobstructed line of site to the proposed location of the south station, CCiC will expect them to be included as sensitive receptor locations when carrying out the detailed assessments.	Baseline noise survey methodology detailed in paragraphs 5.2.17 – 5.2.19 and measurement locations shown in Figure 5.1 of Appendix 5.1
CCiC, Environmental Planning – EHO – 21.10.20	Confirmation was provided confirming that sensitive receptors at Trumpington Meadows will be assessed.	Sensitive receptors listed in paragraphs 5.13 – 5.2.14. Receptor at Trumpington Meadows shown in Figure 5-3.
SCDC, EHO – Environmental Planning – 16.10.20	Details and plans were provided of the revised scheme design setting out noise monitoring locations and the survey methodology based upon the most recent project design information, including areas over which SCDC has jurisdiction.	Baseline noise survey methodology detailed in paragraphs 5.2.17 – 5.2.19 and measurement locations shown in Figure 5.1 of Appendix 5.1
SCDC, EHO – Environmental Planning – 19.10.20	With regard to the noise monitoring proposals, the EHO at SCDC confirmed their agreement with the locations and duration of the baseline measurements proposed.	Baseline noise survey methodology detailed in paragraphs 5.2.17 – 5.2.19 and measurement locations



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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	Clarification was also sought on whether predictions would be made using noise mapping software.	shown in Figure 5.1 of Appendix 5.1  Noise mapping software used for the assessment is detailed in 5.2.15, Operational Phase – Rail Traffic Noise (paragraph 5.2.21), Future Baseline (paragraph 5.3.2) and Assessment of Effects (paragraph 5.4.1)
SCDC, EHO – Environmental Planning – 21.10.20	It was confirmed by email that noise predictions would be made using noise mapping software.	Noise mapping software used for the assessment is detailed in 5.2.15, Operational Phase – Rail Traffic Noise (paragraph 5.2.21), Future Baseline (paragraph 5.3.2) and Assessment of Effects (paragraph 5.4.1)

## Scoping

5.2.6 Table 5-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to Noise, and the corresponding location in the ES where they are addressed.

Table 5-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Natural England	An estimate, by type and quantity, of expected noise residues and emissions should be included.	Estimate of construction noise provided in Assessment of Effects Table 5-14 and Table 5-15 and visual representation provided in Figure 5.2 – Figure 5.7 in Appendix 5.1.  Estimate of operational noise provided in Assessment of Effects Table 5-17 and Table 5-18 and visual representation provided in Figure 5.8 – Figure 5.11 of Appendix 5.1.
	A description of the likely significant effects of the proposed Development on the environment resulting from the emission of noise, should be included.	Assessment of effects
Department for Transport (DfT)	Consideration should be given to widening the scope of the Code of Construction Practice to include proposals for real-time noise monitoring during the construction programme when in close proximity to sensitive receptors and details of noise complaint handling, complaint investigation and complaint resolution.	Details of complaint handling were included in the embedded mitigation provided in Assessment of Effects (Paragraph 5.4.7). A proposal of real-time

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		construction noise monitoring was included in Design and Mitigation (Paragraph 5.5.4)
	Consideration of cumulative effects should include consideration of the Cambridge South East Transport (CSET) Scheme.	Consideration was given to the cumulative effects of the CSET scheme (Table 5-22)
	In the ES, any values selected for the Lowest Observed Adverse Effect Levels and the Significant Observed Adverse Effect Levels should be clearly justified.	Methodology for assessing impacts paragraph 5.2.4
	For rail traffic noise, where assessment is being made at residential receptors, consideration should be given for predicting noise levels at 1.5m for ground floor level and 4/ 4.5m for a typical 1st floor window for both day and night time periods. In addition to noise prediction/ impacts at or near building façades, the assessment should also consider any impacts that may be experienced in external amenity areas such as private gardens and other noise sensitive spaces such as public open spaces.	At the noise monitoring locations, rail traffic is predicted at 1.5 m high (I,e, the same height as the logging equipment). For the building receptors, the highest noise level incident on the façade is presented. Grid figures are at 4m in height to represent a first floor window as required by DfT).  Consideration of amenity areas are provided in Assessment of effects.

## The Study Area

### Technical Scope

5.2.7 The technical scope of the assessment has considered impacts and effects during the construction stage in respect of the following:

- Construction noise impacts on existing noise sensitive receptors (NSRs)
- Construction road traffic noise at off-site NSRs.

5.2.8 The technical scope of the assessment has considered impacts and effects during the operational and completed development stage in respect of the following:

- Operational road traffic noise at off-site NSRs
- Operational noise from road, rail
- Operational noise from the Public Address/Voice Alarm (PAVA) system and plant sources at existing off-site NSRs

### Spatial Scope

5.2.9 The study area extends to 500m from the centreline of the railway. Where appropriate the assessments have been undertaken at existing nearest NSR's to the site boundaries as outlined in Method for Establishing Baseline Conditions. These receptors are considered a 'worst-case' (most exposed) in terms of noise propagation and any further receptors will be screened by these buildings.

### Temporal Scope

- 5.2.10 The assessment has considered impacts arising during the construction stage which would be expected to be temporary and short-term (0–5 years) and temporary and medium-term (5-10 years) in nature, as well as from the operational stage which would be expected to be permanent and long-term in nature (i.e. more than 10 years).
- 5.2.11 The following scenarios have been assessed:
- Scenario 1: Existing Baseline 2019
  - Scenario 2: Future Baseline 2023 (updated traffic flows, train timetable as at present)
  - Scenario 3: Future with proposed Development 2031 (updated road and rail flows) without cumulative schemes
  - Scenario 4: Future with proposed Development + cumulative schemes

## Methodology for Establishing Baseline Conditions

- 5.2.12 Following a desktop study and a site visit in February 2019, eleven noise monitoring locations were selected to establish the baseline sound environment. They have been chosen as being representative of either residential or non-residential sensitive receptors in the general vicinity of each monitoring location. The noise monitoring locations, as agreed with the local Environmental Health Officers, are provided Appendix 5.1.
- 5.2.13 The areas each location represents is described as follows:
- NML1L – Residential property. Granham's Road
  - NML2S – Long Road Sixth Form College
  - NML3L – MRC Laboratory of Molecular Biology, trackside (east)
  - NML4L – AstraZeneca, BioMed Site
  - NML5L – Trumpington Meadows residential area immediately west of Hobson's Brook
  - NML6L – Anne McLaren Building (research facility)
  - NML7L - Note: Reference NML7 not used following revisions to survey
  - NML8S – Trumpington Meadows (South) close to Addenbrooke's Road
  - NML9L – Individual residential properties, Graham's Road, Great Shelford
  - NML10L – Residential area, Davey Crescent, Great Shelford
  - NML11L – Residential properties. Graham's Road
- 5.2.14 Construction / operational noise has been predicted to the noise monitoring locations; as well as the following additional locations (incident façade noise levels).
- A: AstraZeneca, Academy House, Hill's Road (construction noise assessment only)
  - B: The Belvedere – Residential properties. Hill's Road (construction noise assessment only)
  - C: MRC Laboratory of Molecular Biology
  - D: AstraZeneca BioMed Campus Site
  - E: Anne McLaren Building
  - F: ABCAM
  - G: Properties on Abberley Wood Road
  - H: 25 Davey Close
- 5.2.15 These locations are presented in Figure 5-1, Figure 5-2 and Figure 5-3. The baseline ambient noise levels have been established through modelling with commercially available noise modelling software CadnaA® by calibrating with the noise data obtained from the survey.

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Figure 5-1 Assessment Locations – Hills road



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Figure 5-2 Assessment Locations – Cambridge Biomedical Campus

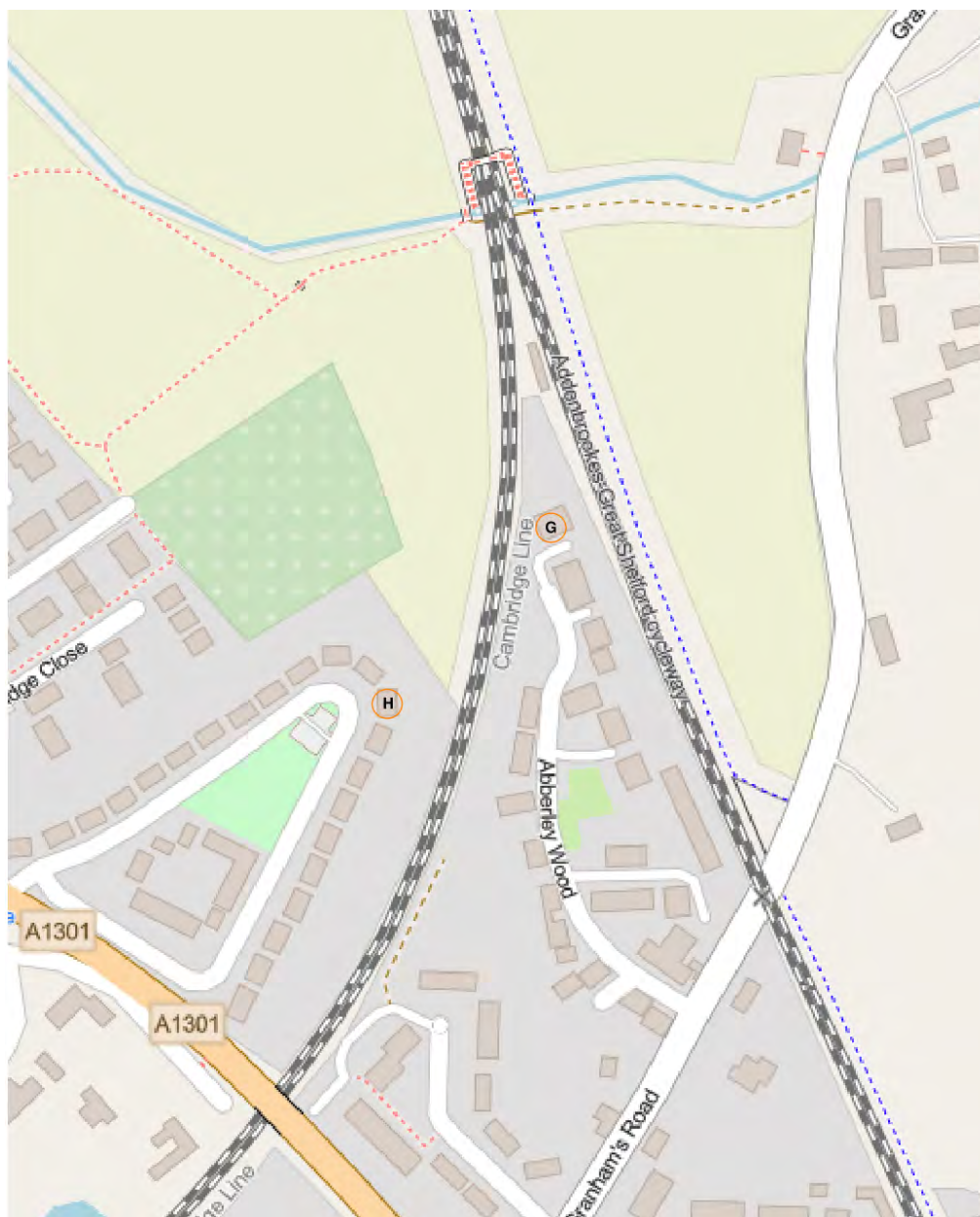


Figure 5-3 Assessment Locations – Shrepreth Branch Junction

5.2.16 The Department of Transport requested external amenity be considered for the assessment of operational rail noise. The following receptors have been identified:

- I: Trumpington skate park
- J: Hobson Bird Reserve
- G: Gardens of properties on Abberley Wood Road
- H: Garden of 25 Davey Close
- K: Nine Wells Local Nature Reserve

#### Noise Monitoring Duration

5.2.17 At noise monitoring locations with the suffix L, i.e. NML1L, NML3L, NML4L, NML5L, NML6L, NML9L, NML10L AND NML11L, predominantly unattended continuous long-term monitoring was undertaken for a period of approximately five days. The monitoring extended over a period that included the weekend as well as weekdays.

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5.2.18 At noise monitoring locations with the suffix S, i.e. NML02S and NML08S, attended short monitoring was carried out over a continuous three-hour period during the daytime between 0700 and 2300 hours.

### Noise Survey Details

5.2.19 Details of the survey methodology is described as follows:

- The surveys have been undertaken using fully calibrated sound level meters compliant with the requirements of IEC 61672-1:2002 (or an equivalent such as BS EN 61672-1:2003) to Class 1 performance
- An on-site calibration check was carried out immediately before and upon completion of the noise surveys, using a fully calibrated calibrator
- The noise surveys were carried out in accordance with BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures
- Measurements were taken in free-field conditions where possible. For instances where it was necessary to take a façade measurement, these were identified and a correction of - 2.5 decibels (dB) was applied to the measured data
- Measurements were taken with the microphone positioned at a height of approximately 1.5m above ground level. At locations where the monitoring was required to represent higher storeys of buildings above ground level, the height was recorded
- During the survey, observations were recorded regarding the general noise environment and prevailing weather conditions
- Continuous measurements were recorded for the duration of the long or short survey period depending on the location

### Noise Measurement Parameters

5.2.1 Measurements were recorded as continuous 15-minute and 1-hour intervals using the following A weighted parameters (Time weighting 'F'):  $L_{Aeq}$ ,  $L_{A90}$ ,  $L_{A10}$ ,  $L_{Amax}$  and  $L_{Amin}$ .

### Defining the Importance/Sensitivity of Receptor

5.2.2 The sensitivity of receptors has been classified based on best practice/guidance as low, medium or high, in accordance with the building use set out in Table 5-3.

Table 5-3 Receptor Sensitivity

Sensitivity	Receptor Type
Low	Commercial and Industrial
Medium	Offices
High	Residential / schools / hospitals / general laboratories / external amenity areas
Very high	Sensitive Laboratories and Research Imaging

### Methodology for Assessing Impacts

5.2.3 The magnitude of impact has been classified as No Change, Negligible, Minor, Moderate or Major in accordance with

5.2.4

5.2.5 Table 5-4 to Table 5-10.



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- 5.2.6 The NPSE sets out the long-term vision of Government noise policy which is 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.
- 5.2.7 The NPSE outlines the following three aims for the effective management and control of environmental, neighbour and neighbourhood noise:
- Avoid significant adverse impacts on health and quality of life;
  - Mitigate and minimise adverse impacts on health and quality of life; and
  - Where possible, contribute to the improvement of health and quality of life.
- 5.2.8 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 (WHO). 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.
  - LOAEL – Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
  - 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.
- 5.2.9 The PPG provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking the effects to the NOEL and, as exposure increases, the LOAEL and SOAEL.
- 5.2.10 As exposure increases above the LOAEL, 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.
- 5.2.11 The LOAEL is described in the PPG as the level above which "noise starts to cause small changes in behaviour and/or attitude e.g. turning up the volume of the television, speaking more loudly, or, where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life."
- 5.2.12 PPG identifies the SOAEL as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep."

## Construction Phase - Construction Traffic Noise on Public Roads

- 5.2.13 Construction traffic using the public Highway was assessed in accordance with the methodology of the Calculation of Road Traffic Noise (CRTN), and an assessment made drawing upon pertinent aspects of the methodology provided within the Design Manual for Roads and Bridges (DMRB) LA111.
- 5.2.14 Although the DMRB is intended for the assessment of new or altered road schemes, which is not the situation for this proposed Development, it does provide some relevant guidance on the assessment of construction traffic. As such, aspects of the DMRB methodology will be implemented as a way to consider the impacts of traffic flow changes on the local road network attributable to the proposed Development.
- 5.2.15 In the short term (with and without construction traffic in the same year) a 1dB change is the threshold level for assessment purposes.

*The DMRB provides classification for the magnitude of change in road traffic noise in terms of both long term and short-term changes in road traffic noise. For the purposes of this assessment the magnitude of change in the short term was considered as this criterion*

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*reflects people's greater sensitivity to noise in the short term when a change in noise initially occurs. The magnitude of the predicted change in noise levels was determined by using the scale shown in*

## 5.2.16 Table 5-4.

Table 5-4 Construction Traffic – Magnitude of Impact

Magnitude of Impact	Change in Traffic Basic Noise Level $L_{A10,18h}$ dB	Adverse Effect Level
Negligible	<1.0	NOAEL
Minor	1.0 to 2.9	LOAEL
Moderate	3.0 to 4.9	SOAEL
Major	$\geq 5.0$	SOAEL

## Construction Phase - Construction Site Noise

- 5.2.17 Assessment of noise was made in accordance with BS 5228-1:2009+A1:2014 Part 1 Noise and significance was set in accordance with LA111 in the absence of any other guidance.
- 5.2.18 BS 5228 provides guidance and recommendations on methods for the calculation of construction noise and the consequential assessment of its impacts upon those exposed to it. Construction plant noise predictions were based on noise data from BS 5228. Noise from on-site haul-roads was calculated based on the 'haul road' method in BS 5228 and is considered in the total construction noise levels presented in this report.
- 5.2.19 The construction noise thresholds were set in accordance with the 'ABC Method' provided in BS 5228. Within the 'ABC Method' the change in the ambient noise level with construction is assessed against defined threshold values.
- 5.2.20 These threshold values vary depending on the period of day or night when construction activity takes place and the existing background sound levels during the corresponding periods. BS 5228 states that exceedance of the determined thresholds by applying the 'ABC Method' by construction noise is considered as significant. The 'ABC Method' threshold values are presented in Table 5-5.

Table 5-5 Construction Plant Noise Thresholds (BS 5228-1)

Assessment category and threshold value period	Threshold value, dB $L_{Aeq,T}$		
	Category A <sup>A)</sup>	Category B <sup>B)</sup>	Category C <sup>C)</sup>
Night-time (2300-0700)	45	50	55
Evenings and weekends <sup>D)</sup>	55	60	65
Daytime (0700-1900) and Saturdays (0700-1300)	65	70	75

<sup>A)</sup> Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values

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Assessment category and threshold value period	Threshold value, dB $L_{Aeq,T}$		
	Category A <sup>A)</sup>	Category B <sup>B)</sup>	Category C <sup>C)</sup>
<sup>B)</sup> Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values			
<sup>C)</sup> Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are greater than category A values			
<sup>D)</sup> 1900-2300 weekdays, 1300-2300 Saturdays and 0700-2300 Sundays			

5.2.21 The magnitude of impact for construction plant noise has been defined as per DMRB LA111 (Table 5-6 ) and reference threshold values shown in Table 5-5.

Table 5-6 Construction Plant – Magnitude of Impact

Magnitude of Impact	Construction noise level	Adverse Effect Level
Negligible	< Measured ambient noise level at NSR	NOAEL
Minor	≥ Measured ambient noise level at NSR, but less than threshold value	LOAEL
Moderate	≥ Threshold Value, but less than 5 dB above threshold value	SOAEL
Major	≥ 5 dB above threshold value	SOAEL

5.2.22 If the ambient noise level is higher than the threshold value in Category C, then the threshold value is set equal to the ambient noise level. Thus, the measured ambient noise level would become the SOAEL.

### Operational Phase – Rail Traffic Noise

- 5.2.23 Consideration of the potential effects resulting from new and altered rail lines, and a possible increase in rail traffic and any changes in rail traffic speed was determined using CadnaA® version 2021 noise modelling software.
- 5.2.24 Rail noise modelling was undertaken by implementing the airborne noise calculation methodology of Calculation of Rail Noise (CRN) which is applicable for the assessment of new and altered rail lines. The method to predict airborne sound attributable to rail operations was used to model sound propagation taking account of the following effects: topography, track design, track points, reflections, shielding by barriers and buildings and where appropriate any physical mitigation measures proposed using noise modelling techniques.
- 5.2.25 Predictions were made for an 18-hour daytime period  $L_{Aeq,18 \text{ hours}}$  between 0600 and 2400 hours and a 6-hour night-time period  $L_{Aeq, 6 \text{ hours}}$  between 0000 and 0600 hours.
- 5.2.26 Noise modelling was undertaken using the proprietary noise mapping software Cadna-A, to produce a model of the existing environment to evaluate the changes in noise arising from the operational activities. Noise modelling was undertaken to create the following two situations that enabled a comparison to be made:
- Baseline scenario 'Without proposed Development' comprising the existing track layout and traffic patterns
  - Scenario 'With proposed Development' that includes new and altered tracks proposed for the rolling stock in the future design year (the year with the highest rail traffic patterns forecast for the first 15 years of operation)

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## 5.2.27 The assessment considered the change in rail noise level between the existing railway lines and the proposed new and altered tracks.

*As part of the assessment, consideration has been given to semantic noise change criteria adapted from within IEMA Guidelines For Environmental Noise Impact Assessment (2014) and other guidance (including DMRB); and where necessary included reference to the guidance provided by the WHO including the Guidelines for Community Noise, Night Noise Guidelines for Europe and Environmental Noise Guidelines for the European Region. The magnitude of the predicted change in noise levels was determined by using the scale shown in*

## 5.2.28 Table 5-7.

Table 5-7 Operational Rail Traffic – Magnitude of Impact

Magnitude of Impact	Change in Noise Level (dB)	Adverse Effect Level
Negligible	<3.0	NOAEL
Minor	3.0 to 4.9	LOAEL
Moderate	5.0 to <10.0	SOAEL
Major	≥ 10.0	SOAEL

## Operational Phase – Road Traffic Noise

- 5.2.29 An assessment to determine the indirect effects of any changes in road traffic as a result of the proposed Development was based upon the methodology and significance criteria set out in the DMRB LA111 Noise and Vibration document. Consideration was also given to the potential effects associated with the new station drop-off facility for road vehicles.
- 5.2.30 The spatial scope for indirect effects included an assessment where the increase or decrease in road traffic caused by the proposed Development would be likely to cause a change in road traffic noise exceeding 1 dB during either the daytime or overnight periods.
- 5.2.31 Changes in traffic as a result of the proposed Development on the local network was calculated in accordance with the methodology of the Calculation of Road Traffic Noise (CRTN), and an assessment made under DMRB LA111. As stated above, the DMRB is intended for the assessment of new or altered road schemes, which is not the situation for the proposed Development, it does provide some relevant guidance that can be adopted for the assessment of noise in the short term, resulting from changes in traffic flows. As such, aspects of the DMRB methodology were implemented as a way to consider the impacts of traffic flow changes on the local road network attributable to the proposed Development once operational.
- 5.2.32 For the purposes of this assessment the magnitude of change in the short term provided in the DMRB was considered as this criterion reflects people's greater sensitivity to noise in the short

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term when a change in noise initially occurs. The magnitude of the predicted change in noise levels was determined by using the scale shown in Table 5-8.

Table 5-8 Operational Road Traffic – Magnitude of Impact

Magnitude of Impact	Change in Traffic Basic Noise Level $L_{A10,18h}$ dB	Adverse Effect Level
Negligible	<1.0	NOAEL
Minor	1.0 to 2.9	LOAEL
Moderate	3.0 to 4.9	SOAEL
Major	$\geq 5.0$	SOAEL

## Operational Phase – New Railway Station Fixed Plant Noise

5.2.33 Consideration was given to potential impacts associated with the new railway station and specifically any mechanical services plant included as part of the station design. Should the design include this type of installation an assessment would be made based upon the methodology provided in BS 4142:2014+A1:2019.

5.2.34 Under the BS 4142:2014+A1:2019 criteria the existing background noise levels outside noise sensitive premises are compared with the calculated/measured rating noise level of the activity under consideration:

- 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 upon context; and
- 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.

5.2.35 The assessment has considered a worst-case situation at the closest sensitive receptors and magnitude of impact established in accordance with Table 5-9.

Table 5-9 Fixed Plant Noise – Magnitude of Impact

BS 4142 Assessment	Example Outcome	Magnitude of Impact	Adverse Effect Level
In excess of $L_{A90} -10\text{dB}$	No effect – not noticeable	No Change	NOEL
Rating Level of between $L_{A90} -10\text{dB}$ and $L_{A90} +0\text{dB}$	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	Negligible	NOAEL
Rating Level of between $L_{A90} +0\text{dB}$ and $L_{A90} +5\text{dB}$	Noise can be heard and causes small changes in behaviour and/or attitude. Affects the acoustic	Minor	LOAEL

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BS 4142 Assessment	Example Outcome	Magnitude of Impact	Adverse Effect Level
	character of the area such that there is a perceived change in the quality of life.		
Rating Level of between $L_{A90}+5\text{dB}$ and $L_{A90} +10\text{dB}$	The noise causes a material change in behaviour and/or attitude. Quality of life diminished due to change in acoustic character of the area.	Moderate	SOAEL
Rating Level of greater than $L_{A90} +10\text{dB}$	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects.	Major	SOAEL

## Operational Phase – Drop off (unloading / loading)

- 5.2.36 The modelled vehicle movement noise level has been compared to the measured background noise levels at the nearest noise-sensitive receptor (AstraZeneca BioMed Campus Site – NML04L) using the methodology set out in BS4142:2014. A 3 dB correction has been applied to the specific level for intermittency to calculate the rating level. The magnitude of impact is defined in Table 5-9. The Cadna-A model takes into account the distance attenuation from source to receiver.
- 5.2.37 BS4142 is typically used to assess the loading and unloading of goods. In the absence of any specific standard/guidance, noise from vehicles idling and dropping off passengers/goods has been assessed in accordance with BS4142.

## Operational Phase – PAVA

- 5.2.38 This assessment is for noise from platform announcements through the PAVA system on the nearest noise sensitive receptors.
- 5.2.39 For the purpose of the assessment, the magnitude of the predicted change in noise levels was determined by using the scale shown in Table 5-10, which is based on BS4142 without the application of penalties.

Table 5-10 PAVA noise magnitude of impact

PAVA noise level	Magnitude of Impact	Adverse Effect Level
< 10 dB below ambient noise level	No change	NOEL
5-10 dB below ambient noise level	Negligible	NOAEL
0-5 dB below ambient noise level	Minor	LOAEL
0-5 dB above ambient noise level	Moderate	SOAEL
> 5 dB above ambient noise level	Major	SOAEL

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- 5.2.40 PAVA noise levels 10 dB below ambient noise levels would not be noticeable in the context of the surrounding noise climate.

**Assessing Significance**

- 5.2.41 Moderate magnitudes of impact are considered the threshold of the SOAEL.
- 5.2.42 Impacts have been assessed on the basis of the sensitivity of the receptors against the magnitude of impact to determine the scale of effects as presented in Table 5-11.



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Table 5-11 Significance of Effects Matrix

		Impact Magnitude				
		No change	Negligible	Minor	Moderate	Major
Receptor Sensitivity	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate

5.2.43 Moderate, large or very large effects are considered Significant.

## Assumptions

### Assumptions

5.2.44 Construction noise predictions have been carried out in CadnaA® based on an assumed worst-case per construction area (Station Area, Shepreth Branch Junction and Hills Road), i.e. highest number of concurrent construction stages. The construction information provided detailed plant to be used for each separate construction activity. Construction stages comprise numerous construction activities. Basing construction noise predictions on all plant listed for each construction stage would be an overestimation of the number of plant in each area at a given point in time. Therefore, construction noise predictions were carried out based on a worst-case assumed list of plant to be operating in each construction area at once. The spectrum for the dominant plant item was applied in the CadnaA® noise model.

5.2.45 All piling works are assumed to be a lower noise method, i.e. Continuous Flight Auger (CFA)

5.2.46 The following correction factors have been added for the operational noise assessment in order to calibrate the model to the measured baseline noise levels. These correction factors remain consistent throughout all scenarios:

- Granhams road surface correction: -3.5dB (to calibrate measured noise levels from this noise source)
- Addenbrookes Road: -1.5dB
- Railway track near the biomedical campus: +4dB

5.2.47 The operational assessment has been based on the data shown in Appendix 5.2, which aligns with the Transport ES chapter 17.

## 5.3 Baseline

### Existing Baseline

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5.3.1 Results are presented during time periods relevant to the construction and operational noise assessments. Table 5-12 presents Day, Evening and Night noise levels for the purposes of the construction noise assessment. Table 5-13 presents day (0600-0000) and night (0000-0600) for the purposes of the operational noise assessment,

Table 5-12 Measured noise levels used for the construction noise assessment

Measurement location	Time period	$L_{eq, T}$	$L_{min, T}$	$L_{max, T}$	$L_{90, T}$	$L_{10, T}$
NML1L	Day (0700-1900)	56.8	33.8	82.6	47.9	57.5
	Evening (1900-2300)	53.7	30.4	80.4	41.2	51.8
	Night (2300-0700)	53.6	29.7	83.0	41.0	49.4
NML2S	Day (0700-1900)	60.9	39.0	86.5	44.9	58.1
NML3L	Day (0700-1900)	58.6	36.6	94.0	47.4	54.9
	Evening (1900-2300)	57.3	34.3	83.7	42.7	50.7
	Night (2300-0700)	57.8	33.7	85.2	43.3	48.8
NML4L	Day (0700-1900)	61.9	37.0	92.4	46.9	56.0
	Evening (1900-2300)	60.4	34.3	87.6	42.0	50.4
	Night (2300-0700)	57.6	33.2	88.0	41.3	48.7
NML5L	Day (0700-1900)	49.9	43.1	77.9	45.5	50.6
NML6L	Day (0700-1900)	58.9	42.4	88.2	48.3	55.4
	Evening (1900-2300)	58.6	41.4	86.6	45.1	53.1
	Night (2300-0700)	54.3	37.9	83.7	43.6	48.7

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Measurement location	Time period	L <sub>eq, T</sub>	L <sub>min,T</sub>	L <sub>max,T</sub>	L <sub>90, T</sub>	L <sub>10, T</sub>
NML8S	Day (0700-1900)	61.0	38.2	79.4	46.4	64.5
NML9L	Day (0700-1900)	52.4	30.1	85.3	41.0	54.1
	Evening (1900-2300)	51.4	23.5	76.7	37.1	52.0
	Night (2300-0700)	46.0	20.2	75.5	30.1	41.1
NML10L	Day (0700-1900)	55.5	30.5	86.6	40.0	52.0
	Evening (1900-2300)	53.4	23.5	78.5	34.9	46.2
	Night (2300-0700)	50.0	20.8	86.6	29.0	39.3
NML11L	Day (0700-1900)	63.4	33.0	94.6	47.0	60.3
	Evening (1900-2300)	58.5	24.9	90.0	36.1	55.3
	Night (2300-0700)	55.4	21.3	98.4	30.8	44.7

Table 5-13 Measured noise levels used for the operational noise assessment

Receptor	Time period	L <sub>eq, T</sub>	L <sub>min,T</sub>	L <sub>max,T</sub>	L <sub>90, T</sub>	L <sub>10, T</sub>
NML1L	0600-0000	56.2	29.9	83.0	46.0	55.7
	0000-0600	52.7	29.7	80.3	40.2	48.5
NML3L	0600-0000	58.2	34.3	94.0	45.8	53.1
	0000-0600	57.2	33.7	85.2	42.7	48.0
NML4L	0600-0000	61.0	34.3	92.4	45.1	53.7
	0000-0600	56.0	33.2	88.0	40.6	47.8
	0600-0000	58.1	40.6	88.2	46.7	53.5

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Receptor	Time period	$L_{eq, T}$	$L_{min, T}$	$L_{max, T}$	$L_{90, T}$	$L_{10, T}$
NML6L & NML7	0000-0600	52.5	37.9	83.7	42.8	47.2
NML9L	0600-0000	51.6	23.2	85.3	38.5	52.8
	0000-0600	43.4	20.2	72.8	28.7	38.3
NML10L	0600-0000	54.3	22.7	86.6	37.8	49.9
	0000-0600	46.9	20.8	86.6	27.4	36.2
NML11L	0600-0000	61.4	22.8	94.6	43.1	58.3
	0000-0600	53.4	21.3	98.4	28.6	41.2

## Future Baseline

- 5.3.2 The future baseline has been modelled based on the calibrated existing baseline model with traffic and rail flows updated to reflect the data provided in Appendix 5.2 for the future baseline (2031).

## 5.4 Assessment of Effects

### Construction Phase - Construction Traffic Noise on Public Roads

- 5.4.1 With the use of noise modelling, traffic noise levels have been predicted at the nearest NSRs / baseline noise monitoring locations with reference to the data provided in Appendix 5.2.
- 5.4.2 It is predicted that there would be minimal change (less than 1 dB) in noise level at the NSRs as a result of construction traffic on public roads. The proposed Development's traffic is therefore expected to have a negligible impact and result in a **Slight Adverse** effect.

### Construction Phase - Construction Site Noise

- 5.4.3 All demolition and construction effects would be direct and temporary.
- 5.4.4 Embedded mitigation has been included in the assessment. This includes Best Practicable Means (BPM) and which are outlined in the Code of Construction Practice (CoCP) Part A (see Appendix 2.4, in Chapter 2 of the ES). Site hoarding of 2.4 m would be installed around the site perimeter, where mitigation is required and practicable. Guidance provided in BS 5228:2009+A1:2014 Annex B, states that a screen can provide 5 dB attenuation for partial line of sight from source to receiver, and up to 10 dB attenuation where there is no line of sight between source and receiver.
- 5.4.5 A CoCP Part B would be prepared in advance of construction and would define all detailed mitigation measures to be adopted to minimise noise and vibration emissions at surrounding sensitive receptors. This would incorporate specific measures within all phases of the works where noise may give rise to disturbance. The CoCP Part B will be produced by the Main Works Contractor and submitted to the local authority for approval prior to construction commencing, to discharge the relevant deemed planning condition.
- 5.4.6 BPM as defined by the Control of Pollution Act 1974, would be implemented as part of the working methodology. This would serve to minimise the noise effects at receptors in the vicinity of the construction works. The reduction in noise levels provided through the implementation of BPM would vary depending on the nature of the works. However, it is expected that BPM would reduce the noise levels by at least 5 dB based on non-simultaneous plant and low noise plant. Typical examples of BPM include:

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- Plan working hours to take account of the effects of noise and vibration upon persons in areas surrounding site operations and upon persons working on-site;
  - Where reasonably practicable, adopt quiet working methods, using plant with lower noise emissions;
  - Where reasonably practicable, adopt working methods that minimise vibration generation;
  - Locate plant away from noise and vibration sensitive receptors, where feasible;
  - Use silenced and well-maintained plant conforming with the relevant EU directives relating to noise and vibration;
  - Avoid unnecessary revving of engines and switch off equipment when not required;
  - Keep internal haul routes well maintained;
  - Use rubber linings for chutes and dumpers to reduce impact noise;
  - Minimise drop height of materials;
  - Start-up plant and vehicles sequentially rather than all together;
  - Carry out regular inspections of noise mitigation measures to ensure integrity is maintained at all times;
  - Provide briefings for all site-based personnel so that noise and vibration issues are understood and mitigation measures are adhered to;
  - Manage plant movement to take account of surrounding noise sensitive receptors, as far as is reasonably practicable; and
  - Carry out compliance monitoring of on-site levels to ensure that the agreed noise and vibration limits are being adhered to.
- 5.4.7 The approach to community liaison and communication regarding construction works would be set out in the CoCP Part B and undertaken throughout the construction stage to provide information to people residing in properties located in the vicinity of the construction works and reduce the likelihood of adverse effects on the local community which could result in potential noise complaints. The level of engagement required would vary during the construction period, depending upon the expected effects experienced by individual receptors due to the construction works.
- 5.4.8 If work is required to extend into periods beyond the agreed working hours, separate authorisation would be secured with the Local Authority via the CoCP Part B and/or the Control of Pollution Act 1974 by seeking a Section 61 consent covering such periods.
- 5.4.9 The construction noise assessment for daytime works is presented in Table 5-14. The construction noise assessment for night-time works is presented in Table 5-15. The tables present the predicted construction noise levels at each existing NSR and the construction areas (Hills Road, Station Area and Shepreth Branch Junction) for the NSRs which are near the proposed construction works. The noise levels include a +3 dB correction for façade reflections. A ‘worst-case’ scenario has been assumed for each construction area i.e. highest number of concurrent works. Full details are provided in Appendix 5.3. The magnitude of impacts have been determined in accordance with Table 5-6. The significance of effects have been established on the basis of the receptor sensitivity in Table 5-11. All receptors assessed in the construction noise assessment are considered High. Baseline noise levels have been rounded to the nearest whole decibel.

*Table 5-14 Predicted construction noise levels - daytime*

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Receptors	Construction area	Measured ambient noise level dBA	Construction noise threshold value dBA	Predicted construction noise façade levels dBA	Magnitude of Impact
NML 1	Shepreth Branch Junction	57	65	49	Negligible
NML 2	Station Area	61	65	70	Major
NML 3	Station Area	59	65	72	Major
NML 4 AstraZeneca, BioMed Site	Station Area	62	65	72	Major
NML 5	Station Area	50	65	58	Minor
NML 6	Station Area	59	65	72	Major
NML 8	Station Area	61	65	68	Moderate
NML 9	Shepreth Branch Junction	52	65	55	Minor
NML 10	Shepreth Branch Junction	56	65	50	Negligible
NML 11	Shepreth Branch Junction	63	65	44	Negligible
A AstraZeneca Academy House	Hills Road	61	65	72	Major
B The Belvedere	Hills Road	61	65	72	Major
D AstraZeneca BioMed Campus site	Station Area	62	65	68	Moderate
G Properties on Abberley Wood Road	Shepreth Branch Junction	56	65	56	Minor
H 25 Davey Close	Shepreth Branch Junction	56	65	50	Negligible

*Hills Road Area*

5.4.10 Major impacts are predicted at receptors AstraZeneca Academy House and the Belvedere. These receptors are considered to have high sensitivity, therefore a Large to Very Large Adverse and **Significant** effects are predicted. The significant effects are based on a 'worst-

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case' and are expected to be temporary in nature. The significant effects are expected to occur over several months as the overall construction for Hills Road area is programmed to extend over 6 months.

*Station Area*

- 5.4.11 Major impacts are predicted at receptors NML 2, NML 3, NML 4 and NML 6. These receptors are considered to have a high sensitivity, therefore a Large to Very Large Adverse and **Significant** effects are predicted.
- 5.4.12 Moderate impacts are predicted at NML 8 and AstraZeneca BioMed Campus site, which are considered high sensitivity. Therefore Moderate Adverse and **Significant** effects are predicted.
- 5.4.13 Minor impacts are predicted at NML 5, which is considered to have a high sensitivity. Therefore, Slight Adverse and **Not Significant** effects are predicted.
- 5.4.14 These effects are based on a 'worst-case' and are expected to be temporary in nature. It is expected these effects are programmed to span 5-6 months.

*Shepreth Branch Junction*

- 5.4.15 Minor impacts are predicted at NML 9, and properties on Abberley Wood Road. These receptors are considered to have a high sensitivity. Therefore, Slight Adverse and **Not Significant** effects are predicted.
- 5.4.16 Negligible impacts are predicted at NML 1, NML 10, NML 11 and 25 Davey Close. Therefore, Slight Adverse and **Not Significant** effects are predicted.
- 5.4.17 **Not significant** effects are predicted as a result of construction work in the vicinity of the Shepreth Branch Junction.

Table 5-15 Predicted construction noise levels – night-time

Receptors	Construction area	Measured ambient noise level dBA	Construction noise threshold value dBA	Predicted construction noise façade levels dBA	Magnitude of Impact
NML 1	Shepreth Branch Junction	54	55	51	Negligible
NML 2*	Station Area	58	58	32	Negligible
NML 3	Station Area	58	58	55	Minor
NML 4	Station Area	58	58	58	Moderate
NML 5**	Station Area	54	55	48	Negligible
NML 6	Station Area	54	55	68	Major
NML 8**	Station Area	54	55	49	Negligible
NML 9	Shepreth Branch Junction	46	55	56	Moderate



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Receptors	Construction area	Measured ambient noise level dBA	Construction noise threshold value dBA	Predicted construction noise façade levels dBA	Magnitude of Impact
NML 10	Shepreth Branch Junction	50	55	56	Moderate
NML 11	Shepreth Branch Junction	55	55	46	Negligible
AstraZeneca Academy House	Hills Road	58	58	73	Major
The Belvedere	Hills Road	58	55	73	Major
AstraZeneca BioMed Campus site	Station Area	58	58	68	Major
Properties on Abberley Wood Road	Shepreth Branch Junction	50	55	58	Moderate
25 Davey Close	Shepreth Branch Junction	50	55	56	Moderate

\* Assumed to be similar to NML 3

\*\* Assumed to be similar to NML 6

#### Hills Road Area

5.4.18 Major impacts are predicted at receptors AstraZeneca Academy House and the Belvedere. These receptors are considered to have a high sensitivity, therefore a Large to Very Large Adverse and **Significant** effects are predicted. Night-time works at Hills Road are scheduled to take 2-3 days at a time. Therefore, the significant effects are based on a 'worst-case' and are short-term and temporary in nature.

#### Station Area

5.4.19 Major impacts are predicted at NML 6 and AstraZeneca BioMed Campus site. The receptors are considered to have a high sensitivity, therefore Large to Very Large Adverse and **Significant** effects are predicted. Regardless, night-time works are scheduled to take place for no more than 8 days at a time and therefore the effects are anticipated to be short-term and temporary in nature.

5.4.20 Moderate impacts are predicted at NML 4, which is a high sensitivity receptor. Moderate or Large Adverse and **Significant** effects are predicted. As previously stated, night-time works are scheduled for no more than 8 days at a time and therefore the effects are anticipated to be short-term and temporary in nature.

5.4.21 Minor impacts are predicted at NML 3 which is considered a high sensitivity receptor. As such Slight Adverse and **Not Significant** effects are predicted at this location.

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- 5.4.22 Negligible impacts are predicted at NML 2, NML 5 and NML 8 during night-time hours. Therefore, Slight Adverse and **Not Significant** effects are predicted at these receptors.

*Shepreth Branch Junction*

- 5.4.23 Moderate impacts are predicted at properties on NML 9, NML 10, Abberley Wood Road and 25 Davey Close, which are high sensitivity receptors. Therefore, Moderate or Large Adverse and **Significant** effects are predicted. It should be noted the effects are anticipated to be short-term and temporary in nature as night-time works at Shepreth Branch Junction are scheduled to take place for no more than 1-2 days at a time.
- 5.4.24 Negligible impacts and Slight Adverse and **Not Significant** effects are predicted at NML 11.

**Operational Phase – Rail Traffic Noise**

- 5.4.25 All operational effects are considered to be direct and permanent.
- 5.4.26 With the use of noise modelling, train noise levels have been predicted at the nearest NSRs / baseline noise monitoring locations in accordance with the data provided by the design team (see Appendix 5.2).
- 5.4.27 Using the database available some train classes have been substituted for similar train classes. These are outlined in Table 5-16.

Table 5-16 Predicted construction noise levels - daytime

Proposed train class	Train class assumed in the model	Penalty added by the in CadnaA to represent for this train class / dB
C66	C66	13.0
Class 365	Class 465 EMU	8.4
Class 387	Class 377T	6
Class 700	Class 450 T Desiro	6
Class 720	Mk III	6
Class 755	Mk III	6

- 5.4.28 For the future year model, the areas with switch gear (as a result of the track layout changes) have an additional penalty of 2.5dB applied to the railway source. This is in accordance with the CRN methodology. The results are presented in

- 5.4.29 Table 5-17. All receptors are considered high sensitivity as per Table 5-3.

Table 5-17 Predicted operational noise – trains only

Receptor	Without proposed Development / dB $L_{Aeq}$		With proposed Development / dB $L_{Aeq}$		Difference / dB	
	Day (0600-0000)	Night (0000-0600)	Day (0600-0000)	Night (0000-0600)	Day (0600-0000)	Night (0000-0600)

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*Free-field measurement locations*

NML 1	54.4	47.7	54.0	48.3	-0.4	0.6
NML 2	59.8	52.7	58.8	53.1	-1.0	0.4
NML 3	57.9	50.8	55.1	49.8	-2.8	-1.0
NML 4	61.7	54.7	60.0	54.8	-1.7	0.1
NML 5	39.2	31.7	37.7	32.1	-1.5	0.4
NML 6	55.7	48.6	55.0	49.8	-0.7	1.2
NML 8	39.0	31.7	37.6	32.1	-1.4	0.4
NML 9	49.6	42.8	49.2	43.5	-0.4	0.7
NML 10	46.2	37.7	46.2	38.9	0.0	1.2
NML 11	43.4	23.5	43.3	23.7	-0.1	0.2

*Buildings (façade noise levels i.e. façade reflection included)*

MRC Laboratory of Molecular Biology	60.7	53.6	57.9	52.5	-2.8	-1.1
AstraZeneca site	57.9	50.7	55.4	50.5	-2.5	-0.2
Anne McLaren Building	56.8	49.6	56.4	51.2	-0.4	1.6
ABCAM	46.8	39.6	45.7	40.4	-1.1	0.8
Properties on Abberley Wood Road	59.6	52.7	59.0	53.3	-0.6	0.6
25 Davey Close	47.5	39.4	47.0	39.9	-0.5	0.5

- 5.4.30 For the Anne McLaren building and noise monitoring locations 6 and 10, there is 1-2dB increase in ambient noise level (from the train contribution only) at the receptors during the night. This is <3dB and therefore a negligible magnitude of impact. As the receptors are of high and very high sensitivity, this results in Slight Adverse effect. This is considered to be **Not Significant**.
- 5.4.31 At all other receptors, there is no increase in noise level and in many cases a slight decrease in noise level. This is a Neutral effect and **Not Significant**.
- 5.4.32 The results for external amenity assessment are presented in Table 5-18, as identified by DfT. For the purposes of this assessment, these receptors are considered as for their human sensitivity.

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Table 5-18 Predicted operational noise – External Amenity

Receptor	Without proposed Development / dB L <sub>Aeq</sub>		With proposed Development / dB L <sub>Aeq</sub>		Difference / dB	
	Day (0600-0000)	Night (0000-0600)	Day (0600-0000)	Night (0000-0600)	Day (0600-0000)	Night (0000-0600)
Trumpington Skate Park	43.1	35.9	41.6	36.1	-1.5	0.2
Hobson Bird Reserve	41.0	-*	41.4	-*	0.4	-*
Gardens of Properties along Abberley Wood Road	57.5	50.6	57.1	51.3	-0.4	0.7
Garden of 25 Davey Close	44.8	36.3	44.2	36.7	-0.6	0.4
Nine Wells Local Nature Reserve	48.5	41.4	47.7	42.1	-0.8	0.7

*\*Hobson Bird Reserve is not considered to be used by humans at night*

- 5.4.33 At all external amenity areas there is no increase in noise level and in many cases a slight decrease in noise level. This is a Neutral effect and **Not Significant**.

### Operational Phase – Road Traffic Noise

- 5.4.34 All operational effects are considered to be direct and permanent. All receptors assessed are considered high sensitivity.
- 5.4.35 With the use of noise modelling, traffic noise levels have been predicted at the nearest NSRs / baseline noise monitoring locations in accordance with the data provided by the design team (see Appendix 5.2).
- 5.4.36 During the day, it is predicted that there would be minimal change in noise level at the NSRs as a result of operational traffic. Indeed, the percentage change in traffic counts is less than 20% (decreasing between 1 and 5% from the 2031 baseline depending on the traffic link), resulting in less than 1dB change. Thus, the proposed Development is expected to make no change to road traffic noise levels, the effect is therefore Neutral and **Not Significant**.

### Operational Phase – New Railway Station Fixed Plant Noise

*The lowest background noise level and the corresponding plant noise limit at each of the nearest NSRs has been outlined in*

Table 5-19. All receptors outline in

- 5.4.37 Table 5-19 are considered high sensitivity.
- 5.4.38 The rating noise level is the specific noise level, plus any corrections for intermittency or other sound characteristics outlined in BS 4142:2014+A1:2019. It should be noted that this plant noise rating level applies to the cumulative noise levels from all plant installed as part of the proposed Development. As is typical practice, it is anticipated that this limit would be secured by means of an appropriately worded planning condition. Background noise levels have been rounded to the nearest whole decibel.

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Table 5-19 Plant noise emission limits

Receptor	Baseline monitoring location used (where applicable)	Daytime (0700 – 2300)		Night time (2300 – 0700)	
		Lowest measured Background Noise Level dB LA90	Noise Rating Level Limit / dB LA <sub>r</sub>	Lowest Measured Background Noise Level dB LA90	Noise Rating Level Limit / dB LA <sub>r</sub>
NML 1		33	33	32	32
NML 2	NML 3 (night-time)	44	44	37	37
NML 3		36	36	37	37
NML 4		36	36	35	35
NML 5	NML 6 (night-time)	45	45	41	41
NML 6	N/A	42	42	41	41
NML 8	NML 6 (night-time)	45	45	41	41
NML 9	N/A	26	30*	22	30*
NML 10	N/A	25	30*	21	30*
NML 11	N/A	28	30*	22	30*
MRC Laboratory of Molecular Biology	NML 3	45	45	32	32
Anne McLaren Building	NML 6	42	42	41	41
25 Davey Close	NML10	25	30*	21	30*
MRC Laboratory of Molecular Biology	NML 3	45	45	32	32
AstraZeneca Site	NML 4	36	36	36	36
Anne McLaren Building	NML 6	42	42	41	41

n.b. the night-time noise limits are based on 1-hour data as provided

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Receptor	Baseline monitoring location used (where applicable)	Daytime (0700 – 2300)		Night time (2300 – 0700)	
		Lowest measured Background Noise Level dB L <sub>A90</sub>	Noise Rating Level Limit / dB L <sub>Ar</sub>	Lowest Measured Background Noise Level dB L <sub>A90</sub>	Noise Rating Level Limit / dB L <sub>Ar</sub>

\* due to the very low background noise levels measured at this location, an absolute lower limit of 30dB L<sub>Ar</sub> has been applied throughout. This is applied following the guidance in BS 4142:2014 which states “Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.”

5.4.39 Suitable plant should be chosen so as to meet the above criteria. This includes all plant associated with the proposed Development.

5.4.40 Providing the above limits are met, the noise impacts of fixed plant installations of the proposed Development are predicted to be negligible and therefore, result in long-term, permanent Slight Adverse effects, which are **Not Significant** effects.

#### Operational Phase – Loading/Unloading

5.4.41 All receptors assessed are considered high sensitivity. The traffic data shown in Appendix 5.2 indicate that approximately 317 vehicles a day are expected to use the station drop-off point on the east of the proposed station building. Based on Ramboll’s previous project experience car movements at low speeds would be expected to produce a sound pressure level of 66 dB L<sub>Aeq,5min</sub> at 3.5m. This noise was modelled using Cadna-A as a point source 5m from the eastern façade of the station building.

5.4.42 The specific noise level from the drop-off point was predicted to be 40 dBA at 1m from the façade of the nearest noise-sensitive receptor, AstraZeneca. As previously stated, a 3 dB penalty has been applied in accordance with BS4142 for intermittency. Thus, the rating level is 43 dB L<sub>Ar</sub>. This level is below the daytime background level and will therefore have a negligible impact and Slight Adverse and **Not Significant** effects. The background level is exceeded by 2 dB and will therefore have a minor adverse impact during the daytime hours.

5.4.43 It is worth noting that this model is based on noise from internal combustion engine vehicles and therefore noise levels from the drop-off point will likely reduce in the future as the proportion of electric vehicles increases.

#### Operational Phase – PAVA

5.4.44 It is expected with normal design considerations with highly directional speakers typical of PAVA systems and signal levels adjusted against the prevailing background noise level that that noise levels incident on the nearest commercial and residential receptors will be significantly below the ambient noise level. All receptors assessed are considered high sensitivity.

##### *AstraZeneca BioMed Campus Creche Facility*

5.4.45 Specific concern was raised during consultation of the potential impact of the PAVA on a Creche Facility within the Amenities Hub of the AstraZeneca BioMed Campus. Publicly available drawings have been reviewed (*Planning application ref. 19/1070/REM, Drawing Amenities Hub General Arrangement Second Floor Plan ref. CB007-HBA-XX-L20-DR-A-201004 rev P0, dated 26/07/2019*). The creche facility is on the second floor with aspects outward on the southern, northern and eastern façades, facing away from the railway. The creche has an external play courtyard which is screened on all sides by the Amenities Hub building massing.

- 5.4.46 Given the nearest receptors are commercial, with sealed building facades, no significant effects (Neutral or Slight) are anticipated as a result of PAVA noise. It is expected that noise levels would be controlled during detailed design with a suitably worded planning condition.

## 5.5 Design and Mitigation

### Construction Approach and Mitigation of Construction Effects

- 5.5.1 Working practices will be agreed with the appointed principal contractor within detailed Construction Method Statements to be secured as part of the CoCP Part B to reduce the predicted worst-case noise levels and impacts to NSRs. BPM would also be implemented. Works would be programmed to minimise the overlap of noisy activities. Quiet plant would be selected where possible. Noisy activities would be screened e.g. around localised plant and activities.
- 5.5.2 In respect of all construction related noise, it should be noted that the effects are temporary and would only occur for short periods within the overall programme.
- 5.5.3 Aside from the above measures, additional measures such as mufflers for breakers and localised screening for cutters and piling rigs may provide an additional 5 dB reduction.
- 5.5.4 Adverse noise levels would be controlled by the implementation of a noise monitoring regime. Where a construction activity task is identified as likely to result in Significant Effects on sensitive receptors a noise monitoring regime will be implemented. The monitoring equipment will be installed for the duration of the identified construction activity at locations that are safe and secure and representative of the closest sensitive receptors. The equipment will be set-up to provide automatic text alerts to nominated stakeholders and construction personnel when levels reach an amber warning construction alert level and a red warning construction threshold level so that immediate action can be taken to reduce levels as necessary to prevent exceedance of the construction noise level limit set. The level will be set as part of the CoCP Part B.

### Scheme Design and Mitigation of Operational Effects

- 5.5.5 As there are no significant effects from the operational road or rail traffic no additional mitigation is proposed.
- 5.5.6 Plant noise will be mitigated during detailed design so as to meet the requirements set out in this ES chapter. Compliance will be secured through the relevant deemed planning condition.

## 5.6 Assessment of Residual and Cumulative Effects

### Residual Effects from Construction

- 5.6.1 Despite the adoption of embedded mitigation, temporary significant adverse effects are predicted at some receptors during some periods of construction as stated in Table 5-6. It should be noted that this would occur for relatively short-periods within the overall programme (5-6 months). The construction plant noise at all the other receptors would not be significant.
- 5.6.2 Residual effects from construction noise during daytime and night-time hours are presented in
- 5.6.3
- 5.6.4

- 5.6.5 Table 5-20 and



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5.6.6 Table 5-21. These residual effects have been determined by applying a 5 dB reduction for the additional mitigation stated in Section 5.5. Baseline noise levels have been rounded to the nearest whole decibel.

Table 5-20 Residual effects from construction - daytime

Receptors	Construction area	Measured ambient noise level dBA	Construction noise threshold value dBA	Predicted construction noise façade levels dBA	Magnitude of Impact
NML 1	Shepreth Branch Junction	57	65	44	Negligible
NML 2	Station Area	61	65	65	Moderate
NML 3	Station Area	59	65	67	Moderate
NML 4	Station Area	62	65	67	Moderate
NML 5	Station Area	50	65	53	Minor
NML 6	Station Area	59	65	67	Moderate
NML 8	Station Area	61	65	63	Minor
NML 9	Shepreth Branch Junction	52	65	50	Negligible
NML 10	Shepreth Branch Junction	56	65	45	Negligible
NML 11	Shepreth Branch Junction	63	65	39	Negligible
AstraZeneca Academy House	Hills Road	61	65	67	Moderate
The Belvedere	Hills Road	61	65	67	Moderate

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Receptors	Construction area	Measured ambient noise level dBA	Construction noise threshold value dBA	Predicted construction noise façade levels dBA	Magnitude of Impact
AstraZeneca site	Station Area	62	65	63	Minor
Properties on Abberley Wood Road	Shepreth Branch Junction	56	65	51	Negligible
25 Davey Close	Shepreth Branch Junction	56	65	45	Negligible

*Hills Road Area*

5.6.7

5.6.8

5.6.9

5.6.10 Table 5-20 shows with additional mitigation, the magnitude of impact at the Hills Road area receptors (AstraZeneca Academy House and The Belvedere) may be reduced to moderate impact and a Moderate or Large Adverse and **Significant** effect.

*Station Area*

5.6.11

5.6.12

5.6.13

5.6.14 Table 5-20 shows with additional mitigation, all predicted major impacts may be reduced to moderate impacts. Moderate impacts and Moderate or Large Adverse and **Significant** effects are predicted at NML 2, NML 3, NML 4 and NML 6.

5.6.15 Negligible to Minor impacts, and Slight Adverse and **Not Significant** effects are predicted at NML 5, NML 8 and AstraZeneca site with additional mitigation set out in Section 5.5.

*Shepreth Branch Junction*

5.6.16 **Not significant** effects are predicted at receptors as a result of construction noise at Shepreth Branch Junction with the additional mitigation set out in Section 5.5.

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Table 5-21 Residual effects from construction – night-time

Receptors	Construction area	Measured ambient noise level dBA	Construction noise threshold value dBA	Predicted construction noise façade levels dBA	Magnitude of Impact
NML 1	Shepreth Branch Junction	54	55	46	Negligible
NML 2*	Station Area	58	58	27	Negligible
NML 3	Station Area	58	58	50	Negligible
NML 4	Station Area	58	58	53	Negligible
NML 5**	Station Area	54	54	43	Negligible
NML 6	Station Area	54	55	63	Major
NML 8**	Station Area	54	54	44	Negligible
NML 9	Shepreth Branch Junction	46	55	51	Minor
NML 10	Shepreth Branch Junction	50	55	51	Minor
NML 11	Shepreth Branch Junction	55	55	41	Negligible
AstraZeneca Academy House	Hills Road	58	58	68	Major
The Belvedere	Hills Road	58	55	68	Major
AstraZeneca site	Station Area	58	58	63	Major
Properties on Abberley Wood Road	Shepreth Branch Junction	50	55	53	Minor
25 Davey Close	Shepreth Branch Junction	50	55	51	Minor

\*Assumed to be similar to NML 3

\*\*Assumed to be similar to NML 6

**Hills Road Area**

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- 5.6.17 Major impacts, and Large to Very Large Adverse and **Significant** effects are predicted at receptors AstraZeneca Academy House and the Belvedere with additional mitigation set out in Section 5.5 due to night-time works. Night-time works at Hills Road are scheduled for 2-3 days at a time. Therefore, the significant effects are based on a 'worst-case' and are short-term and temporary in nature.

*Station Area*

- 5.6.18 Major impacts and Large to Very Large Adverse and **Significant** effects are predicted at NML 6 and AstraZeneca site with additional mitigation set out in Section 5.5 due to night-time works. As previously stated, night-time works are scheduled for no more than 8 days at a time. Therefore, the effects are based on a 'worst-case' and are short-term and temporary in nature.
- 5.6.19 All other Station Area receptors are predicted to experience negligible to minor and Slight Adverse and **Not Significant** effects due to night-time works.

*Shepreth Branch Junction*

- 5.6.20 Negligible to minor impacts and Slight Adverse and **Not Significant** effects are predicted at all other Shepreth Branch Junction receptors during night-time works with the additional mitigation set out in Section 5.5.
- 5.6.21 Where significant residual effects are predicted, specific construction tasks would be considered. For specific construction tasks that are identified in the CoCP Part B as likely to result in significantly increased noise levels, consideration will also be given to applying for Section 61 Consent.

**Residual Effects from Operation**

- 5.6.22 All effects remain as reported in the Assessment of Effects section of this chapter.

**Cumulative Effects****Inter-Project Effects**

- 5.6.23 Cumulative schemes are detailed in Chapter 2 Appendix 2.3. For the purpose of the assessment, the schemes detailed in Table 5-22 as all other cumulative schemes are considered too distant to have an in-combination effect on a receptor.
- 5.6.24
- 5.6.25 Table 5-22 provides a summary of the likelihood for cumulative construction noise effects to arise from the proposed Development with the remaining cumulative schemes. Ambient noise levels in the future scenario with cumulative schemes is presented in Appendix 5.1.

*Table 5-22 Inter-project construction noise effects*

Committed Schemes ID	Construction		Completed Development Operational	
	Cumulative Effects Likely	Reason	Cumulative Effects Likely*	Reason
1	No	No overlap with construction works.	No	These are not noise generating uses (mostly residential / laboratories) so not considered likely to increase
2	Yes	Construction works may overlap with the proposed Development construction works (construction period not currently known). Due to proximity of the proposed	No	

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Committed Schemes ID	Construction		Completed Development Operational	
	Cumulative Effects Likely	Reason	Cumulative Effects Likely*	Reason
		Development, construction noise from this development may increase overall construction noise levels. It is expected that BPM, CoCP Part B and additional mitigation would be utilised for CSET to minimise construction noise levels.		noise climate in totality.
3	No	No overlap with construction works.	No	
5 / 39 / 45	No	No overlap with construction works.	No	
7	No	No overlap with construction works.	No	
8	No	No overlap with construction works.	No	
9	No	No overlap with construction works.	No	
10	No	No cumulative effects anticipated due to the distance from the proposed Development.	No	
16	Yes	Construction works may overlap with the proposed Development construction works (construction period not currently known). Due to proximity of the proposed Development, construction noise from this development may increase overall construction noise levels. It is expected that BPM, CoCP Part B and additional mitigation would be utilised for CSET to minimise construction noise levels.	No	
29	Yes		No	
32	Yes		No	
46	No	No cumulative effects anticipated due to the distance from the proposed Development.	No	

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Committed Schemes ID	Construction		Completed Development Operational	
	Cumulative Effects Likely	Reason	Cumulative Effects Likely*	Reason
CSET scheme (37)	Yes	Construction works are to overlap with proposed Development construction works during 2023-2025. Due to proximity of the proposed Development, construction noise from CSET may increase overall construction noise levels. It is expected that BPM, CoCP Part B and additional mitigation would be utilised for CSET to minimise construction noise levels.	Yes	Increased bus movements as a result of the CSET scheme

5.6.26 When the proposed Development is operational the ambient noise levels from rail and road combined, with the cumulative schemes are presented in Table 5-23. This includes the CSET busway with 164 movements on the Francis Crick Avenue, Dame Mary Archer Way, the existing guided busway crossing and the new route from the south of the proposed Development towards Trumpington. This shows that although the proposed Development does not lead to a significant increase in noise levels, the cumulative schemes (CSET) will result in approximately 5dB change at the majority of receptors.

Table 5-23 Predicted cumulative noise levels from all contributing sources at noise-monitoring locations

Measurement Location	Baseline (2019)		Future baseline (2031)		Future with development		Completed Development + Cumulative	
	Day	Night	Day	Night	Day	Night	Day	Night
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
NML 1	57.0	54.4	57.2	54.8	56.9	54.9	60.8	59.1
NML 2	61.9	59.0	62.1	59.4	61.5	59.4	65.6	63.6
NML 3	60.0	56.9	60	57.1	58.5	56.8	61.8	59.0
NML 4	61.9	55.6	61.9	55.7	60.3	55.7	64.2	58.6
NML 5	47.9	47.4	48.2	47.7	48.0	47.7	51.7	51.4
NML 6	56.6	52.1	56.7	52.4	56.1	52.7	59.3	55.3
NML 8	61.3	61.3	61.8	61.8	61.6	61.6	66.3	66.3
NML 9	53.4	51.7	53.6	52.0	53.5	52.1	57.5	56.3
NML 10	51.5	50.2	51.5	50.2	51.5	50.3	55.5	54.8

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NML 11	59.6	59.5	59.6	59.5	59.6	59.5	64.3	64.3
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## 5.7 Assessment Summary

5.7.1 Table 5-24 provides assessment summary with respect to construction and operational noise impacts of the proposed Development and how they have been addressed.

Table 5-24 Assessment Summary

Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
All receptors	Construction traffic	Construction	N/A	<b>Not Significant</b>
AstraZeneca Academy House, The Belvedere, NML 2, NML 3, NML 4, NML 6	Construction noise	Construction	BPM, CoCP Part B and additional measures such as mufflers for breakers and localised temporary screening	<b>Significant</b>
NML 1, NML 2, NML 5, NML 8, AstraZeneca Site, NML 9, NML 10, NML 11, 25 Davey Close, Properties on Abberley Wood Road	Construction noise	Construction	BPM, CoCP Part B and additional measures such as mufflers for breakers and localised temporary screening	<b>Not Significant</b>
All receptors	Traffic noise	Operational	N/A	<b>Not Significant</b>
All receptors	Train noise	Operational	N/A	<b>Not Significant</b>
All receptors	Plant noise	Operational	Suitable plant selection and attenuation measures during detailed design, secured by a suitably worded planning condition	<b>Not Significant</b>
All receptors	PAVA noise	Operational	Appropriate design	<b>Not Significant</b>

5.7.2 Construction noise is considered to have significant effects on the AstraZeneca Academy House, The Belvedere, NML 2, NML 3, NML 4 and NML 6 receptors.

5.7.3 Where significant effects have been identified as likely to occur these can be managed to acceptable levels through the adoption of BPM, other mitigating construction methods and the implementation of a noise monitoring regime as described in Section 5.5 and detailed in the CoCP Part B. The monitoring regime would provide an amber early warning alert to designated stakeholders and construction personnel for circumstances in which noise levels



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approached the permitted threshold limits. This would enable construction work to be reviewed and adapted as necessary to remain within permitted limits to be set out in the CoCP Part B. Noise monitoring will be shared with the EHO/LA on a regular basis which is to be agreed, and within 24 hours following a complaint received either directly or via the EHO/LA.

- 5.7.4 For specific construction tasks that are identified in the CoCP Part B as likely to result in significantly increased noise levels consideration will also be given to applying for Section 61 Consent.
- 5.7.5 No significant effects due to construction noise are predicted at any other NSRs detailed in section 5.2 (Methodology for Establishing Baseline Conditions).
- 5.7.6 All operational noise is considered to have no significant effects.

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## 5.8 References

Reference	Title
Ref 5.1	The Transport and Works (Applications and Objections procedure) (England and Wales) Rules 2006 as amended, particularly by The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 [SI 2017 No. 1070] <a href="https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made">https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made</a>
Ref 5.2	Control of Pollution Act, 1974. HMSO.
Ref 5.3	Environmental Protection Act, 1990.
Ref 5.4	Noise Insulation Regulations, 1975.
Ref 5.5	Noise Insulation (Railways and Other Guided Transport Systems) Regulations, 1996.
Ref 5.6	Department of Environment, Food and Rural Affairs, 2010. Noise Policy Statement for England.
Ref 5.7	Cambridge City Council, 2018. Cambridge Local Plan Policy 35: Protection of Human Health and Quality of Life from Noise and Vibration, CCC.
Ref 5.8	South Cambridgeshire District Council, 2010. District Design Guide Supplementary Design Guide Appendix 6: Noise: Supplementary Design Guide, SCDC.
Ref. 5.9	South Cambridgeshire District Council, 2018. Local Plan Policy HQ/1: Design Principles, SCDC.
Ref 5.10	British Standards Institution, 2014. British Standard 4142:2014+ A1 2019 Method for Rating and Assessing Industrial and Commercial Sound. BSI.
Ref 5.11	British Standards Institution, 2014. British Standard 5228: 2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites, BSI.
Ref 5.12	British Standards Institution, 2003&1991. British Standard 7445-1&-2 Description and Measurement of Environmental Noise, BSI.
Ref 5.13	British Standards Institution, 2014. British Standard 8233+ A1 2019 2014 Guidance on sound insulation and noise reduction for buildings, BSI.
Ref 5.14	Department of Transport, 1988. Calculation of Railway Noise, DoT.
Ref 5.15	Department of Transport and the Welsh Office, 1988. Calculation of Road Traffic Noise, DoT & Welsh Office.
Ref 5.16	Highways England Sustainability & Environment Appraisal, 2020 Design Manual for Roads and Bridges LA 111 Noise and Vibration, Highway England Sustainability & Environmental Appraisal.
Ref 5.17	Network Rail, 2009. NR-L2-TEL-30134-PAVA Design and Installation Requirements for Public Announcement, Voice Alarm and Long Line Public Announcement Systems, NR.
Ref 5.18	Network Rail, 2019. NR/L2/ENV/121 ISSUE 1 Managing Environmental and Social Impact of Noise and Vibration, NR.
Ref 5.19	World Health Organisation. 1999. Guidelines for Community Noise. Geneva. WHO.

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Reference	Title
Ref 5.20	World Health Organisation. 2009. Night Noise Guidelines for Europe. Geneva. WHO.
Ref 5.21	World Health Organisation. 2018. Environmental Noise Guidelines for the European Region. Geneva. WHO.
Ref 5.22	Ministry of Housing, Communities & Local Government. 2019. Planning Practice Guidance: Noise, MHCLG.

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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 6 – Acoustics Assessment Part 2 - Vibration**

JUNE 2021

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## **APPENDICES**

Appendix 6.1 Baseline Vibration Surveys

Appendix 6.2 Construction Phase Impact Assessment

Appendix 6.3 Operational Phase Impact Assessment



## 6 Acoustics Assessment Part 2 - Vibration

### 6.1 Introduction

- 6.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to vibration. In this chapter, the term “vibration” is used to describe small oscillations (or movements) occurring as part of the ambient environment conditions. The chapter includes a summary of relevant consultation to date, baseline conditions and the findings of the impact assessments. The assessment incorporates relevant design and other mitigation measures that would be employed during construction and operation of the proposed Development.

### Relevant Aspects of the Proposed Development

- 6.1.2 A description of the proposed Development is provided in Chapter 4 of the ES. Specific aspects of the proposed Development that are relevant to the topic of vibration are detailed in the subsequent sections.

### Construction Phase

- 6.1.3 Construction works are proposed to form the new station building, new track and signalling configuration and infrastructure supporting these. The close proximity of these works to the scientific research and healthcare buildings on the Cambridge Biomedical Campus (CBC) in particular, requires the impacts from these works to be assessed.
- 6.1.4 It is noted that the CBC has been the subject of ongoing and significant construction works for many years, as the campus has expanded. Significant construction works, in this location, are therefore not unusual.
- 6.1.5 It is considered that the nearby healthcare and scientific research buildings on the CBC are the most sensitive receptors for the purposes of assessing vibration effects. Residential and other properties located further away from the site of the proposed Development are less sensitive, in assessment terms, but are nevertheless considered in this chapter. The proposed construction works at Shepreth Branch Junction are less significant in terms of vibration effects. However, piling works to be undertaken to move the position of the overhead line equipment have been considered in the assessment.
- 6.1.6 Track works on the existing operational railway line to the north in the area near Hills Road bridge are minor and are not included in the scope of this vibration assessment.

### Operational Phase

- 6.1.7 The predominant operational changes proposed are relating to the new station area where the two-line track will be replaced with a four-platform station served by two main line tracks and two loop tracks.
- 6.1.8 The permissible speed on the main line tracks will not change from the current 90mph with the main difference being the introduction of switches and crossings on the line to serve the loop tracks. Switches are the movable sections of track that allow trains to move from one line to another. Crossings are the track elements where the rails intersect and the train wheels need to cross through a discontinuity in the rail.
- 6.1.9 The addition of the loop tracks results in the chance of four trains being present at any one time. However, it is not possible for more than two trains to be travelling at a time as the loop tracks are too short to allow for this. The loop track speed limit would be 60mph.
- 6.1.10 For the CBC receptors the principal assessment is therefore the vibration that would be caused by trains passing over new switches and crossings.
- 6.1.11 The operational changes proposed at the Shepreth Branch Junction could also result in vibration impacts. The changes include an increase in the current linespeed from zones of 30mph and 40mph to 50mph through the whole junction for trains travelling to and from Royston.

- 6.1.12 An assessment of the vibration effect of this line speed increase on the nearby residential receptors is carried out based on baseline vibration measurements of the impact of the existing track with its current line speed, corrected for the increase in speed.

## 6.2 Assessment Methodology

### Legislation, Policy and Guidance

#### Legislation

- 6.2.1 The following legislation is relevant to the assessment of vibration effects and will inform the assessment as appropriate:
- The Control of Pollution Act 1974 (Ref 6.1), which was introduced to regulate a wide range of polluting activities, including noise and vibration. Parts of the Act have since been superseded by the Environmental Protection Act 1990 (Ref 6.2)
  - The Environmental Protection Act 1990 (EPA 1990) (Ref 6.2)

#### Policy

- 6.2.2 The following policy has been considered in the assessment of vibration:
- Local Policy: Cambridge City Council (CCiC) Cambridge Local Plan (October 2018) Policy 35: Protection of human health and quality of life from noise and vibration (Ref 6.3)
  - Local Policy: South Cambridgeshire District Council (SCDC) District Design Guide Supplementary Design Guide (SPD) 2010 Appendix 6: Noise: Supplementary Design Guide (Ref 6.4)

#### Guidance

- 6.2.3 The following National Standards and Guidance have been considered in the assessment:
- BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration (Ref 6.5)
  - ISO 14837-1:2005 Mechanical vibration - Ground-borne noise and vibration arising from rail systems - Part 1: General guidance (Ref 6.6)
  - US Federal Transit Administration Report No. 0123 - Transit Noise and Vibration Impact Assessment Manual (2018) (Ref 6.7)
  - Health Technical Memorandum 08-01: Acoustics (2013) (Ref 6.8)
  - ISO/TS 10811 Mechanical vibration and shock - Vibration and shock in buildings with sensitive equipment - Part 2: Classification (Ref 6.9)
  - Measurement and Assessment of Groundborne Noise and Vibration (Red Book), Association of Noise Consultants, 3rd edition, March 2020 (Ref 6.10)
  - BS ISO 4866:2010 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures (Ref 6.11)
  - BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting (Ref 6.12)
- 6.2.4 The highly specific nature of the scientific work being undertaken in some of the nearby buildings means that a bespoke assessment process and assessment criteria has been established on which to measure the impact of the design proposals. This is because the above standards do not provide guidance on the acceptability limits for scientific equipment.
- 6.2.5 The Vibration Criteria (VC) curves have been used as the basis for the assessment as defined in ISO/TS 10811, part 2 Mechanical vibration and shock - Vibration and shock in buildings with sensitive equipment - Part 2: Classification. (Ref 6.9).

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## Consultation and Scoping

### Consultation

- 6.2.6 In addition to the wider consultation associated with the proposed Development, specific consultation with respect to vibration impacts has been carried out. This consultation has focussed mainly on the vibration-sensitive buildings on the CBC, which have more onerous requirements in relation to vibration than other potential receptors located further away from the site of the proposed Development, e.g. residential receptors.
- 6.2.7 Table 6-1 provides a summary of Consultee issues raised with respect to vibration and how they have been addressed.

Table 6-1 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Cambridge City Council EHO/ Adam Finch/ 16/10/20	In agreement with proposed baseline locations proposed and need to liaise with CBC building users to agree the sensitivity requirements	No action for baselines  Consultation with CBC building users carried out as set out below
South Cambridgeshire District Council EHO/ Nick Atkins/ 19/10/20	Review of proposed baseline locations for SCDC area. If Shepreth Branch Junction impacts require it, a baseline monitoring location near Davey Crescent/ Granham's Close should be added	A baseline monitoring location for Granham's Close was included and this formed part of the assessment of the construction and operational impact of the proposed Development
MRC Laboratory of Molecular Biology/ Stephen Holmes/ 15/01/21 23/03/21	Vibration baseline locations close to electron microscope suite (to east of building) and a general lab space to the west would be acceptable.  Equipment sensitivity requirements set out for use in the impact assessment  Would like to be updated on the baseline measurements and assessments to agree results and requirements for mitigation	Baseline locations refined to align with requirements.  Vibration sensitivity requirements used in the assessment  Presentation of findings of impact assessment to Steve Holmes on 23/3/21. The need for mitigation of operational impacts was agreed but that this would need to be finalised based on the detailed design phase.
University of Cambridge Anne McLaren Building/ Deborah Griffith/ 16/02/2021	Proposed baseline monitoring location, equipment sensitivity requirements advised	Due to operational restrictions it was not possible to take measurements in the building. Permission was granted to use previous data collected during the commissioning of the building for the assessment. The building sensitivity was also confirmed by the building users.
Royal Papworth Hospital/ Adam Olivant/ 25/02/2021	Proposed baseline monitoring location, equipment sensitivity requirements	Baseline location refined to align with requirements  Equipment vibration sensitivity requirements incorporated into the assessment

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
AstraZeneca R&D Centre/ Andrew Smith/ 10/02/2021	Proposed baseline monitoring location, equipment sensitivity requirements	Baseline location refined to align with requirements  Equipment vibration sensitivity requirements incorporated into the assessment
Abcam building/ Graham Flack/ 04/02/2021	Proposed baseline monitoring location, equipment sensitivity requirements	Baseline location refined to align with requirements  Equipment vibration sensitivity requirements incorporated into the assessment
Cancer Research UK building/ Colin Weir/ 29/01/2021	Proposed baseline monitoring location, equipment sensitivity requirements	Baseline locations refined to align with requirements.  Equipment vibration sensitivity requirements incorporated into the assessment
University of Cambridge Anne McLaren Building/ Deborah Griffith/ 07/05/2021	Summary of results from assessment for Anne McLaren Building provided via email.	Not applicable
AstraZeneca R&D Centre/ Andrew Smith/ 07/05/2021	Summary of results from assessment for AstraZeneca R&D Centre provided to AZ via email. Confirmation from AZ of no comments received 10/5/21	No Action

## Scoping

6.2.8 Table 6-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to vibration, and the corresponding location in the ES where those responses are addressed.

Table 6-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Department of Transport, Natasha Kopala	In the Environment Statement any values selected for the Lowest Observed Adverse Effect Levels and the Significant Observed Adverse Effect Levels should be clearly justified	Table 6-8 contains the LOAEL and SOAEL values for the impact assessment for both construction and operational and phases. The justification for the selection is included in the supporting text to the table.
Department of Transport, Natasha Kopala	The DfT scoping opinion in relation to the proposed Development (Chapter 3) sets out the following points in relation to vibration effects:  Consideration should be given to widening the scope of the Code of Construction Practice to include:  • a construction vibration management plan;	This comment is relevant to this chapter as it relates to construction vibration but is not covered by it.  The CoCP Part B will cover these proposed aspects when the level of detail is available prior to construction

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Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
	<ul style="list-style-type: none"> <li>proposals for real-time noise and vibration monitoring during the construction programme when in close proximity to sensitive receptors; and</li> <li>details of noise / vibration / lighting complaint handling, complaint investigation and complaint resolution.</li> </ul>	
Greater Cambridge Shared Planning, Charlotte Burton	<p>The GCSP response to the scoping opinion sets out the following points:</p> <p>With regards to vibration, Section 12.2.3 of the Report states that “Further consultation with CCC and CBC is likely in order to agree operationally acceptable vibration limits and to ensure that stakeholders are engaged in any required mitigation proposals.” This is welcomed and we acknowledge that the commercial / research premises at CBC is likely to require a bespoke methodology for the vibration assessment. This will need to be agreed in consultation with the LPA and stakeholders at CBC.</p>	<p>Refer to consultation process in Table 6-1 for consultations with CBC stakeholders to agree sensitivity requirements and consultation on mitigation proposals.</p> <p>Bespoke methodology set out in Appendix 6.3</p>

## The Study Area

6.2.9 A site boundary plan for the proposed Development is shown in Figure 4.1 of Appendix 4.1.

### Construction Vibration

- 6.2.10 In the same way as operational vibration, construction vibration is more focussed around the new station area. The same receptors will therefore be considered for construction vibration impacts.
- 6.2.11 In addition, a potential impact relating to construction vibration has been identified at Shepreth Branch Junction, due to the presence of piling works. The closest residential receptors will therefore be assessed. Should an adverse impact be identified for these receptors, the extent of the assessment will be widened to determine the zone of adverse impact.
- 6.2.12 The construction works for minor alterations to the track to the north of the station area near to the Hills Road bridge are considered minimal and/or short lived and no worse than the current operational railway from a vibration point of view and are not therefore assessed further.

### Operational Vibration

- 6.2.13 As set out in the ‘Relevant Aspects of the Proposed Development’ section (section 02), the operational changes that could lead to significant vibration impacts are close to the new station area and the line speed changes close to the Shepreth Branch Junction hence the study area for operational vibration is limited to these zones.
- 6.2.14 The identified receptors are the highly sensitive scientific and healthcare buildings adjacent to the railway line near to the station area. The vibration requirements within these buildings are below the threshold of human perception and hence assessing the impact on these buildings is more onerous than other receptors located further away.
- 6.2.15 The closest residential receptors to the proposed Development have also been included in the assessment for the new station area, as well as the residential receptors located close to Shepreth Branch Junction.

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## Methodology for Establishing Baseline Conditions

6.2.16 Baseline vibration surveys have been carried out at a number of locations across the site. The measurements have been carried out in accordance with BS ISO 4866:2010 (Ref 6.11).

6.2.17 Table sets out baseline locations measured.

6.2.18 A map view with the baseline locations annotated is shown in Figure 6-2 of Appendix 6.1.

Table 6-3 Vibration baseline measurement locations (see **Error! Reference source not found.** of Appendix 6.1 for location reference)

Receptor	Locations	Location reference
MRC Laboratory of Molecular Biology	2 locations on ground floor	VML1A in the north-east wing in the most sensitive location and furthest from the railway VML1B in the south-west wing closest to the railway
University of Cambridge Anne McLaren Building	1 location on ground floor and 1 location on second floor	VML2A on ground floor VML2B on second floor
Abcam building	1 location on ground floor	VML3
AstraZeneca R&D Centre	1 location in the basement	VML4
Cancer Research UK building	1 location in the basement and 1 location on ground floor	VML5A in the basement VML5B on ground floor
Royal Papworth Hospital	1 location within building	VML6
Hobson's Park Residences	1 location external to buildings	VML7
Sedley Taylor Road Residences	1 location external to buildings	VML8
Granham's Close, Davey Crescent, Abberley Woods Residences	1 location external to buildings on Granham's Close	VML9

6.2.19 The baseline locations are as per the scoping document and as agreed with the Cambridge City Council and South Cambridgeshire District Council Environmental Health Officers with the exception of the following:

- At scoping stage, it was not expected that a baseline location within the Astrazeneca buildings would be viable due to the building being constructed. Following consultation with Astrazeneca a suitable location was agreed and a baseline location added.
- Two baseline locations within Royal Papworth Hospital were proposed. Operational limitations prevented two locations being viable and only one was carried out but in a location representative for the assessment.
- An additional baseline location was added at Granham's Close to give information for the residential properties near to Shepreth Branch Junction.

6.2.20 Baseline locations in the Heart and Lung Research Institute building that is under construction were not possible as set out in the scoping report. The vibration sensitivity of this facility being similar to surrounding buildings that are closer to the railway for which baseline data has been measured means baseline data is not required.

6.2.21 No new measurements were taken in the Anne McLaren Building because of operational restrictions for the building. However, the building stakeholders granted permission to use



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previous data collected by Ramboll in December 2017 during the commissioning stage of the building.

- 6.2.22 For the residential receptors close to the Shepreth Branch Junction works only one baseline location was assessed to be required. The location on Granham's Close provides a measurement point as close to the railway as any of the residential receptors. This provides information that can be applied to all the other residential receptors of relevance based on the line speed and track type remaining constant. Where the line speed changes to 40mph the effect of this is taken into account in the vibration predictions and an additional baseline location is not required.

### Forecasting the Future Baseline

- 6.2.23 In the study area there is not expected to be a significant change in vibration sensitive receptors during the construction period. The AstraZeneca buildings and Heart and Lung Research Institute are likely to be operational in that period, but these are unlikely to alter the existing baseline conditions except for potentially more road traffic being present, although this is offset by the current construction traffic present.
- 6.2.24 The baseline measurement locations are also set away from current construction works at these buildings. The change from a construction phase to an operational phase for these buildings is not therefore expected to be significant in the baseline measurement locations.
- 6.2.25 During the operational phase of the proposed Development, more development at CBC is planned albeit further from the railway and station area, so is not therefore considered likely to affect the current measured baseline.
- 6.2.26 One potentially significant aspect is that the baseline measurements were undertaken during a period of national lockdown for Covid-19. This resulted in the surrounding infrastructure being significantly quieter than normal. It is expected therefore that the 'normal' baseline levels would be higher than that measured because there would be more road traffic. However, during the baseline measurement period the train timetable was operating near to its normal frequency and since individual train pass-bys have been used as the basis for the assessment, the difference is unlikely to be significant. The effect of the proposed Development on the vibration levels from the railway can be assessed reliably from the baseline measurements undertaken. Higher background levels from other existing vibration sources would either be lower than that predicted from the railway and have no effect on the conclusions or, if higher, would lessen the assessed impact as it is already being experienced. In either case the assessment undertaken is considered to be conservative.

### Defining the Importance/Sensitivity of Receptors

- 6.2.27 The relative sensitivity of potential receptors within the study area are shown in Table 6-4. The sensitivity has been determined following professional best practice and published guidance as set out in paragraphs 6.3.27 to 6.3.33.

Table 6-4: Sensitivity of receptors

Sensitivity of Receptor	Receptor	Receptors in Assessment
Negligible	Waste facilities, transport hubs (i.e. rail stations)	
Low	Industrial, factories, distribution depots	
Medium	Office, commercial, church/chapel (places of worship and other faith centres), healthcare, listed structures, schools and residential locations,	All residential receptors considered

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Sensitivity of Receptor	Receptor	Receptors in Assessment
High	Hospitals and General Laboratory spaces, Sensitive Laboratory and Research Imaging	All CBC receptors considered including Royal Papworth Hospital

- 6.2.28 The sensitivity of school and residential locations is set out in BS5228-2 (Ref 6.5) and relate to human perception.
- 6.2.29 The requirements for hospitals are contained within HTM08-01 (Ref 6.8) and vary dependent on the type of space being considered. Consultation with Royal Papworth Hospital has been undertaken to identify the most sensitive spaces within the building and their corresponding vibration criteria.
- 6.2.30 The sensitivity of laboratory spaces is more variable and dependent on the type of work being undertaken. For this reason, consultation with each of the receptors' facilities management teams has been undertaken to determine their sensitivity, as set out in the following sections.
- 6.2.31 The sensitivity has been agreed based on the generic Vibration Criteria (VC) which are expressed as root-mean-squared (RMS) velocity in one-third octave frequency bands. The vibration criteria range from VC-A to VC-E with A being the least onerous albeit still half the level of human perception. Table 6-5 contains the VC curves and their corresponding vibration levels. The vibration level corresponding to VC-E is 16 times lower than that for VC-A, i.e. VC-E is more onerous than VC-A (each band has half the allowable vibration of the previous).

Table 6-5: Vibration Criteria (VC) curves and corresponding vibration levels

VC curve	RMS Velocity, micro-m/s
VC-A	50
VC-B	25
VC-C	12.5
VC-D	6.25
VC-E	3.125

- 6.2.32 The identified vibration criteria requirements have been validated through baseline vibration testing to establish the current vibration levels. The higher of the measured vibration levels or assessed criteria will be used as the reference for the impact assessment.
- 6.2.33 Defined averaging times are not set out in any standards for the VC levels. Whether the building is sensitive to short term vibration levels (e.g. during a train pass-by) compared to the average vibration levels over a longer period of time depends on the equipment itself and its tolerance to short term vibration levels being higher. As a conservative approach, the VC levels are compared to the highest short-term vibration levels predicted unless noted otherwise in this section. This means the vibration levels presented will be the highest expected during train pass-bys as set out in the assumptions.
- 6.2.34 The results of the consultation undertaken with each of the sensitive receptors, where bespoke criteria are required, are included in the following sections.

## MRC-LMB

- 6.2.35 The MRC LMB is a large research laboratory which moved to its current site in 2013 and was designed to accommodate the impact of the existing railway at that time.
- 6.2.36 The most-sensitive areas are required to achieve VC-E but with short term events of VC-D.



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6.2.37 The requirements of the general laboratory spaces vary with the upper floors needing to achieve VC-A and ground floor spaces VC-B.

**Anne McLaren Building, University of Cambridge**

6.2.38 The Anne McLaren building was completed in 2018 and houses sensitive laboratory spaces and specialist imaging equipment. It was designed to accommodate the impact of the existing railway at that time.

6.2.39 The general building requirements are VC-A.

6.2.40 The south western area of the building at ground floor level requires VC-C to be achieved.

**AstraZeneca Buildings**

6.2.41 The AstraZeneca buildings comprise a R&D centre adjacent to the Royal Papworth Hospital and support buildings nearer the railway. Planning approval has been granted for a transport hub and office building adjacent to the railway.

6.2.42 AstraZeneca have advised that the only sensitive equipment within the R&D building they are concerned with is a potential electron microscope in the basement. There are no defined criteria for the proposed equipment and a sensitivity of VC-D for short term events could be assigned, similar to the LMB, although this is not an absolute requirement. However, the existing baseline levels measured levels up to VC-C and hence this is used as the comparison within this assessment.

**Abcam Building**

6.2.43 The vibration requirement within the Abcam building is VC-A.

**Royal Papworth Hospital**

6.2.44 The vibration requirements for Royal Papworth Hospital have been based on the requirements of HTM 08-01 and are governed by the medical imaging at ground floor the location of which has been based on the site plans available on the hospital website.

6.2.45 Cancer Research UKThe Cancer Research UK building includes a basement level where vibration-sensitive research is carried out which requires a vibration level of VC-A.

6.2.46 The vibration requirement for laboratory spaces on suspended slabs is typically in the region of VC-A to ISO-1 (or twice VC-A). This has been assumed for the upper floors of the building.

**Methodology for Assessing Impacts****Impact Characterisation**

6.2.47 Vibration-sensitive receptors and the proposed assessment methodology are set out in Table 6-66 below. See Figure 6-4 in Appendix 6-1 for Vibration impact assessment measurement locations.

*Table 6-6 Vibration-sensitive receptors identified, potential vibration sources and assessment methodology*

Phase	Source	Receptor	Assessment methodology
Construction	Station construction site	CBC scientific receptors (see operational)	BS5228, Bespoke

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		Residential	BS5228
	Shepreth Branch Junction satellite compound	Residential	BS5228
	Eastern construction compound	CBC – Abcam building	BS5228, Bespoke
	Shepreth Branch Junction line speed improvements New station and track changes	Residential	ISO 14837-1
Operational	New station and track adjacent to CBC	CBC – MRC Laboratory of Molecular Biology	ISO 14837-1, Bespoke criteria Bespoke assessment
		CBC- UoC Anne McLaren building	
		CBC – AstraZeneca R&D centre	
		CBC – Cancer Research UK	
		CBC – Abcam building	
		CBC – Royal Papworth Hospital	

- 6.2.48 Two methodologies have been applied to determine the new vibration levels. The first has been to use the documents set out in the Relevant National Standards and Guidance section which typically use empirical relationships to establish changes in the vibration source levels. The second has been to measure vibration levels from the existing switches and crossings at Shepreth Branch Junction and to compare these to the plain line track (i.e. with no switches and crossings) 500m north allowing for each train type and speed. These are the closest switches and crossings on similar ground conditions and give example data.
- 6.2.49 The baseline vibration data has been used to correlate current railway vibration sources with vibration levels measured within the sensitive receptors for the same events. This has enabled a vibration pathway transfer function to be assessed for each receptor.
- 6.2.50 The impact of the new vibration sources has been assessed at the receptors considering the vibration pathway transfer function, resulting in a prediction of the unmitigated vibration levels at the receptors for comparison with the criterion for each receptor set out in the Importance/Sensitivity section.
- 6.2.51 Where predicted vibration levels were greater than the established criteria, mitigation options have been considered.

### Assessing Significance

- 6.2.52 The assessment of vibration considers the potential significant vibration effects that could arise from the construction and operation of the proposed Development on the identified receptors.
- 6.2.53 Vibrations occur as part of the ambient environment conditions. The level of vibration, and the nature of it - whether transient or continuous - is dependent on the source of vibration.
- 6.2.54 The vibration receptors identified in this assessment are already subjected to varying levels of vibration in the existing baseline conditions, depending on their locations relative to nearby vibration sources, including the existing railway track. This assessment considers the likely

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changes in the vibration climate due to the introduction of the proposed Development, i.e. the impacts on the receptors due to the proposed Development.

6.2.55 The impacts are classed into the following two categories:

- Impact on operation of sensitive equipment and processes in the buildings; and
- Impact on building occupants and users.

6.2.56 The impact is assessed and classed into five categories as shown in Table 7, ranging from 'no change to current' to 'major' impact based on the level of change in the vibration climate that the proposed Development is likely to introduce. The change is expressed in terms of number of VC bands (i.e. the factor of change in vibration level), for example, a change of one VC band means a doubling of the vibration level, one-half VC band is an increase of 50%. The change is measured relative to the vibration criteria of the building or the baseline vibration level, if the measured baseline vibration levels are higher than the criteria.

Table 6-7: Vibration impact criteria for vibration-sensitive contents in the building

Impact classification	For sensitive equipment and processes in the building when measured relative to the existing vibration levels	
	Number of VC bands change for transient events <sup>1</sup>	Number of VC bands change for long-term averages <sup>2</sup>
No change	No change to current	No change to current
Negligible	<0.5	No change to current
Minor	0.5-1	<0.5
Moderate	1-2	0.5-1
Major	>2	>1

6.2.57 For building occupants and users, these categories are based on standard vibration dose value (VDV) limits that define the likelihood of adverse effect on those subjected to such levels of vibration. Table outlines the four categories of impact for building occupants and users based on the VDV limits for residential properties.

6.2.58 The Lowest Observable Adverse Effect Level (LOAEL) and Significant Observable Adverse Effect Level (SOAEL) are included in the table for reference. These values have been chosen based on recommendations in the ANC Red book (Ref 6.10) which is industry best practice for establishing the effect of vibration on humans. The SOAEL and LOAEL approach is only relevant to human receptors and does not therefore apply to Table 6-7.

Table 6-8: VDV Vibration impact criteria for occupants and building users measured relative to existing baseline conditions

Impact classification	For human perception when measured relative to the existing levels of vibration		Comment
	VDV m/s <sup>1.75</sup> Daytime (0700 - 2300)	VDV m/s <sup>1.75</sup> Night-time (2300-0700)	
No change	No change to current	No change to current	

<sup>1</sup> Transient events occurring over relatively short period, measured typically over a 1second period

<sup>2</sup> Long-term averages typically measured over a period of 1 hour

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Impact classification	For human perception when measured relative to the existing levels of vibration		Comment
	VDV m/s <sup>1.75</sup> Daytime (0700 - 2300)	VDV m/s <sup>1.75</sup> Night-time (2300-0700)	
Negligible	<0.2	<0.1	
Minor	>0.2-0.4	>0.1-0.2	LOAEL
Moderate	>0.4-0.8	>0.2-0.4	SOAEL
Major	>0.8	>0.4	

6.2.59 For construction vibration, Peak Particle Velocity (PPV) is used as specified in BS5228-2 (Ref 6.5). The impact classification based on this metric is given in Table 6-9. The PPV levels associated with the impact classification take account of the enhanced sensitivity of the scientific receptors and have been set lower than would be applied just for human perception.

6.2.60 However, to assess the significance of the impact for human perception and with consideration to the duration of construction activities the PPV has been converted to the VDV metric using an empirical relationship given in the ANC Red Book (Ref 6.10).

6.2.61 The impact classification based on the VDV metric in Table 6-8 is used for assessing the construction phase impacts, with the LOAEL and SOAEL as defined in Table 6-8 therein.

Table 6-9: PPV Vibration impact criteria for occupants and building users in relation to construction vibration

Impact classification	For human perception when measured relative to the existing levels of vibration	Comment
	PPV (mm/s)	
No change	No change to current	
Negligible	<0.14	
Minor	>0.14-0.3	Predicted vibration levels in this range for human occupants will be assessed using VDV to establish the LOAEL and SOAEL
Moderate	>0.3-1.0	
Major	>1.0	

The bespoke matrix shown in

6.2.62 Table 6-10 will be used to assess the significance of impact on the identified receptors. The level at which significant effects occur are shown in the blue highlighted cells and generally occur when a Slight or Moderate or higher effect is predicted.

Table 6-10 Significance matrix

		Impact Magnitude				
		No change	Negligible	Minor	Moderate	Major
Receptor Sensitivity	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

## Limitations and Assumptions

### Limitations

6.2.63 The operational phase vibration assessment has been limited to aspects of the proposed Development that will be materially different to the existing railway track, namely, the introduction of switches and crossings and loop platforms for the train station. No assessment on the proposed track quality has been carried out, as this is assumed to be similar, if not better, than the existing conditions.

### Assumptions

- 6.2.64 The impact of increases in the number of train passages and increase in train speeds at Shepreth Junction have been assessed but the trains are assumed to be similar to those operating on the existing track based on the timetabling information available.
- 6.2.65 The construction impacts of the proposed Development have been limited to impacts on occupants and building users and on vibration-sensitive equipment in the buildings. Given the levels of vibration expected, no assessments have been undertaken for damage to property.
- 6.2.66 Additional assumptions are listed in Table 6-11 below for various aspects affecting the assessment.

Table 6-11: Assumptions made in the impact assessment

Aspect	Assumptions
Number and types of trains	Assumptions relating to these have been set out in “Baseline Noise Survey – Train timetables” by Arcadis (see Appendix 5.2).

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Aspect	Assumptions
Freight trains	12 freight trains are timetabled out of 367 train passages daily. They do not always run and are of varying length. Half of these are scheduled after 5.30pm. The effect of freight trains has been accounted for in the VDV measurements for receptors but for individual train pass-by events the passenger trains are taken as the basis of the assessment because they comprise the vast majority of events. Freight trains may cause higher vibration levels than passenger trains but are a small number of events per day.
Train speeds	It was assumed that there will be no change in maximum line running speed through the station area and trains will continue to operate at speeds similar to those measured in the baseline survey measurements.
Vibration-generating aspects	<p>The principal operational vibration impact from current levels in the new station area is the introduction of track discontinuity in the form of switches and crossings (the crossings particularly).</p> <p>It is assumed there are no other track discontinuities such as joints in rails as axle counters are used in the area. The platform loop track linespeed is 60mph and therefore less critical than the mainline 90mph which is unchanged from the current arrangement.</p> <p>The principal operational vibration impact in the Shepreth branch Junction area is the line speed increase from 30/40mph to 50mph.</p>
Location of switches and crossings	The proposed locations of the switches and crossings (S&C) as shown in Appendix 6.3 Figure 6-34 and Figure 6-35 have been used as the basis of the assessment. The results are sensitive to the location of S&C and any significant change in location could change the assessment.
Typical train events	The assessment was based on single train pass-by events. During the baseline surveys, there were periods when trains travelling in opposite directions passed each other in the CBC region, but the frequency of this occurrence was less than 5-10% of all train pass-bys observed. The vibration levels in the as-developed case will be dominated by the S&C locations and hence the chance of trains passing this location at the same time and at the high speeds associated with greatest impact will be lower. However, sometimes trains will pass over S&C simultaneously and may cause higher levels, but this is expected to be sufficiently infrequent to not warrant forming the basis of assessment.
Linespeed change at Shepreth Branch Junction	Regions of the junction having speed limit of 30mph and 40mph in the existing track will be changing to a uniform 50mph speed limit
Condition of track and wheels	It was assumed that the condition of the track will not be worse than the existing one in terms of rail and wheel roughness, save for the introduction of the S&C on the track for transitioning in and out of the bay platforms.
Track maintenance	It was assumed that track maintenance will be in line with the rate of track degradation to keep the track in good condition
Railway station access	It was assumed that the vehicular access to the railway will be predominantly smooth and flat without speed bumps or similar that could cause a vibration source of greater magnitude than the current on-site roads on the CBC.

## 6.3 Baseline

### Existing Baseline

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- 6.3.1 Table 6-12 contains a basic summary of the baseline vibration levels measured inside the scientific receptors and externally at Hobson's Park, the sports grounds of Hills Road Sixth Form College and Granham's Close. Detailed results are contained in the Baseline Vibration Report in Appendix 6-1.
- 6.3.2 The baseline levels are shown in terms of the Maximum vibration levels during the periods of train pass-by and for the entire measurement period. Disparities between these two metrics are attributed to non-railway sources.
- 6.3.3 The Hobson's Park, Sedley Taylor Road (Hill's Road Sixth Form College sports ground) and Granham's Close measurements were taken externally to buildings, with vibration levels - in terms of Vibration Dose Value (VDV) – being much lower than the minimum requirements for residential buildings. The vibration levels inside the residential buildings are expected to be even lower than external ones, given the additional distance and coupling loss between the soil and foundation of the buildings (Ref 6.10).

Table 6-12: Summary of baseline vibration levels

Building	Location	Description	Baseline Level for train events (Maximum 2s VC Levels)	Baseline Level for entire measurement period (Maximum 2s VC Levels)
MRC-LMB	VML1A	North-east wing ground floor	VC-D	VC-C
	VML1B	South-west wing ground floor	VC-C	VC-B
Anne McLaren Building	VML2A	Ground-floor	VC-D	VC-C
	VML2B	Second floor	VC-C	VC-C
Abcam Building	VML3	Ground-floor	VC-D	VC-D
AstraZeneca	VML4	Basement	VC-C	VC-C
Cancer Research UK	VML5A	Basement	VC-C	VC-B
	VML5B	Ground floor	VC-D	VC-B
Royal Papworth Hospital	VML6	Ground floor	VC-C	VC-C
Hobson's Park Residential receptors	VML7	External location, 10-15m from the nearest building	N/A (train signatures difficult to identify from other ambient sources)	VDV (projected from measurement period) 0.018m/s <sup>1.75</sup> (8hr night) 0.021m/s <sup>1.75</sup> (16hr night)
Sedley-Taylor Road Residential receptors	VML8	External location, similar distance as the closest properties to the railway	VDV (projected from measurement period) 0.029m/s <sup>1.75</sup> (8hr night) 0.035m/s <sup>1.75</sup> (16hr night)	VDV (projected from measurement period) 0.03m/s <sup>1.75</sup> (8hr night) 0.036m/s <sup>1.75</sup> (16hr night)
Granham's Close	VML9	External location, similar distance as	VDV (projected from measurement period)	VDV (projected from measurement period)



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Building	Location	Description	Baseline Level for train events (Maximum 2s VC Levels)	Baseline Level for entire measurement period (Maximum 2s VC Levels)
Residential receptors (relevant also to Davey Crescent and Abberley Woods)		the closest properties to the railway	0.037m/s <sup>1.75</sup> (8hr night) 0.044m/s <sup>1.75</sup> (16hr night)	0.047m/s <sup>1.75</sup> (8hr night) 0.056m/s <sup>1.75</sup> (16hr night)

## Future Baseline

- 6.3.4 No changes from the existing baseline are expected in relation to the future baseline.
- 6.3.5 The Cambridge South East Transport (CSET) scheme will result in modification to the existing CBC site and the traffic conditions but vibration impact has been scoped out of the Impact Assessment for the CSET scheme (Ref 6.13) based on road surfaces being constructed and maintained to be free from irregularities, which avoids the potential for significant adverse vibration effects. This is therefore not considered to have a material impact on the vibration baseline levels.
- 6.3.6 Further development on the CBC site will include construction of a transport hub, nursery facility and offices on the AstraZeneca south plot, some 25m from the railway track. This is not expected to alter the vibration baseline levels. In addition, these proposed uses will be less onerous than the scientific building requirements assessed within this chapter and any mitigation proposed for receptors assessed in this chapter would be sufficient for these other uses as well.

## 6.4 Design and Mitigation

- 6.4.1 This section sets out how vibration effects have been considered in the design and mitigation measures that have been included within scheme proposals. These mitigation measures have been incorporated into the impact assessment to reach a conclusion on residual effects.

### Construction Approach and Mitigation of Construction Effects

- 6.4.2 The detailed assessment of the construction vibration approach and the proposed mitigation of effects is set out in Appendix 6.2.
- 6.4.3 The predicted significant impacts are limited to the receptors located in close proximity to the construction areas. The highest impact is predicted to be at Abberley Woods, where the closest residential properties are very close to construction works. However, the amount of work to be carried out in this location is relatively small and so the impact will be of short-term duration.
- 6.4.4 On the CBC site, Moderate impacts are predicted for the MRC LMB building, Anne McLaren building and Abcam building for works that are in close proximity. This results in a significant effect in accordance with the Significance Matrix. For MRC LMB and Abcam the closest works are the creation and use of the haul roads. Construction of these haul roads will be of short-term duration and a well-maintained road surface will be provided to mitigate against any increase in vibration impacts due to potholes and other significant vibration causing defects.
- 6.4.5 Construction vibration will be mitigated through the use of Best Practicable Means which will be set out in the outline Code of Construction Practice (CoCP) Part A (see Appendix 2.4) with further detail of the measures below provided in the CoCP Part B to be submitted to the Local Planning Authority for approval.
- 6.4.6 Best Practicable Means (BPM) for construction vibration in relation to the proposed Development include:
- Choice of construction machinery to have the lowest vibration impact to achieve the required end specification within the time constraints posed by the operational railway.

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- No use of vibratory piling techniques except for at Shepreth Branch Junction where no other technique is viable due to track possession limitations. Where vibratory piling is to be used a low vibration method such as the Movax approach is to be used.
  - Limiting the time of significant vibration producing works to daytime activity, unless required as part of a railway track possession where the sequence of work dictates night time vibration producing activity is unavoidable. Such situations would be specifically addressed in the CoCP Part B.
  - Maintaining haul roads and construction access in good condition.
  - Maximising the distance of vibration producing construction works from sensitive receptors where this is possible.
  - Construction vibration monitoring to alert the contractor to any exceedances of defined criteria allowing the contractor to take steps to mitigate the exceedance.
  - Enhanced consultation with stakeholders on upcoming works and vibration predictions to inform of potential vibration levels. This should be linked to construction vibration monitoring results to refine future predictions based on the previous measurements.
- 6.4.7 Moving significant vibration producing machinery further from the receptors is not possible for track works due to the railway corridor being fixed. For these works the choice of methodology and equipment are the available mitigation options.
- 6.4.8 The choice of methodology and equipment to be used will be heavily influenced by the contractor but the design has sought to avoid, where possible, any high vibration activities such as impact piling.
- 6.4.9 The location of construction compounds has been chosen to be distant from the most sensitive receptors within practical limits and access constraints. The locations of construction compounds are shown in Figures 4-7 and 4-8 in Chapter 4 of this ES.
- 6.4.10 Construction methodologies will be developed and managed by the contractor to limit the vibration impact from construction activity through the use of best practice and through regular communication with the neighbouring building users and monitoring of vibration levels.
- 6.4.11 The CoCP Part A will set out the approach to minimising construction vibration and how liaison with the nearby building stakeholders will be undertaken to limit disruption especially for the CBC buildings highlighted above with a Moderate impact. It will not be possible to achieve the low levels of vibration required to avoid disruption to the scientific activities being undertaken in these buildings at all times. By the use of BPM the level and impact of these elevated vibration levels can be reduced to manageable levels as demonstrated by the continuing operation of these buildings through the nearly constant construction works that have been ongoing on the site.

## Scheme Design and Mitigation of Operational Effects

- 6.4.12 The design of the Development has considered the potential vibration effects during operation. The following principles have been included in the embedded design:
- The station approach has been positioned further from the most vibration-sensitive receptors than the closest existing roads. Vehicle routes will be smooth and free from speed bumps.
  - The line speed will not increase in the Station area and the new loop platforms will have a lower line speed.
  - The new switches and crossings are positioned away from sensitive buildings where possible. However, restrictions of the Long Road bridge dimensions restrict how far north the switches and crossings can be located.
  - Line speed increases in the Shepreth Branch Junction area have been limited to 50mph which is lower than the surrounding lines.

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- 6.4.13 The impact assessment has shown that, with the implementation of these mitigation measures, the impact on most receptors identified is negligible, in accordance with the assessment methodology. This is the case for all residential receptors.
- 6.4.14 For the AstraZeneca R&D centre a minor impact is predicted in respect of one sensitive area which may contain an electron microscope in the future, which was raised by AstraZeneca in consultation. A definitive criterion has not been set for this equipment and hence there is uncertainty as to whether the predicted levels would actually be a concern. As the equipment is a potential future provision, it could be procured with appropriate internal active vibration isolation systems to cope with the predicted vibration levels to mitigate any impact.
- 6.4.15 For the MRC LMB building, a residual impact is predicted which will require further mitigation. Details of mitigation measures under consideration and subject to ongoing discussion with the stakeholders are set out in the following paragraphs.
- 6.4.16 Mitigation measures would focus on the source vibration levels in the form of the switches and crossing design, resilient components in the track such as railpads, under-sleeper pads and ballast mats, and floating slab track systems for the section of track alongside the MRC LMB building.
- 6.4.17 Also under consideration is receptor mitigation. This is considered to be more appropriate given it is the most sensitive electron microscope equipment within the MRC LMB that is predicted to be impacted. Enhanced vibration isolation of this equipment is being investigated as an alternative or in parallel with source mitigation.
- 6.4.18 The approach is subject to ongoing dialogue between Network Rail and the MRC LMB and Network Rail are committed to agreeing a mitigation approach with MRC LMB prior to any development works commencing. The potential mitigation options set out in the following paragraphs have been discussed in outline with MRC LMB. Further investigation of the options is continuing, and a final agreement will only be possible when the detailed design stage has progressed to allow the options to be fully developed.
- 6.4.19 Table 6-13 contains a summary of the options for vibration mitigation measures that could be implemented on the track, together with a high-level assessment of the effectiveness of each. As the MRC LMB receptors are sensitive across a range of frequencies, including low frequencies, some commonly used techniques are not suitable.

Table 6-13: Options for track vibration mitigation measures

Option	Description	Range of effectiveness	Suitability
1	Resilient fasteners, e.g. railpads	5-10dB vibration reduction above 30-40Hz frequency range	Not expected to be suitable – Recent products and research show possible benefit for Switches and crossings which should be reviewed further.
2	Ballast mats	8-12dB above 25-30Hz frequency range	Not expected to be suitable
3	Floating slab track	Attenuates vibration above 15Hz typically, with attenuation levels depending on the mass of the slab	May be suitable if the natural frequency can be lowered to below 10Hz
4	Resiliently supported ties	Vibration reduction in the 15-40Hz frequency range	May be suitable
5	Switch and crossing design optimisation	Limited information available but could consider movable frogs	This option has been assessed and found

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Option	Description	Range of effectiveness	Suitability
			not to be feasible given the site constraints
6	Move switches and crossings further from MRC LMB	Would be more effective at high frequencies	This is limited by Long Road bridge and any changes within this constraint are marginal

- 6.4.20 Mitigation measures that can be implemented along the transmission path would require extensive civil engineering works and are therefore not considered viable in this situation given the limited space between the railway and the nearest buildings.
- 6.4.21 Since the building currently exists, the most viable vibration receptor mitigation is through localised isolation systems for the equipment in the affected areas. Given the level of vibration sensitivity, an active vibration isolation system may be required, e.g. TMC and Minus-K bases. It is not currently known if the MRC-LMB uses specific isolation systems already. If so, additional mitigation may not be required but, if not, there may be an opportunity to address the impact at receptor level for the affected equipment which could be more cost-effective than reducing the source vibration levels. This option is being explored by Network Rail with the MRC-LMB and will be considered in addition to the source mitigation options.
- 6.4.22 Mitigation will be adopted into the scheme to avoid any significant impact on the MRC LMB with the final details of the method to be employed to be agreed with LMB at the detailed design stage.

## 6.5 Assessment of Residual and Cumulative Effects

### Introduction

- 6.5.1 This section sets out the residual and cumulative effects of the proposed Development after the embedded design measures set out in the previous section have been incorporated.
- 6.5.2 The mitigation measures set out in Table have not been included in the assessment since their efficacy for the vibration at the critical frequencies for the scientific receptors is unclear at the current stage of design. These source mitigation measures may be included or receptor mitigation in the MRC LMB dependent on the best approach considered through detailed design.

### Residual Effects from Construction

- 6.5.3 There are two areas of residual impact: the residences very close to the Shepreth Branch Junction construction zone and the buildings on CBC that are very close to the construction areas.
- 6.5.4 For the residential properties in Abberley Wood and Davey Crescent there are likely to be some short duration activities (ground works and piling for OLE) that are close to individual houses for which vibration levels will have a Major impact, see **Error! Reference source not found.**6.2 for reference. The proximity makes this unavoidable but through the use of Best Practicable Means (in particular good communication on likely periods of vibration impacts, selection of low vibration equipment and vibration monitoring to give real-time feedback on vibration levels being produced) the impact can be minimised and a detailed Code of Construction Practice Part A will identify works which require specific consultation with impacted parties to ensure they are aware of the plans. The residual effect is anticipated to be **Significant**.
- 6.5.5 For the MRC-LMB and Anne McLaren building the close proximity to the buildings of some construction works leads to difficulty in mitigating the effects. For human perception the impacts are expected to be Negligible or Minor after the use of BPM, and thus **Not Significant**. However, the scientific uses are more sensitive and hence the impact would be greater, up to Moderate, during groundwork activities which are close to the buildings. The Code of Construction Practice Part B will reflect the specific sensitivity of these receptors and an enhanced consultation

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process will be implemented to allow for coordinating construction activity with the building users to reduce the impact as far as possible, although this is still expected to remain **Significant**.

- 6.5.6 The MRC LMB and Anne McLaren building users will be consulted further as the detailed design is progressed and the Code of Construction Practice Part B is developed to allow specific mitigation measures to be included well in advance of construction works commencing.

### Residual Effects from Operation

- 6.5.7 For the residential receptors, the predicted impact following the implementation of the embedded design measures is assessed as negligible (see Appendix 6.3). Residual effects during operation are considered to be **Not Significant**.
- 6.5.8 The assessment (see Appendix 6.3) has shown that the residual effect during operation on the Royal Papworth Hospital will be **Not Significant**.
- 6.5.9 The scientific building receptors in CBC will experience Negligible (**Not Significant**) residual effects, with the exception of the most sensitive area of the MRC LMB building. For this area elevated levels of vibration are predicted to be caused by trains passing over the switches and crossings and result in a Significant impact without mitigation. However, as set out in the Scheme Design and Mitigation of Operational Effects section above, measures to mitigate this effect are currently under discussion with the MRC LMB and will continue into the detailed design phase of the proposed Development. The residual effect is expected to reduce to **Not Significant**. A commitment to the delivery of mitigation at MRC LMB will be secured through a legal agreement between Network Rail and MRC LMB.
- 6.5.10 Occasional freight train traffic could cause vibration levels exceeding the levels from passenger trains which have been the main assessment method for the CBC buildings. The small number of these in the timetable has meant these have not been considered as an adverse effect on the scientific receptors since very occasional higher vibration levels are not expected to be problematic in a research environment, and thus the residual effect is expected to be **Not Significant**. Freight trains have been considered in the residential receptor assessments for which no residual effects are predicted to be **Not Significant**.

### Cumulative Effects

- 6.5.11 The Cambridge South East Transport (CSET) Phase 2 scheme will be developed alongside the proposed Development, with overlapping periods of construction.
- 6.5.12 No cumulative assessment has been carried out for the operational impact. Operational vibration impact assessment was scoped out of the CSET Environmental Scoping Report (Ref 6.6) based on the assumption that maintained road surfaces will be free from irregularities which avoids the potential for significant adverse vibration effects.
- 6.5.13 There will be construction vibration impact from the CSET site, movement of construction vehicles on the existing road network and from the CSET site compound, although the CSET Environmental Scoping Report concluded this could be scoped out depending on the location of the compound. The compound nearest to the CBC is understood to be situated south of the CBC and remote from the sensitive receptors. Cumulative effects are not therefore expected to be significant and have not been assessed.

## 6.6 Assessment Summary

- 6.6.1 **Error! Reference source not found.** provides a summary of the assessment with respect to vibration and how they have been addressed.

*Table 6-14 Assessment Summary*

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
MRC-LMB	Adverse impact on operation of scientific facility during construction phase	C	<p>Best Practicable Means to be implemented in line with Code of Construction Practice</p> <p>Key BPMs:</p> <ul style="list-style-type: none"> <li>- No vibratory piling</li> <li>- Well constructed and maintained haul road</li> <li>- Low vibration construction techniques</li> <li>- Enhanced consultation and engagement</li> <li>- Vibration monitoring with real-time feedback</li> </ul>	<b>Significant</b> (for scientific operation during some construction activities)
	Adverse impact on operation of scientific facility during operational phase	O	The option of vibration mitigation at the receptor is being explored by Network Rail with the MRC-LMB and will be considered in addition to the source mitigation options.	<b>Not Significant</b>
Anne McLaren Building	Adverse impact on operation of scientific facility during construction phase	C	<p>Best Practicable Means to be implemented in line with Code of Construction Practice</p> <p>Key BPMs:</p> <ul style="list-style-type: none"> <li>- No vibratory piling</li> <li>- Well constructed and maintained haul road</li> <li>- Low vibration construction techniques</li> <li>- Enhanced consultation and engagement</li> <li>- Vibration monitoring with real-time feedback</li> </ul>	<b>Significant</b> (for scientific operation during some construction activities)
	Adverse impact on operation of scientific facility during operational phase	O		<b>Not Significant</b>

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Abcam Building	Adverse impact on operation of scientific facility during construction phase (compound construction ground works only)	C	<p>Best Practicable Measures to be implemented in line with Code of Construction Practice</p> <p>Key BPMs:</p> <ul style="list-style-type: none"> <li>- No vibratory piling</li> <li>- Well constructed and maintained haul road</li> <li>- Low vibration construction techniques</li> <li>- Enhanced consultation and engagement</li> <li>- Vibration monitoring with real-time feedback</li> </ul>	<b>Not Significant</b>
AstraZeneca R&D Centre	Adverse impact on operation of scientific facility during construction phase	C	<p>Best Practicable Means to be implemented in line with Code of Construction Practice</p> <p>Key BPMs:</p> <ul style="list-style-type: none"> <li>- No vibratory piling</li> <li>- Low vibration construction techniques</li> <li>- Enhanced consultation and engagement</li> </ul> <p>Future microscope equipment can be supplied with enhanced isolation systems and may not be present during construction phase</p>	<b>Not Significant</b>
	Adverse impact on operation of scientific facility during operational phase	O	Future microscope equipment can be supplied with enhanced isolation systems	<b>Not Significant</b>
Cancer Research UK Building/ Basement	None	All		<b>Not Significant</b>



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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Royal Papworth Hospital	None	All		<b>Not Significant</b>
Hobson's Park Residences	None	All		<b>Not Significant</b>
Sedley-Taylor Road Residences	None	All		<b>Not Significant</b>
Abberley Woods/ Davey Crescent / Granham's Close Residences	Adverse impact on quality of life during construction phase	C	<p>Best Practicable Means to be implemented in line with Code of Construction Practice</p> <p>Key BPMs:</p> <ul style="list-style-type: none"> <li>- No vibratory piling except where essential due to track possession limitations</li> <li>- Low vibration construction techniques</li> <li>- Enhanced consultation and engagement</li> <li>- Vibration monitoring with real-time feedback</li> </ul>	<b>Significant</b>  (to closest receptors during some construction activities)



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## 6.7 References

Reference	Title
Ref 6.1	The Control of Pollution Act 1974
Ref 6.2	The Environmental Protection Act 1990 (EPA 1990)
Ref 6.3	Local Policy: Cambridge City Council (CCiC) Cambridge Local Plan (October 2018) Policy 35: Protection of human health and quality of life from noise and vibration
Ref 6.4	Local Policy: South Cambridgeshire District Council (SCDC) District Design Guide Supplementary Design Guide (SPD) 2010 Appendix 6: Noise: Supplementary Design Guide
Ref 6.5	BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration
Ref 6.6	ISO 14837-1:2005 Mechanical vibration - Ground-borne noise and vibration arising from rail systems - Part 1: General guidance
Ref 6.7	US Federal Transit Administration Report No. 0123 - Transit Noise and Vibration Impact Assessment Manual (2018)
Ref 6.8	Health Technical Memorandum 08-01: Acoustics (2013)
Ref 6.9	ISO/TS 10811 Mechanical vibration and shock - Vibration and shock in buildings with sensitive equipment - Part 2: Classification
Ref 6.10	Measurement and Assessment of Groundborne Noise and Vibration (Red Book), Association of Noise Consultants, 3rd edition, March 2020
Ref 6.11	BS ISO 4866:2010 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures
Ref 6.12	BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting
Ref 6.13	Environmental Scoping Report, Cambridge South East Transport (CSET) Phase 2, 13 October 2020, Mott MacDonald
Ref 6.14	RIVAS Deliverable D3.6 - Description of the vibration generation mechanism of turnouts and the development of cost-effective mitigation measures, dated 28/02/2013

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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 7 – Air Quality**

JUNE 2021

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## 7 Air Quality

### 7.1 Introduction

- 7.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to air quality. The assessment incorporates relevant design and other mitigation measures that would be employed during the construction and operation of the proposed Development.
- 7.1.2 A summary of relevant legislation, policy and guidance, and a description of the methodologies used to assess the potential effects of the proposed Development is provided in this chapter. Baseline conditions are set out followed by the impact assessment and a summary of the assessment findings is then provided.

### Relevant Aspects of the Proposed Development

- 7.1.3 A description of the proposed Development is provided in Chapter 4: The Site and the Proposed Development, of this ES. The proposed Development has the potential to impact air quality during the construction and operational phase, the specific aspects of which are detailed in the following section.

#### Construction Phase

- 7.1.4 Construction activities associated with the build out of the proposed Development has the potential to impact air quality by generating dust and vehicle exhaust emissions. Dust is typically emitted during the preparation of the land (for instance demolition, land clearance, and earth movement) and during construction. A large proportion of dust emissions are sourced from site plant and vehicles moving over temporary roads and open ground. These vehicles may then travel onto the local road network and deposit mud and dust onto the roads meaning that dust emissions can occur relatively far from the site boundary.
- 7.1.5 The scale and duration of the build out of the proposed Development also means that there would be a number of journeys by construction vehicles to and from the site across the construction phase which would impact on air quality in terms of vehicle exhaust emissions. Exhaust emissions of pollutants including nitrogen dioxide (NO<sub>2</sub>) and particulate matter will occur from onsite plant Non-Road Mobile Machinery (NRMM). Emissions from NRMM will be temporary and minimised through the application of mitigation measures. Due to the low baseline air quality concentrations and the transient and temporary nature of the emissions, it was determined that NRMM emissions would not be significant and have therefore been scoped out of further assessment.

#### Operational Phase

- 7.1.6 The operational phase of the proposed Development has the potential to cause a change in the number of vehicle trips on the local road network during operation with an anticipated decrease in local road traffic due to modal shift to rail. The vehicle exhaust emissions associated with the change in traffic flow have the potential to improve local air quality and positively affect existing receptors located close to the proposed Development site and surrounding road network.
- 7.1.7 Defra's Local Air Quality Management (LAQM) Technical Guidance (LAQM.TG(16)) (Ref 7.1) states that rail sources become a consideration for sulphur dioxide (SO<sub>2</sub>) emissions where there is relevant exposure within 15 metres of idling locomotives on at least three occasions per day (with each period of idling being longer than 15 minutes) or for nitrogen dioxide (NO<sub>2</sub>)

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emissions where there is relevant exposure within the 30m of moving diesel locomotives combined with NO<sub>2</sub> background concentrations of 25µg/m<sup>3</sup> or more.

- 7.1.8 In light of this, the following observations have been made regarding SO<sub>2</sub> and NO<sub>2</sub> emissions from diesel locomotives in the context of the criteria for consideration of rail emissions as set out in LAQM.TG(16);
- It is anticipated that there will be no change in frequency or volume of diesel locomotives (both passenger and freight) associated with the operation of the proposed Development as compared to the future baseline;
  - Short term idling will occur on a regular basis at those platforms where those scheduled diesel passenger services would disembark and embark; however, it is unlikely that the idling will take place for longer than 15 minutes on more than three occasions per day. Also relevant exposure is likely to be minimal and short term within 15 metres of the locomotive exhaust(s). Idling is also expected to occur at the signals at Shepreth Branch Junction but idling times are unlikely to exceed 15 minutes on more than three occasions each day.
  - Relevant exposure within 15m of the locomotive exhausts such as lineside residences, schools, etc is minimal between Shepreth Branch Junction and Cambridge Central Station.
  - LAQM.TG(16) suggests that exceedances of NO<sub>2</sub> 1-hour objective are unlikely to occur where the annual mean is below 60µg/m<sup>3</sup>. Annual mean background NO<sub>2</sub> concentrations are well below 25 µg/m<sup>3</sup> within 15m of the railway line in the vicinity of the proposed Development.
  - The guidance also lists a number of relevant railway lines which would require further consideration due to heavier utilisation of diesel passenger trains. The railway line associated with the proposed Development is not listed within the guidance as a route with high levels of diesel locomotives.
- 7.1.9 For these reasons, quantitative assessment of emissions from diesel locomotives have been scoped out of the assessment (Refer to Table 7-3 for summary of scoping opinion).

## 7.2 Assessment Methodology

### Legislation, Policy and Guidance

#### Legislation

- 7.2.1 Directive 96/62/EC (the Air Quality Framework Directive 1996) (Ref 7.2) implemented between 1996 and 1998 aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.
- 7.2.2 Directive 2008/50/EC (the Ambient Air Quality Directive 2008) (Ref 7.3) defines objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole.
- 7.2.3 Part IV of the Environment Act 1995 (Ref 7.4) requires the UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The ambient air quality standards and objectives relevant to air quality assessment are given statutory backing in England through the Air Quality (England) Regulations 2000 (SI 2000/928) (Ref 7.5), the Air Quality (England)(Amendment) Regulations 2002 (SI 2002/3043 (Ref 7.6) and the Air Quality Standards Regulations 2007 (SI 2007/64) (Ref 7.7). The Air Quality Standards Regulations 2010 (SI 2010/1001) (Ref 7.8) came into force during 2011 and transposed the requirements of the EU Directive 2008/50/EC (Ref 7.3). The AQS sets out the relevant objectives that are maximum ambient pollutant concentrations not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale.
- 7.2.4 Air Quality Limit Values (AQLVs) were published in these Air Quality Regulations for seven pollutants, in addition to Target Values for an additional five pollutants. These are generally in



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line with the AQS objectives, although the requirements for the determination of compliance vary.

- 7.2.5 Table 7-1 presents the AQS objectives for pollutants considered within this assessment which are the principal traffic-based air pollutants.

Table 7-1 Air Quality Objectives and Limit Values

Pollutant	Air Quality Strategy Objectives and Limit Values	
	Maximum Concentration (µg/m <sup>3</sup> )	Averaging Period
NO <sub>2</sub>	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM <sub>10</sub>	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
PM <sub>2.5</sub> *	25	Annual mean

\*It should be noted that the PM<sub>2.5</sub> objective is a target value. It is not in the 2010 regulations and there is no legal requirement for Local Authorities to meet it.

- 7.2.6 It is a requirement of the Environment Act 1995 (Ref 7.4) that Local Authorities (LAs) review current and future air quality within their area of jurisdiction under the system of LAQM. Any areas of relevant exposure where the AQS objectives are not, or unlikely to be, achieved should be identified.
- 7.2.7 Where it is anticipated that an AQS objective will not be met, it is a requirement that an Air Quality Management Area (AQMA) be declared. Where an AQMA is declared, the LA is obliged to produce an Air Quality Action Plan (AQAP) in pursuit of the achievement of the AQS objectives.
- 7.2.8 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154) (Ref 7.9) and subsequent amendments, such as construction sites, are those provided in Section 79 of Part III of the Environmental Protection Act 1990 (EPA 1990) (Ref 7.10).
- 7.2.9 A statutory nuisance in relation to dust and deposits is defined under Section 79 of the EPA 1990 as follows:
- ‘any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance.’*
- 7.2.10 Enforcement of the Act, in regard to dust nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the EPA 1990 (Ref 7.10). Enforcement can insist that there be no dust beyond the boundary of the

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works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

## Policy

- 7.2.11 The National Planning Policy Framework (NPPF) 2019 (Ref 7.11) sets out the Government's core policies and principles with respect to land use planning, including air quality and requires local planning authorities to take account of air quality in plan making. Paragraph 181 of the Framework states:

*'Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'*

- 7.2.12 The Clean Air Strategy 2019 (Ref 7.12) sets out the proposals to tackle air pollution and complements other UK government strategies. Chapter 5 of the Clean Air Strategy sets out actions to reduce emissions from transport primarily nitrogen oxides in areas where concentrations currently exceed legal limits.
- 7.2.13 The guidance and principles detailed in the NPPF and Clean Air Strategy have been considered throughout this assessment.

## Local Policy

- 7.2.14 The majority of the proposed rail and station works are located in the Cambridge City Council (CCiC) area of jurisdiction, however part of the red line boundary for construction works falls within South Cambridgeshire District Council (SCDC) area. The proposed works in the SCDC area are confined to upgrading existing rail infrastructure. Therefore, the only material air quality consideration within SCDC is likely to be construction dust as the modelled road network for the operational phase of the assessment does not cover the SCDC area (see paragraph 7.2.37).
- 7.2.15 The following local policy documents are of relevance to the assessment:
- Cambridge Local Plan (2018) (Ref 7.13): Policy 36 'Air Quality, Odour, and dust' explains that planning permission would be refused where applications lead to significant adverse effects on health, the environment or amenity via air pollutants. It also explains that any new development should not be permitted if it demonstrated to increase exposure to unacceptable levels of existing air quality, odour or other air pollutants. According to the end-use and nature of the area and application, applicants 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 (i.e. avoids creating new exposure to unacceptable levels of air quality);*
    - *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 of 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*

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- *any impacts on the proposed use from existing poor air quality, odour and emissions are appropriately monitored and mitigated by the developer”*
- Cambridge City Council Air Quality Action Plan (2018-2023) (CCiC AQAP) (Ref 7.14). The CCiC AQAP consists of three priorities in line with the principles of the NPPF and demonstrates CCiC’s drive to improve air quality over the coming years:
  - *Priority 1 – Reduce emissions in the central areas of Cambridge. Source apportionment shows that traffic emissions are the main source of air pollution in the city and that a reduction in emissions is required to meet the National Air Quality Objectives.*
  - *Priority 2 – Reduce emissions across Cambridge. The planned growth in population and economic activity in the Greater Cambridge area could threaten the success of an Air Quality Action Plan if just considering short term objectives.*
  - *Priority 3 – Keep emissions low in the future. Keeping emissions low and reducing emissions further will improve public health for all who live, work and visit Cambridge.*
- SCDC Local Plan 2018 (Ref 7.15) Relevant aspects of Policy SC/12 Air Quality are summarised as follows:
  - *Where development proposals would be subject to unacceptable air quality standards or would have an unacceptable impact on air quality standards they will be refused.*
  - *An assessment of the impact of the proposals on local air quality should be carried out with regard to relevant guidance that demonstrates national air quality objectives will be achieved.*
  - *Development must demonstrate it does not lead to adverse effects on health, the environment or amenity.*
  - *Any impacts on the proposed use from existing poor air quality, are appropriately mitigated*

Network Rail Policy

7.2.16 The Network Rail (NR) Environment Sustainability Strategy 2020-2050 (Ref 7.16) details a number of targets and key milestones that NR wish to achieve between 2020 and 2050.

Those targets relevant to local air quality are summarised as follows:

- *All appropriate plant, worksites and depots to have dust suppression in place by 2029.*
- *Transition assets away from use of natural gas by 2029*
- *Establish an air quality monitoring regime for worksites and depots by 2024*
- *Complete electric vehicle charging roll out by 2029 and transition of NR’s fleet to Ultra Low Emission (ULE) by 2035.*
- *Update procurement model by 2022 to reduce value chain emissions by 2032*
- *Purchase 100% non-traction electricity by 2020 and aim to feed 100% of NR non-traction electricity from renewable sources by 2030.*
- *Implement air quality improvement plans for all NR managed stations and depots by 2024.*

Guidance

7.2.17 The National Planning Practice Guidance (NPPG) (Ref 7.17) web-based resource was launched by the Department for Communities and Local Government, as updated on 1<sup>st</sup> November 2019, to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

- What air quality considerations does planning need to address?
- What is the role of plan-making with regard to air quality?
- Are air quality concerns relevant to neighbourhood planning?

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- What information is available about air quality?
  - When could air quality considerations be relevant to the development management process?
  - What specific issues may need to be considered when assessing air quality impacts?
  - How detailed does an air quality assessment need to be?
  - How can an impact on air quality be mitigated?
- 7.2.18 The guidance principles in the NPPG have been considered throughout this assessment.
- 7.2.19 The Greater Cambridge Sustainable Design and Construction Supplementary Planning Document (SPD), January 2020 (Ref 7.18) provides specific guidance on how the policies in the CCiC and SCDC local plans should be implemented to ensure that the environmental and social impact in the area is minimised. The guidance states, with respect to air quality, that all developments should aim to be air quality neutral and that air quality beneficial developments will be welcomed. The guidance states that consideration of air quality and air pollution will be relevant during both the operational and the construction phase. The guidance in the Greater Cambridge Sustainable Design and Construction SPD has been considered throughout this assessment.
- 7.2.20 The Institute of Air Quality Management (IAQM) guidance on the assessment of dust from demolition and construction (2014) (Ref 7.19) was followed in the assessment of construction phase dust impacts. The guidance provides a mechanism for the assessor to consider both the magnitude of emissions and sensitivity of an area in order to define the level of risk of dust soiling and human health impacts during the construction phase. Defining the construction dust risk levels allows appropriate mitigation measures to be adopted.
- 7.2.21 For construction and operational phase impacts from vehicle exhaust emissions, the following guidance has been used to inform the assessment:
- Institute of Air Quality Management Land-use Planning & Development Control: Planning for Air Quality (Ref 7.20)
  - Highways England Design Manual for Roads and Bridges (DMRB) LA 105 England National Application Annex to LA 105, Air Quality (formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15) (Ref 7.21)
  - Local Air Quality Management Technical Guidance LAQM.TG(16) (Ref 7.1)
- 7.2.22 The IAQM Land Use Planning and Development Control guidance (Ref 7.20) hereby referred to as ‘the IAQM development control guidance’ is applicable in assessing the effect of changes in exposure of members of the public resulting from developments such as the proposed Development. It provides guidance on how to decide whether an air quality assessment is required, how to undertake a suitable assessment of operational impacts and whether these are to be considered significant or not, and how to identify whether additional mitigation is required.
- 7.2.23 Highways England LA 105 (Ref 7.21) provides a methodology for assessing the risk of non-compliance with the Ambient Air Quality Directive (2008/50/EC) (Ref 7.3) associated with the operational phase of the proposed Development.
- 7.2.24 LAQM.TG(16) (Ref 7.1) provides best practice principles for the technical assessment of local air quality including the use of monitoring data, selection of receptors and verification procedure. LAQM.TG(16) also provides guidance for the application of Defra tools and resources used for the technical assessment of air quality.

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## Consultation and Scoping

### Consultation

7.2.25 Table 7-2 provides a summary of consultee issues raised with respect to air quality and how they have been addressed through informal scoping and public consultation.

Table 7-2 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Greater Cambridge Shared Planning (GCSP) Adam Finch and Jo Dicks 19/06/2020	<p>A Scoping Memo was provided in advance to inform the consultees of Arcadis's outline air quality methodology. This was then discussed in a telecon for comment.</p> <p>Queries were made regarding the proposed development's impact on taxi flows in the vicinity of the station owing to similar problems at Cambridge Railway Station. It was agreed that this would be explored in terms of inclusion in the traffic data.</p> <p>Additionally, a query was made as to whether the proposed Development would be integrated with bus networks. Confirmation of anticipated bus integration has not been made and would not be until Cambridge South East Transport (CSET) have prepared their plan for the proposed Development.</p>	The methodology for this assessment was agreed as acceptable.
Natural England Julie Lunt 26/06/2020	<p>Natural England were provided with the Air Quality Scoping Note and provided a written response in June 2020.</p> <p>Natural England acknowledged that the development proposals do not appear to affect any ecological designated sites such as SSSI, SAC, Ramsar, SPA, NNR. General advice was provided in an Annex with regards to air quality assessment.</p>	Air quality impacts at designated ecological sites have been screened out, as detailed in paragraph 7.2.49 and are not included within this assessment.
Trumpington Residents Association (TRA) David Plank 31/08/2020	<p>TRA were provided with the Air Quality Scoping Note and had the following comments (as presented in TRAs written response to the Scoping Note on 02/09/20), which are noted and responded to as follows;</p> <ul style="list-style-type: none"> <li>•“Modelling of Air Quality operational impacts’ referred to in the detailed scoping note should be carried out”.</li> <li>•“Various adverse effects on air quality are included in the Scoping Note – such as increased emissions of dust during</li> </ul>	<p>Assessment of operational phase air quality impacts from changes in road traffic flows will be carried out as part of the environmental statement and will be informed by dispersion modelling.</p> <p>Mitigation measures have been explored and proposed as required, should any aspect of the air quality</p>

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	construction, construction vehicle exhaust emissions, and a long-term increase in the number of bus and car journeys when the station is operational. However, there is no reference to potential mitigation of these effects, or of the account which should be taken of these in the EIA. We suggest that potential mitigation should be included in the EIA".	assessment conclude that there is likely to be a significant residual effect.

## Scoping

7.2.26 Table 7-3 provides a summary of consultee responses contained within the Scoping Opinion in relation to air quality, and the corresponding location in the ES where they are addressed.

Table 7-3 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Department for Transport and GCSP	<ul style="list-style-type: none"> <li>Air quality impacts during the construction and operational phases of the development should be quantified both inside and outside the development area.</li> </ul>	The air quality study areas are presented in Figures 7-1 and 7-2. Determination of the air quality study area is defined in paragraphs 7.2.27 to 7.2.36.
	<ul style="list-style-type: none"> <li>Consideration should be given to vehicle movements associated with the operation of the development including taxi movements, drop off and pick up throughout the day, maintenance and deliveries and not just peak time vehicle movements.</li> </ul> <p>Taxi movements have been considered in the overall AADT data used for air quality modelling.</p>	All traffic data used for air quality modelling purposes is presented in Appendix 7.2.
	<ul style="list-style-type: none"> <li>Clarification required on how the proposed development links in with the existing public transport network and in particular whether the development will lead to an increase in bus movements on the local road network.</li> </ul> <p>The development will not lead to an increase in bus movements.</p>	Assumptions section 7.2.81. See traffic and transport Chapter 17 for further detail.
	<ul style="list-style-type: none"> <li>Consideration should be given to the potential emissions from trains.</li> </ul>	Potential impact from train emissions discussed in section 7.1.

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Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
	<ul style="list-style-type: none"> <li>Roads and receptor points to be included in the modelling should be agreed with the relevant local planning authority prior to the work being undertaken.</li> </ul> <p>All roads provided with traffic data have been included in the air quality model for this assessment. Receptors assessed include worst-case locations for each road within the air quality study area including the 'sensitive receptors' highlighted at the scoping stage.</p>	<p>Modelled roads and receptors are presented on Figures.</p> <p>A full list of modelled receptor details are presented in Appendix 7.2. Table 1.</p> <p>A full list of the road network supplied with traffic data for assessment is presented in Appendix 7.2 Table 2.</p>
	<ul style="list-style-type: none"> <li>It should take into account the cumulative impact of all planned development within the local area</li> </ul> <p>Inter-project cumulative effects of the proposed Development with other schemes have been included in the traffic data provided and hence cumulative effects in relation to air quality have been considered throughout the assessment</p>	Paragraph 7.5.25
Natural England	The assessment should take account of the risks of air pollution and how these can be managed or reduced.	Risks of air pollution have been considered and there are no ecological receptors within the study area for potential operational effects, as stated in paragraph 7.2.49.
GCSP	The Construction and Environmental Management Plan (CEMP) shall detail the emissions reduction measures, including dust mitigation	Full list of construction dust mitigation measures detailed in Appendix 7.3, summarised in Table 7-13 Assessment Summary.
	Changes in pollutant concentration to be considered against local policy, in particular Policy 36 of the Cambridge local Plan 2018 and the Air Quality Action Plan 2018.	Local policy, detailed in paragraphs 7.2.14 and 7.2.15, have been considered for this assessment.
	Assessment of construction dust effects in accordance with the IAQM guidance on assessment of dust from demolition and construction.	Paragraphs 7.2.50 to 7.2.57
	Cumulative effects assessment should include Cambridge South East Transport Scheme (CSET) proposal.	Paragraph 7.5.25



## The Study Area

### Construction Phase

- 7.2.27 The IAQM construction dust guidance (Ref 7.19) requires that construction dust impacts are assessed up to 350m from the locations of demolition, construction and earthworks activities for human receptors, and up to 50m for ecological receptors. The construction phase study area also covers a 50m buffer around routes used by construction vehicles on the public highway up to 500m from the main site entrances. The full extent of the construction dust study area is presented in Appendix 7.1, Figure 7-1.
- 7.2.28 Impacts from construction phase vehicle exhaust emissions were assessed in the manner described below for operational impacts.

### Operational Phase

- 7.2.29 For the operational phase, the IAQM development control guidance (Ref 7.20) does not explicitly specify the geographical extent within which impacts should be assessed. DMRB LA 105 (Ref 7.21) states that all impacts within 200m of those roads which meet any of a set of traffic change criteria should be assessed. Impacts from vehicle exhaust emissions beyond 200m of the emission source are generally accepted to be negligible, and on smaller roads such as single carriageway A-roads there are rarely significant impacts beyond 50m.
- 7.2.30 The IAQM development control guidance (Ref 7.20) details its own indicative criteria with respect to change as a result of a proposed Development that if met, highlight the need for an assessment, rather than necessarily defining the boundaries of a study area. The criteria relevant to the proposed Development are:
- a change in Light Duty Vehicle (LDV) flows of >100 Annual Average Daily Traffic (AADT) within or adjacent to an Air Quality Management Area (AQMA), or >500 AADT elsewhere
  - a change in Heavy Duty Vehicle (HDV) flows of >25 AADT within or adjacent to an AQMA, or >100 AADT elsewhere
  - where a road is realigned by 5m or more and is within an AQMA
  - where a junction is added or removed close to existing receptors
  - where there are one or more substantial combustion processes and there is a risk of impacts at relevant receptors.
- 7.2.31 Should any of the above criteria be met, then the guidance suggests that further assessment may be required. However, it should be noted that the guidance states that *“the criteria provided are precautionary and should be treated as indicative; in some instances, it may be appropriate to amend them on the basis of professional judgement.”* Therefore, the decision to proceed to further assessment should also be based on professional judgement, rather than the criteria alone.
- 7.2.32 When the traffic data was screened, a number of roads met the IAQM change criteria. Analysis of the roads which met the IAQM criteria demonstrated that the main traffic impact of the proposed Development is to reduce the volume of traffic travelling on Addenbrooke's Road and Francis Crick Avenue.
- 7.2.33 However, it was decided that the air quality impacts of the proposed Development would be assessed across the entire geographical extent that traffic data was provided for, rather than assessing only those roads that met the IAQM criteria. This represents a more holistic approach as many roads which did not meet the criteria have been included for assessment.
- 7.2.34 The assessment considered worst-case sensitive receptor locations (i.e. those receptors closest to roads with the largest changes in traffic flow and/or those receptors where existing



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pollutant concentrations are highest) within 200m of those links which comprise the traffic network provided were compared against UK AQS objectives as appropriate.

7.2.35 In accordance with the above criteria, this air quality assessment comprised the road network presented in Appendix 7.1, Figure 7-2, and includes the following areas:

- Addenbrooke's Road
- A1309 Hauxton Road/ High Street
- A1134 Long Road
- A1307 Babraham Road
- Francis Crick Avenue

7.2.36 The traffic changes associated with the proposed Development will be the greatest on these roads and therefore will provide an indication of wider impacts beyond the roads modelled within the air quality study area. It is therefore considered that there would not be any significant air quality impacts outside of the assessment study area.

7.2.37 All roads included in the modelled network as part of the air quality study area for the operational phase assessment are located within the CCiC area and does not extend into the SCDC area of jurisdiction.

#### Defra Pollution Climate Mapping Compliance Risk

7.2.38 Defra assesses and reports on the status of air quality in the UK, by reference to the Limit Values for each pollutant, in accordance with EU Directive 2008/50/EC (Ref 7.3). For the purposes of Defra assessment and reporting, the UK is divided into 43 zones and agglomerations (hereafter referred to as zones). The main pollutant of concern with respect to compliance is NO<sub>2</sub>.

7.2.39 The assessment of compliance with the Directive is undertaken using both monitoring from the Defra AURN Network and modelling from Defra's Pollution Climate Mapping (PCM) model. To determine the study area for the compliance risk assessment, the study area for the local air quality assessment is compared with the PCM model network as modelled by Defra.

7.2.40 A review of the traffic flow changes associated with the operational phases of the proposed Development revealed that there are no Defra PCM links that meet the DMRB screening criteria (Ref 7.21) for compliance risk assessment.

## **Methodology for Establishing Baseline Conditions**

7.2.41 The existing baseline comprises the air quality conditions in the area that is likely to be affected by the proposed Development. A review of the existing baseline has been undertaken to establish an understanding of the current air quality environment, to identify areas that are likely to be sensitive to changes in emissions as a result of the proposed Development and to inform model verification. Baseline information on air quality has been collected from the following sources:

- Online map and aerial photograph resources (Including Google Maps, Magic.gov.uk, and digital Ordnance Survey mapping)
- Defra UK Air website (Ref 7.22)
- SCDC website (Ref 7.23)
- CCiC website (Ref 7.24)

## **Defining the Importance/Sensitivity of resource**

### **Human Receptors**

7.2.42 The AQS objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building façades of residential properties, schools, hospitals (e.g.

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associated with the adjacent Cambridge Biomedical Campus (CBC)) and care homes. The 24-hour PM<sub>10</sub> mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1-hour mean NO<sub>2</sub> objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for one hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

- 7.2.43 Exceedances of 60µg/m<sup>3</sup> as an annual mean NO<sub>2</sub> concentration can be used as an indicator of potential exceedances of the 1-hour mean NO<sub>2</sub> objective, and exceedances of 32µg/m<sup>3</sup> PM<sub>10</sub> as an annual mean can be used to predict the number of exceedances of the 24-hour objective.
- 7.2.44 Similarly, LAQM.TG(16) (Ref 7.1) also provides a relationship between the annual mean PM<sub>10</sub> concentration and the number of exceedances of the 24-hour objective. Those areas where the annual mean concentration is greater than 32µg/m<sup>3</sup> were demonstrated to be at risk of exceeding the 24-hour objective. Thus, exceedances of 32µg/m<sup>3</sup> as an annual mean PM<sub>10</sub> concentration are used as an indicator of potential exceedances of the 24-hour mean PM<sub>10</sub> objective.
- 7.2.45 LAQM.TG(16) (Ref 7.1) provides the following examples of where annual mean AQS objectives should apply:
- residential properties
  - schools
  - hospitals
  - care homes
- 7.2.46 These are all locations where sensitive subsets of the population could potentially be exposed to air pollutants over a long-term period. Worst case receptor locations were selected for assessment. These were the locations where existing pollution concentrations are highest and/or where the proposed Development is expected to have the largest impact in traffic changes. Following this approach, sensitive receptors at 16 locations were chosen for assessment reflecting the road network included in the traffic assessment, including;
- The Royal Papworth Hospital (R1)
  - Residential properties in the surrounding local road network (R3-R15)
  - Addenbrooke's Treatment Centre (R1)
  - Long Road Sixth Form College (R2 and R16)
- 7.2.47 In addition to the above, a number of non-residential receptors within the 350m of the proposed Development have been identified which are at risk of reduced amenity in terms of unmitigated impacts from construction dust. These are;
- Medical Research Council Laboratory
  - AstraZeneca HQ
  - AstraZeneca Data Centre
  - AstraZeneca R&D enabling buildings
  - Abcam plc
  - The Anne McClaren Building (University of Cambridge)
- 7.2.48 Details of the modelled receptor locations are presented in Appendix 7.2 Table 2 and displayed on Figure 7-2.

## Ecological Receptors

- 7.2.49 No designated sites have been identified within 200m of the affected road network, therefore no ecological receptors have been modelled within this assessment. The closest designated site to the proposed Development is Nine Wells Local Nature Reserve located over 250m from the closest affected road (Addenbrookes Road).

## Methodology for Assessing Impacts

### Impact Characterisation

#### Assessment of Construction Dust Effects

- 7.2.50 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined in the IAQM construction dust guidance (Ref 7.19). The methodology is summarised in the following paragraphs. However detailed assessment steps are presented in Appendix 7.3.
- 7.2.51 If there are no ecological or human receptors within 350m of the Site boundary, or within 50m of the haul routes (up to 500m from the site entrance(s)), then the need for a construction dust assessment can be screened out. However, if receptors are present within these boundaries then an assessment should be carried out.
- 7.2.52 The most common air quality impacts that may arise during demolition and construction activities are:
- Dust Deposition, resulting in the soiling of surfaces and reduction in amenity
  - Elevated PM<sub>10</sub> concentrations, as a result of dust generating activities on site as a risk to human health
- 7.2.53 These impacts may affect human and ecological receptors. The IAQM construction dust guidance (Ref 7.19) defines a human receptor as:
- “any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM<sub>10</sub> over a time period relevant to the Air Quality Objectives. In terms of annoyance effects, this will most commonly relate to dwellings, but may also refer to other premises such as buildings housing cultural heritage collections (e.g. museums and galleries), vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations (e.g. salad or soft-fruit production).”*
- 7.2.54 An ecological receptor is defined as:
- “any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats).”*
- 7.2.55 The risk of dust emissions from construction/ demolition activities causing an adverse effect on human or ecological receptors depends on:
- The type of construction activities being undertaken, and the duration of these activities.
  - The size of the construction site.
  - The meteorological conditions (such as wind speed, wind direction and rainfall).
  - The proximity of the receptors to the construction activities.
  - The effectiveness of any dust deposition mitigation measures.
  - Receptors’ sensitivity to dust.

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- 7.2.56 Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are demolition, earthworks, construction and trackout (the vehicle-borne transfer of mud and debris onto the highway).
- 7.2.57 The potential for dust emissions was assessed for each activity that is likely to take place and considers three separate dust effects including nuisance due to dust soiling, harm to ecological receptors and the risk of health effects due to an increase in exposure to PM<sub>10</sub>.

Assessment of Operational Effects**Dispersion Modelling**

- 7.2.58 The Atmospheric Dispersion Modelling System (ADMS) Urban model (version 5.0.0.1) has been used to predict the impacts for the following scenarios:
- Base year (2019) - This scenario is modelled for the purposes of model verification and represents the year in which the surveys which informed the traffic datasets were sampled in.
  - Opening year (2026) (with and without the proposed Development) – The first full year that the proposed Development will be operational, including future baseline that accounts for traffic growth and consented cumulative developments.
  - Fully operational year (2031) (with and without the proposed Development) – Five years after the opening year of the proposed Development, when passenger numbers are anticipated to be operating at normal as defined by the Outline Business Case (including future baseline that accounts for traffic growth and consented cumulative developments).
- 7.2.59 ADMS is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and Defra.
- 7.2.60 The model requires input data that details the following parameters, details of which are presented in Appendix 7.2:
- Meteorological data;
  - Roughness length;
  - Monin-Obukhov length;
  - Traffic data;
  - Vehicle emission factors; and
  - Road widths.

**NO<sub>x</sub> to NO<sub>2</sub> conversion**

- 7.2.61 Predicated annual mean NO<sub>x</sub> concentrations from the dispersion model were converted to NO<sub>2</sub> concentrations using the Defra NO<sub>x</sub> to NO<sub>2</sub> Calculator (v8.1) (Ref 7.25), following the method detailed within LAQM.TG(16) (Ref 7.1). The traffic mix and local authority used for the conversion from NO<sub>x</sub> to NO<sub>2</sub> were selected depending on the modelled receptor and diffusion tube locations.

**Model Verification**

- 7.2.62 The predicted results from a dispersion model may differ from measured concentrations for a number of reasons, including:
- Uncertainties in source activity data such as traffic flows and emissions factors;
  - Variations in meteorological conditions;
  - Overall model limitations; and
  - Uncertainties associated with monitoring data.

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- 7.2.63 Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all these aspects. Concentrations of NO<sub>2</sub> were predicted at the monitoring locations for the base year and compared against the concentrations measured in those locations. Where the modelling under/over predicts pollutant concentrations, an adjustment factor is derived which is then applied to the future modelling predictions to correct for any systematic bias. This approach is intended to address any limitations in the ability of the model to predict the dispersion of pollutants away from the roads and limitations in the emission factors used.
- 7.2.64 Model verification was undertaken using traffic data, meteorological data and monitoring data for the base year of 2019, in accordance with the principles outlined in Defra's LAQM.TG(16) (Ref 7-1). Details of the model verification procedure are outlined in Appendix 7.4.

**Long Term Trends**

- 7.2.65 A report produced on behalf of Defra (Ref 7.26), considered NO<sub>2</sub> monitoring data from across the UK and suggests that reductions in concentrations have slowed in recent years; therefore, it is now agreed among many air quality professionals that future predictions of NO<sub>2</sub> concentrations may be underestimated. Defra updated the air quality tools in 2020 (including the new Emission Factor Toolkit (EFT) (Ref 7.27), background maps and NO<sub>x</sub> to NO<sub>2</sub> Calculator (Ref 7.25) which aimed to close this “gap” between forecast and monitored NO<sub>2</sub> trends. However, it is considered that future NO<sub>2</sub> levels based on these updated tools are still likely to be underestimated. Therefore, a long-term trend (LTT) gap analysis has been carried out for NO<sub>2</sub>, in accordance with Highways England LA 105 (Ref 7.21). This provides a worst-case approach to the NO<sub>2</sub> modelling results of this assessment.
- 7.2.66 This LTT NO<sub>2</sub> gap analysis has been based on adjustment of the opening year modelled NO<sub>2</sub> concentrations using base year modelled NO<sub>2</sub> concentrations and an alternative projection factor (based on a projected base year, which is the base year traffic data with opening year emissions and backgrounds) as outlined in LA 105 (Ref 7.21). Highways England has provided a gap analysis tool (Ref 7.28) to assist with the calculation which has been used in the assessment. Although this approach is used for highways related schemes it is applicable for use in this assessment as the main source of emissions in the area is road traffic.

Assessment of Construction Phase Vehicle Emissions

- 7.2.67 The methodology for assessing impacts from increased construction phase vehicle flows was carried out and appraised in accordance with the IAQM development control guidance (Ref 7.20) as set out in the preceding section concerning operational local air quality.
- 7.2.68 Construction vehicle flows have been calculated based on the number of HDVs required to deliver materials to, and waste from the proposed Development site.
- 7.2.69 The anticipated peak period during the construction phase for the proposed Development is expected to be during 2023. Construction phase vehicle exhaust emissions have been assessed using the peak construction year traffic flow as a worst-case approach.

**Assessing Significance**Construction Phase

- 7.2.70 The IAQM construction dust guidance (Ref 7.19) categorises the unmitigated risk of dust impacts on human health and amenity (rather than ascribe a significance of effect) as a

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means of identifying the level of dust emissions mitigation required to ensure that residual impacts are 'not significant'.

7.2.71 A higher dust risk rating requires more stringent mitigation measures in order to limit residual effects.

7.2.72 The methodology for assessing significance of effects from construction phase vehicle exhaust emissions follows the same guidance as for the operational phase detailed in paragraphs 7.2.73 to 7.2.77.

### Operational Phase

7.2.73 The impacts of the proposed Development have been assessed in accordance with the IAQM development control guidance (Ref 7.20). The characterisation of air quality effects during operation is dependent upon the percentage change in concentration and the total concentration, relative to the relevant air quality objective(s) (presented in Table 7-1). The impact descriptors relative to the change metrics and air quality assessment levels are presented in Table 7-4. The table is used by rounding the change in percentage pollutant concentration to a whole number, making it clear which category the impact falls within.

Table 7-4 IAQM impact descriptors for individual receptors (Ref 7-20)

Long Term Average Concentration at Receptor in Assessment Year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 - 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 - 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

7.2.74 The relevant AQAL is 40µg/m<sup>3</sup> as an annual mean for both NO<sub>2</sub> and PM<sub>10</sub>, and 25µg/m<sup>3</sup> as an annual mean for PM<sub>2.5</sub>.

7.2.75 IAQM notes that these impact descriptors are for individual receptors only and the overall significance of effect should be determined using professional judgement, taking into the degree of impact and factors such as:

- The existing and future air quality in the absence of the proposed Development
- The extent of current and future populations exposure to the impact
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

7.2.76 The IAQM development control guidance (Ref 7.20) notes that an individual property exposed to a moderate adverse effect might not be considered a significant effect, but many hundreds of properties exposed to a slight adverse effect could be. This indicates that the IAQM

development control guidance (Ref 7.20) avoids the use of prescriptive approaches and places an emphasis on professional judgement.

- 7.2.77 Evaluation of the significance of effects from construction phase vehicle exhaust emissions has been undertaken in the accordance with the approach described above.

## Limitations and Assumptions

### Limitations

- 7.2.78 Emission rates and background concentrations for 2030 have been used to carry out the 2031 operational phase assessment as current air quality tools issued by Defra have a horizon year of 2030. Therefore, the 2031 assessment is considered to be worst case, as emissions rates and background concentrations are likely to decrease between 2030 and 2031 due to the ongoing effect of national and local government policy and the integration of greater numbers of cleaner vehicles (lower emission) into the traffic fleet. Additionally, 2031 traffic flows both with and without the proposed Development would be higher in 2031 than would actually be the case in 2030 due to traffic growth over time so this also highlights the inherent conservatism that is embedded in the assessment.

### Assumptions

- 7.2.79 The construction phase dust assessment assumes that all proposed construction activities will take place within the site boundary. This is a worst-case estimate that has been adopted to ensure that potential impacts at receptors within 350m of the application site boundary have been considered.
- 7.2.80 For the construction phase vehicle exhaust emissions assessment, the year assessed is 2023 which is assumed to be the peak construction year within the construction phase. It is assumed that the construction vehicles will access the site using six temporary construction access points. Further detail of the construction traffic assumptions is presented in the Chapter 17 (Transport) section 17.2.
- 7.2.81 The 2019 baseline traffic flows along Granham's Road were taken from the Environmental Statement for Land at Newbury Farm development (Ref 7.29), with the percentage of HDV's adapted from the associated Transport Assessment for the proposed Development. Traffic flows for Francis Crick Avenue were estimated using survey data from Thursday 10 October 2019 between 06:00 and 21:00. Given that the roads are controlled by ANPR to prevent through traffic and that before 6am and after 9pm most of the trips' attractors would be closed, for robustness it was assumed that 24-hour flows are equal to 15-hour (06:00-21:00) flows.
- 7.2.82 The opening year of the proposed Development is 2026, however it is anticipated that the station will not be fully utilised until 2031. It is assumed that the shift from road vehicle to rail use will increase from 2026 onwards and be at its greatest in 2031 when compared to a without development scenario. Therefore, the scenario of 2031 has been assessed, in addition to the opening year, as this assumes the largest traffic impact associated with the proposed Development and also includes cumulative traffic associated with other reasonably foreseeable developments such as Cambridge South East Transport (CSET).
- 7.2.83 It is anticipated that the development will not lead to an increase in bus movements. The station will generate about 678 rail/bus interchange trips throughout the day which equates to about 2 extra passengers per bus.

## 7.3 Baseline

### Existing Baseline

#### Local Authority Air Quality Monitoring Data

- 7.3.1 As required by Part IV of the Environment Act 1995 (Ref 7.4), CCiC produces Annual Status Reports (ASRs) each year. The most recently available report is the 2020 ASR (Ref 7.30) which summarises air quality in CCiC during 2019. In total CCiC monitor NO<sub>2</sub> at 74 locations (69 passive and five automatic sites) and particulate matter at four locations. The majority are



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located in city centre where air quality is poorest. CCiC declared an AQMA in 2005 due to persistent exceedances of the AQS objective for annual mean NO<sub>2</sub>. The southern edge of the AQMA is located approximately 1.9km north of the proposed Development.

- 7.3.2 There are 10 passive diffusion tube NO<sub>2</sub> monitoring sites located within 1.5km of the proposed Development and Cambridge Biomedical Campus (CBC), displayed on Figure 7-3. The annual mean concentrations at these sites between 2015 and 2019 are summarised in Table 7-5.

Table 7-5 Summary of Cambridge City Council NO<sub>2</sub> monitoring sites in the vicinity of the proposed Development

Monitoring Site ID	Type	X	Y	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )				
				2015	2016	2017	2018	2019
DT6	K	544867	255709	N/A	N/A	40	37	34
DT27	R	544575	255307	25	24	19	20	18
DT28	R	546953	255138	N/A	N/A	39	32	33
DT51	R	544960	254220	27	27	24	22	25
DT66	R	544614	254646	N/A	36	32	30	28
DT67	R	544664	254600	N/A	25	21	18	19
DT68	R	545237	254212	N/A	22	18	17	16
DT69	R	546702	255380	N/A	27	24	22	21
DT70	R	546700	255374	N/A	27	22	21	21

R = Roadside (i.e within 1-5m of the kerbside)

K= Kerbside (i.e. Site sampling within 1m of a busy road)

- 7.3.3 Table 7-5 demonstrates that annual mean concentrations of NO<sub>2</sub> in the vicinity of the proposed Development were below the relevant AQS objective of 40µg/m<sup>3</sup> during 2019. The highest concentration is located at DT6 which is a kerbside site on A1134 Long Lane. The nearest representative site to the proposed Development is DT68 located on Addenbrooke's Road which had an annual mean concentration of 16µg/m<sup>3</sup> during 2019, indicating a good level of existing air quality in the vicinity of the proposed Development.
- 7.3.4 Table 7-5 also demonstrates that concentrations of NO<sub>2</sub> at all of the local monitoring sites have decreased over time since 2015.
- 7.3.5 Automatic monitoring of particulate matter elsewhere in the city indicates that both PM<sub>10</sub> and PM<sub>2.5</sub> meet the respective annual mean and daily AQS objectives (applicable to PM<sub>10</sub> only) for each pollutant at all sites.
- 7.3.6 There are no air quality monitoring sites from the SCDC area located within the operational phase air quality study area for the proposed Development.

### Defra Background Concentrations

- 7.3.7 Predictions of background pollutant concentrations are periodically produced by Defra to assist LAs in their review and assessment of air quality. These are produced for every 1km Ordnance Survey grid square in the UK. The Site and air quality study area is located across a number of grid squares. Data for the grid squares that cover the air quality study area were downloaded from the Defra website (Ref 7.22) for the purposes of the assessment. Table 7-6



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summarises the range of background concentrations for the base year (2019) relating to the grid squares covering the proposed Development site and surrounding study area.

Table 7-6 Base year (2019) Defra background concentrations at the proposed Development site

Pollutant	Minimum ( $\mu\text{g}/\text{m}^3$ )	Maximum ( $\mu\text{g}/\text{m}^3$ )	Average ( $\mu\text{g}/\text{m}^3$ )	Annual Mean Air Quality Objective ( $\mu\text{g}/\text{m}^3$ )
NO <sub>2</sub>	8.9	12.6	10.4	40
PM <sub>10</sub>	15.1	16.8	15.9	40
PM <sub>2.5</sub>	9.6	10.0	9.8	25

7.3.8 Table 7-6 shows that 2019 background NO<sub>2</sub> and particulate matter concentrations in the vicinity of the proposed Development are below the relevant objective values.

7.3.9 Air quality practitioners commonly acknowledge that Defra background maps of NO<sub>2</sub>/NO<sub>x</sub> are often overly optimistic as they generally assume a greater decrease in pollutant concentrations over time than is actually the case when compared to monitoring data. To establish whether there was a systematic under-prediction, the concentrations recorded during 2019 at three urban background diffusion tube monitoring sites in Cambridge, shown in Table 7-7, were compared to Defra background mapped values for the same grid square. These monitors were chosen as they were located in locations away from road pollution sources and are therefore representative background concentrations within the grid square that they are located.

Table 7-7 Cambridge City Council 2019 Background NO<sub>2</sub> Concentrations

Monitoring Site ID	X	Y	2019 Annual Mean NO <sub>2</sub> Background Concentration ( $\mu\text{g}/\text{m}^3$ )		
			Monitored	Defra Modelled	Factor
DT11	544784	256746	11	9	1.22
DT36	546596	257594	15	13	1.15
DT37	545885	260088	15	12	1.25
Average					1.21

7.3.10 With reference to Table 7-7, when compared to monitors in urban background locations it was found that the Defra maps appeared to under predict NO<sub>2</sub> concentrations by a factor of 1.21. Therefore, the concentrations in the background NO<sub>x</sub>/NO<sub>2</sub> maps were uplifted by 1.21. This is broadly consistent with national comparisons (Air Quality Consultants Ltd, 2019 (Ref 7.31)) undertaken by where the factor has been found to be 1.05. The locally derived factor of 1.21 factor was applied to PM<sub>10</sub> and PM<sub>2.5</sub> background maps as there was insufficient monitoring data generated in background locations to calculate particulate matter specific factors.

7.3.11 As the background NO<sub>x</sub>, PM<sub>2.5</sub>, and PM<sub>10</sub> maps provide data for the individual pollutant sectors (e.g. motorway, trunk A-roads, primary A-roads, minor roads and industry), the components relating to in-grid square A-road traffic were removed (after the backgrounds had been uplifted) for those road types being explicitly modelled. This was done to avoid double counting of road emissions. The NO<sub>x</sub> contribution of the in-grid A-road sectors was removed from the uplifted total NO<sub>x</sub> background concentrations. The adjusted total NO<sub>x</sub> background

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concentration was then converted to NO<sub>2</sub> for use in the assessment. This was undertaken using the NO<sub>2</sub> Adjustment for NO<sub>x</sub> Sector Removal tool (Ref 7.32). This calculator was used to adjust the 2019, 2026 and 2030 background concentrations. Defra tools were configured to 2030 for the purposes of the 2031 modelled scenario as the latest available year in the tools is 2030.

## Future Baseline

### Defra Background Concentrations: 2026

7.3.12 Data for the grid squares that cover the air quality study area were downloaded from the Defra website (Ref 7.22) for the purposes of the assessment. Table 7-8 summarises the range of background concentrations for the opening year (2026) relating to the grid squares covering the proposed Development site and surrounding study area.

*Table 7-8 Opening year (2026) Defra background concentrations at the proposed Development site*

Pollutant	Minimum (µg/m <sup>3</sup> )	Maximum (µg/m <sup>3</sup> )	Average (µg/m <sup>3</sup> )	Annual Mean Air Quality Objective (µg/m <sup>3</sup> )
NO <sub>2</sub>	6.9	10.0	8.0	40
PM <sub>10</sub>	14.0	15.6	14.8	40
PM <sub>2.5</sub>	8.7	9.0	8.9	25

7.3.13 Table 7-8 shows that 2026 background NO<sub>2</sub> and particulate matter concentrations in the vicinity of the proposed Development are below the relevant annual mean air quality objective values.

### Defra Background Concentrations: 2030

7.3.14 Data for the grid squares that cover the air quality study area were obtained from the Defra website (Ref 7.22) for the purposes of the assessment. Table 7-9 summarises the range of background concentrations for 2030 (the closest representative year for the full operational year of 2031) relating to the grid squares covering the proposed Development site and surrounding study area.

*Table 7-9 Representative full operational year (2030) Defra background concentrations at the proposed Development site*

Pollutant	Minimum (µg/m <sup>3</sup> )	Maximum (µg/m <sup>3</sup> )	Average (µg/m <sup>3</sup> )	Annual Mean Air Quality Objective (µg/m <sup>3</sup> )
NO <sub>2</sub>	6.3	9.3	7.3	40
PM <sub>10</sub>	14.0	15.6	14.7	40
PM <sub>2.5</sub>	8.7	9.0	8.9	25

7.3.15 Table 7-9 shows that 2030 background NO<sub>2</sub> and particulate matter concentrations in the vicinity of the proposed Development are below the relevant objective values.

## 7.4 Design and Mitigation

- 7.4.1 The design features of the proposed Development and mitigation measures that would ameliorate adverse effects on air quality are set out in this section.

### Construction Approach and Mitigation of Construction Effects

- 7.4.2 Construction phase impacts from dust were characterised in accordance with IAQM's (2014) construction dust guidance (Ref 7.19) as a means of defining the level of construction phase mitigation that was required. The full construction phase dust emissions assessment is presented in Appendix 7.3.
- 7.4.3 In summary, the assessment concluded that the potential risk of dust soiling to receptors is high for earthworks and construction, and low or negligible for trackout activities. The potential risk of human health impacts is low for each activity. The assessment has therefore indicated that the maximum risk of unmitigated dust effects (i.e. consideration of both dust soiling and human health impacts) is high.
- 7.4.4 Therefore, those mitigation measures detailed in the IAQM construction dust guidance (Ref 7.19) commensurate with a high-risk site have been included as part of the outline Code of Construction Practice (CoCP Part A) (see Appendix 2.4).
- 7.4.5 The IAQM construction dust guidance (Ref 7.19) provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the proposed Development based on the unmitigated risk of dust effects and are detailed in full in Appendix 7.3. The proposed mitigation measures summarised below will be secured through the CoCP Part A:
- Site Management (logging of incidents/complaints)
  - Monitoring (site inspections, soiling checks, compliance with Dust Management Plan, etc)
  - Preparing and Maintaining the site (locate dust causing activities away from receptors, barriers, cleaning, enclosed specific operations with high potential for dust production, cover stockpiles, etc)
  - Operating vehicle/machinery and sustainable travel (comply with NRMM standards (as detailed in Regulation (EU) 2016/1628 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road machinery (Ref 7.33) and Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (SI 2018/764) (Ref 7.34)) no idling, use mains electricity, travel plan etc)
  - Operations (employ dust suppression, use enclosed chutes, minimise drop heights, etc)
  - Earthworks measures (revegetate promptly, use hessian mulches and cover with topsoil, etc)
  - Construction measures (avoid scabbling, keep aggregates damp, ensure fine powder materials are delivered enclosed and stored in silos, ensure bags are sealed after use)
  - Trackout measures (wash access and local roads, avoid dry sweeping of large areas, ensure vehicle-borne materials are covered, install hard surface haul routes, wheel washing, etc).

### Scheme Design and Mitigation of Operational Effects

- 7.4.6 The nature of the scheme design and implementation incorporates a reduction of operational air quality effects as it promotes a sustainable journey transfer from vehicle use to rail and

therefore reduces traffic on the local road network and the associated vehicle exhaust emissions.

- 7.4.7 Additional operational mitigation measures beyond the embedded scheme design is not required due to the predicted negligible air quality effects for all modelled scenarios.

## 7.5 Assessment of Residual and Cumulative Effects

### Introduction

- 7.5.1 The following section outlines the residual effects once the design features and mitigation measures described in Section 7.4 have been implemented.
- 7.5.2 The operational phase section summarises the effects anticipated from the changes in road traffic associated with the operation of the proposed Development in 2026 and 2031. The modelled scenarios without and with the proposed Development in 2026 and 2031 include committed developments of the future baseline, taking into account growth from regional housing and job forecasts.

### Residual Effects from Construction

#### Construction Phase Vehicle Emissions

- 7.5.3 There are estimated to be a total of 224 two-way HGV movements and 516 two-way LGV movements (as an AADT flow) to and from the proposed Development site per working day during the peak construction period in 2023. The construction vehicle traffic is expected to access the site at various access points along the site boundary and the emissions associated with these movements have been assessed accordingly. For further detail on construction traffic movements refer to Chapter 17: Traffic and Transport.
- 7.5.4 The modelled results, displayed in Appendix 7.5 demonstrate that the largest impact of construction vehicle exhaust emissions on any of the existing worst-case receptors is an increase of 2.1  $\mu\text{g}/\text{m}^3$  annual average  $\text{NO}_2$  at R12, located on Addenbrookes Road approximately 500m west of the proposed Development. The highest annual mean  $\text{NO}_2$  concentration in the peak construction year was 26.7  $\mu\text{g}/\text{m}^3$  predicted at R7, located on the A1309 High Street. Figure 7-2 displays the modelled road network and receptor locations.
- 7.5.5 The highest annual average  $\text{PM}_{10}$  concentration during the peak construction year was 17.9  $\mu\text{g}/\text{m}^3$  and predicted at R11, located on Addenbrookes Road approximately 500m west of the proposed Development.
- 7.5.6 The largest increase of annual average  $\text{PM}_{10}$  concentration at any modelled receptor in the peak construction year was of 0.4  $\mu\text{g}/\text{m}^3$  at R12.
- 7.5.7 The modelled concentrations at all receptors in the peak construction period was significantly below the relevant annual mean AQS objective for each pollutant. Therefore, in accordance with IAQM guidance the air quality impacts associated with construction vehicle exhaust emissions are negligible as summarised in Table 7-10.

Table 7-10 Summary of 2023  $\text{NO}_2$ ,  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$  modelling results

IAQM Descriptor	Number of existing receptors	
	Adverse	Beneficial
Substantial	0	0
Moderate	0	0
Slight	0	0
Negligible	16	

## Construction Dust Assessment

- 7.5.8 In order to mitigate against the impacts of construction dust at receptors, best practice measures should be adopted. Based on the risk ratings presented in this chapter, mitigation measures have been proposed to reduce the potential impacts, as detailed in Appendix 7.3.
- 7.5.9 The identified mitigation measures are incorporated into the CoCP Part A and reflect the requirements of best practice measures. This will be developed in more detail when CoCP Part B will be produced prior to commencement of works and submitted to the local planning authorities for approval to discharge the relevant deemed planning condition. It will outline environmentally sensitive areas, mitigation measures to protect such areas, and method statements for specific construction activities.
- 7.5.10 With adoption of the mitigation measures summarised in paragraph 7.4.5 (detailed in full in Appendix 7.3), impact of construction phase dust effects would be Negligible and residual effects would be **Not Significant**, as the adopted measures will serve to reduce or eliminate impacts on dust soiling and human health.

## Residual Effects from Operation

- 7.5.11 The operational phase impacts have been assessed for the opening year of 2026 and full operational year of 2031. The modelled scenarios with and without the proposed Development include committed developments are therefore inherently cumulative in nature.
- 7.5.12 Without and with proposed Development concentrations were predicted for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>. The change in pollutant concentration and resultant total concentration would determine whether the proposed Development impact at a given existing receptor would be Negligible, Slight, Moderate or Substantially Adverse/Beneficial. A total of 16 receptor locations across the modelled road network were assessed (presented in Figure 7-2). These locations were those receptors closest to roads with the greatest predicted change in traffic flow and/or where existing pollutant concentrations were highest to ensure a worst-case approach was considered. Details of the modelled receptor locations are listed in Appendix 7.2.

## 2026 Opening Year

- 7.5.13 The results of Base Year (2019), Do-Minimum (2026) and Do-Something (2026) NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations at the modelled receptor locations are presented in Appendix 7.5. The annual mean NO<sub>2</sub> concentrations reported for the Do-Minimum and Do-Something (2026) have been adjusted using Long Term Trends (LTT) Gap Factor Analysis in accordance with the advice in LA 105 (Ref 7.21). This is to ensure that the future year modelled predictions are not overly optimistic.

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7.5.14 Table 7-11 summarises the change in annual mean NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentration associated with the 2026 operational phase on all modelled receptors and associated IAQM impact descriptor.

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Table 7-11 Summary of 2026 NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> modelling results

IAQM Descriptor	Number of existing receptors	
	Adverse	Beneficial
Substantial	0	0
Moderate	0	0
Slight	0	0
Negligible	16	

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- 7.5.15 Table 7-11 demonstrates that the impact of the proposed Development is negligible at all existing receptors in the 2026 operational phase for pollutants NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>.
- 7.5.16 The highest predicted NO<sub>2</sub> concentration in the 'with Development' scenario is at R7 where an annual mean concentration of 24.6 µg/m<sup>3</sup> is predicted. R7 is located on the A1309 High Street where it is predicted to experience a 5% reduction in traffic as a result of the proposed Development; the change in concentration at this receptor is regarded as Negligible and **Not Significant**. This indicates that no modelled receptors are expected to exceed both the annual mean and 1 hour mean objectives for NO<sub>2</sub>.
- 7.5.17 The receptor with the highest PM<sub>10</sub> and PM<sub>2.5</sub> concentration was R7 with a concentration of 18.4 µg/m<sup>3</sup> and 16.9 µg/m<sup>3</sup> for PM<sub>10</sub> and PM<sub>2.5</sub> respectively. Both concentrations are well below the relevant annual mean AQS objectives of 40 µg/m<sup>3</sup> for PM<sub>10</sub> and 25 µg/m<sup>3</sup> for PM<sub>2.5</sub>.
- 7.5.18 Therefore, the results demonstrate that the operational phase of the proposed Development in the opening year of 2026 would not lead to any adverse significant effects on local air quality at existing receptors.

## 2031 Full Operational Year

- 7.5.19 The Base Year (2019), Do-Minimum (2031) and Do-Something (2031) NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations at the modelled receptor locations are presented in Appendix 7.5. The annual mean NO<sub>2</sub> concentrations reported for the Do-Minimum and Do-Something (2031) have been adjusted using Long Term Trends (LTT) Gap Factor Analysis in accordance with the advice in LA 105 (Ref 7.21). This is to ensure that the future year modelled predictions are not too optimistic.
- 7.5.20 Table 7-12 summarises the change in annual mean NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentration associated with the 2031 operational phase on all modelled receptors and associated IAQM impact descriptor.

Table 7-12 Summary of 2031 NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> modelling results

IAQM Descriptor	Number of existing receptors	
	Adverse	Beneficial
Substantial	0	0
Moderate	0	0
Slight	0	0
Negligible	16	



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- 7.5.21 Table 7-11 demonstrates that the impact of the proposed Development is negligible at all existing receptors in the 2031 operational phase for pollutants NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>.
- 7.5.22 The highest predicted NO<sub>2</sub> concentration in the 'with Development' scenario is at R7 where an annual mean concentration of 24.1 µg/m<sup>3</sup> is predicted. R7 is located on the A1309 High Street where it is predicted to experience a 5% reduction in traffic as a result of the proposed Development; the change in concentration at this receptor is regarded as Negligible and **Not Significant**. This indicates that no modelled receptors are expected to exceed both the annual mean and 1 hour mean objectives for NO<sub>2</sub>.
- 7.5.23 The receptor with the highest PM<sub>10</sub> and PM<sub>2.5</sub> concentration was R7 with a concentration of 18.6 µg/m<sup>3</sup> and 16.9 µg/m<sup>3</sup> for PM<sub>10</sub> and PM<sub>2.5</sub> respectively. Both concentrations are well below the relevant annual mean AQS objectives of 40 µg/m<sup>3</sup> for PM<sub>10</sub> and 25 µg/m<sup>3</sup> for PM<sub>2.5</sub>.
- 7.5.24 Therefore, the results demonstrate that the operational phase of the proposed Development in the full operational year of 2031 would not lead to any adverse significant effects on local air quality at existing receptors.

## Cumulative Effects

- 7.5.25 Inter-project cumulative effects of the proposed Development with other schemes have been included in the traffic data provided and hence cumulative effects in relation to air quality have been considered throughout the assessment. A full list of cumulative schemes included in the traffic modelling are detailed in the Cumulative Effects section in Chapter 17: Transport and Traffic.

### CSET Scheme

- 7.5.26 A construction plan for the CSET Scheme was not available at the time of this assessment however CSET are seeking to avoid construction overlap with the proposed Development within the same areas and therefore reduce the risk of cumulative dust impacts. Should this change and the CSET construction works coincide with the construction phase of the proposed Development, it is envisaged that CSET would also adopt best practice mitigation measures in terms of construction dust, in which case, the potential cumulative effects from fugitive dust emissions during the construction phase will remain as **Not Significant**.
- 7.5.27 Any traffic generated by the CSET scheme would cause increases in vehicle exhaust emission in the vicinity of the proposed Development, however, any potential operational emissions increases would be as a result of CSET alone as traffic flows are anticipated to reduce as a direct result of the proposed Development. The results of the dispersion modelling undertaken for the operational phase of the proposed Development confirm that concentrations are expected to decrease or show no change at all modelled receptors when the proposed Development is assessed in isolation.
- 7.5.28 Construction traffic data for CSET was not available at the time of this assessment, however, providing liaison with the CSET scheme in the vicinity of the proposed Development is undertaken regarding construction vehicle routes and mitigation measures, it is not anticipated that this would cause significant cumulative effects, particularly as existing background concentrations are low. Potential cumulative effects from vehicle emissions during the construction and operational phases will therefore remain as **Not Significant**.

## 7.6 Assessment Summary

- 7.6.1 The risk of dust impacts during the construction phase was evaluated by assessing the dust emissions magnitude of the planned construction activities and by taking into account the existing sensitivity of the area. It was concluded that there would be a high risk of dust impacts from the construction phase if left unmitigated. However, with the application of the relevant mitigation measures outlined in Appendix 7.3, it is concluded that the residual effect would be Negligible and **Not Significant**.
- 7.6.2 The vehicle exhaust emissions impact of the proposed Development on local air quality has been assessed by undertaking air quality modelling of the without and with proposed

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Development scenarios in 2023 peak construction year, 2026 opening year and 2031 full operational year.

- 7.6.3 Base year (2019) monitored concentrations indicated that air quality in the study area does not exceed the AQS Objectives. Traffic data for the various assessment years have been modelled in ADMS-Urban and the modelled output has been verified using existing monitoring data. For NO<sub>2</sub> and particulate matter, the implementation of the proposed Development is predicted to result in Negligible impacts at existing worst-case receptors in each scenario and therefore effects are **Not Significant**.
- 7.6.4 The evaluation of the significance of effects was informed with the application of professional judgment in accordance with the IAQM development control guidance (Ref 7.20). It was concluded that the proposed Development does not have a significant effect on local air quality in either of the operational or construction phases.
- 7.6.5 Table 7-13 provides assessment summary with respect to air quality and how they have been addressed.

Table 7-13 Assessment Summary

Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Human Receptors (Increased dust soiling/increased PM <sub>10</sub> concentrations from construction activities)	<p>The potential effects from dust soiling are high risk.</p> <p>In accordance with IAQM construction dust guidance it is not appropriate to consider the significance of effects without mitigation as the purpose of the guidance is to define the required mitigation.</p>	C	<p>Full detail presented in Appendix 7.3. In summary:</p> <ul style="list-style-type: none"> <li>• Site Management (logging of incidents/complaints)</li> <li>• Monitoring (site inspections, soiling checks, compliance with Dust Management plan, etc)</li> <li>• Preparing and Maintaining the Application Site (locate dust causing activities away from receptors, barriers, cleaning, enclosed specific operations with high potential for dust production, cover stockpiles, etc)</li> <li>• Operating vehicle/machinery and sustainable travel (comply with NRMM standards, no idling, use mains electricity, travel plan etc)</li> <li>• Operations (employ dust suppression, use enclosed chutes, minimise drop heights, etc)</li> <li>• Earthworks measures (revegetate promptly, use hessian mulches and cover with topsoil, etc)</li> <li>• Construction measures (avoid scabbling, keep aggregates damp, ensure fine powder materials are delivered enclosed</li> </ul>	<p>Negligible</p> <p><b>Not Significant</b></p>

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
			and stored in silos, ensure bags are sealed after use)  • Trackout measures (wash access and local roads, avoid dry sweeping of large areas, ensure vehicle-borne materials are covered, install hard surface haul routes, wheel washing, etc)	
Human Receptors (Increased pollutant concentrations from construction vehicle exhaust emissions)	The potential effects from increased pollutant concentrations are negligible and Not Significant.	C	None required. Assessment of impacts with worst-case assumptions results in negligible effects.	Negligible <b>Not Significant</b>
Human receptors during operational phase	The potential effects from NO <sub>2</sub> , PM <sub>10</sub> and PM <sub>2.5</sub> for existing receptors are negligible and Not Significant.	O	None required	Negligible <b>Not Significant</b>

## 7.7 References

Reference	Title
Ref 7.1	Defra (2018) Local Air Quality Management Technical Guidance LAQM.TG(16)
Ref 7.2	Air Quality Framework Directive (1996) Directive 96/62/EC
Ref 7.3	Ambient Air Quality Directive (2008) Directive 2008/50/EC
Ref 7.4	Part IV of the Environment Act 1995
Ref 7.5	Air Quality (England) Regulations 2000 (SI 2000/928)
Ref 7.6	Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043)
Ref 7.7	Air Quality Standards Regulations 2007 (2007/64)
Ref 7.8	The Air Quality Standards Regulations 2010 (SI 2010/1001)
Ref 7.9	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154)
Ref 7.10	Section 79 of Part III of the Environmental Protection Act 1990
Ref 7.11	Ministry of Housing, Communities and Local Government (2019), National Planning Policy Framework
Ref 7.12	Defra (2019) Clean Air Strategy 2019, Available from: <a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf</a>
Ref 7.13	Cambridge City Council (2018) Cambridge Local Plan. Available from: <a href="https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf">https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf</a>
Ref 7.14	Cambridge City Council (2018) Cambridge City Council Air Quality Action Plan 2018 -2023. Available from: <a href="https://www.cambridge.gov.uk/air-quality-action-plan">https://www.cambridge.gov.uk/air-quality-action-plan</a>
Ref 7.15	South Cambridgeshire District Council (2018) South Cambridgeshire Local Plan. Available from: <a href="https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/the-adopted-development-plan/south-cambridgeshire-local-plan-2018/">https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/the-adopted-development-plan/south-cambridgeshire-local-plan-2018/</a>
Ref 7.16	Network Rail (2020) The Network Rail (NR) Environment Sustainability Strategy 2020-2050. Available from: <a href="https://safety.networkrail.co.uk/environmental-sustainability-strategy/">https://safety.networkrail.co.uk/environmental-sustainability-strategy/</a>
Ref 7.17	Department for Communities and Local Government (2014), National Planning Practice Guidance (as amended) Available from <a href="http://planningguidance.communities.gov.uk/blog/guidance/air-quality/">http://planningguidance.communities.gov.uk/blog/guidance/air-quality/</a>
Ref 7.18	Greater Cambridge Shared Planning (2020) The Greater Cambridge Sustainable Design and Construction Supplementary Planning (SPD) Document. Available from: <a href="https://www.cambridge.gov.uk/media/8157/greater-cambridge-sustainable-design-and-construction-spd.pdf">https://www.cambridge.gov.uk/media/8157/greater-cambridge-sustainable-design-and-construction-spd.pdf</a>
Ref 7.19	Institute of Air Quality Management (IAQM) (2014), Guidance on the Assessment of Dust from Demolition and Construction version 1.1
Ref 7.20	Institute of Air Quality Management & Environmental Protection UK (2017) Land-Use Planning & Development Control: Planning for Air Quality V1.2.

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Reference	Title
Ref 7.21	Highways England (2020) Design Manual for Roads and Bridges LA 105 England National Application Annex to LA 105, Air Quality
Ref 7.22	Defra (2020) UK Air website <a href="https://uk-air.defra.gov.uk/">https://uk-air.defra.gov.uk/</a>
Ref 7.23	South Cambridgeshire District Council (2020) South Cambridgeshire District Council Air Quality Website <a href="https://www.scambs.gov.uk/environment/pollution/air-pollution/local-air-quality-management/">https://www.scambs.gov.uk/environment/pollution/air-pollution/local-air-quality-management/</a>
Ref 7.24	Cambridge City Council (2020) Cambridge City Council Air Quality Website <a href="https://www.cambridge.gov.uk/air-quality">https://www.cambridge.gov.uk/air-quality</a>
Ref 7.25	Defra (2020) NO <sub>x</sub> to NO <sub>2</sub> Calculator (v8.1). Available at: <a href="https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html">https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html</a>
Ref 7.26	Department for Environment, Food and Rural Affairs (Defra) (2011), Trend in NO <sub>x</sub> and NO <sub>2</sub> emissions and ambient measurements in the UK
Ref 7.27	Defra (2020) Emissions Factor Toolkit version 10.1. Available at: <a href="https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html">https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html</a>
Ref 7.28	Highways Agency (2012) Long Term Gap Analysis Calculator v1.1
Ref 7.29	RPS group (2019) Land At Newbury Farm Planning Application. Available from: <a href="https://applications.greatercambridgeplanning.org/online-applications/applicationDetails.do?activeTab=documents&amp;keyVal=PWLDTYDXGHA00">https://applications.greatercambridgeplanning.org/online-applications/applicationDetails.do?activeTab=documents&amp;keyVal=PWLDTYDXGHA00</a>
Ref 7.30	Cambridge City Council (2020) 2020 Annual Status Report. Available from: <a href="https://www.cambridge.gov.uk/media/8526/air-quality-annual-status-report-2020.pdf">https://www.cambridge.gov.uk/media/8526/air-quality-annual-status-report-2020.pdf</a>
Ref 7.31	Air Quality Consultants Ltd (2019) <a href="https://www.aqconsultants.co.uk/resources">https://www.aqconsultants.co.uk/resources</a>
Ref 7.32	Defra (2020) NO <sub>2</sub> Adjustment for NO <sub>x</sub> Sector Removal tool
Ref 7.33	Regulation (EU) 2016/1628 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road machinery
Ref 7.34	Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (SI 2018/764)

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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 8 – Biodiversity**

JUNE 2021

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## 8 Biodiversity

### 8.1 Introduction

- 8.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to Biodiversity. The assessment incorporates relevant design and other mitigation measures that would be employed during construction of the proposed Development.
- 8.1.2 A summary of relevant legislation, policy and guidance, and a description of the methodologies used to assess the potential effects of the proposed Development is provided in Sections 8.2. The assessment of baseline conditions is addressed in section 8.3.
- 8.1.3 All figures referenced within this Chapter are presented in Volume 3 Appendix 8.1 of the ES and all appendices referenced in this Chapter are presented in Volume 3 (Appendices 8.2 to 8.10).

### Relevant Aspects of the Proposed Development

- 8.1.4 A description of the proposed development is provided in Chapter 4: The Site and the Proposed Development, of this ES. The proposed Development has the potential to impact on Biodiversity during the construction and operational phase, the specific aspects of which are detailed in the subsequent sections of this chapter.

#### Construction Phase

- 8.1.5 Construction activities which have the potential to impact on biodiversity may include:
- Vegetation clearance of the development footprint and works areas
  - Earth works and movement
  - Demolition works associated with track improvements
  - Rail improvement works and additional track and signalling works
  - Construction of the proposed station and associated infrastructure, access routes and compound areas
  - Creation of amenity areas and soft landscaping
  - Changes in lighting, noise, vibration and air or water quality
- 8.1.6 The impacts of the construction phase on conservation areas will also be considered and assessed.

#### Operational Phase

- 8.1.7 Operational activities which have the potential to impact on Biodiversity may include:
- Activities associated with the operation and management of the new station and associated infrastructure and drainage
  - Direct or indirect impacts from the presence of new infrastructure and changes in the operation of the railway including lighting, noise, vibration, visual or air quality effects
  - Increased public access or recreational pressure
  - Activities associated with the management of newly created areas

### 8.2 Assessment Methodology

#### Legislation, Policy and Guidance

- 8.2.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the proposed Development. A summary of the relevant legislation and policies and their requirements is provided below.

## Legislation

### Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

- 8.2.2 This Directive (abbreviated to “The Habitats Directive”) (Ref 8.1) is a European Council Directive adopted in 1992. Annex IV of the Directive lists the European Protected Species (EPS) that member states should legislate to protect, Annex II lists those species for which provision within Special Areas of Conservation (SACs) needs to be accommodated. The provisions of the Habitats Directive are transposed into UK law by the Conservation of Habitats and Species Regulations 2017 (as amended).

### Conservation of Wild Birds (2009/147/EC)

- 8.2.3 This Directive (abbreviated to “The Birds Directive”) (Ref 8.2) provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. Annex I of the Birds Directive lists the species and sub-species which are particularly threatened and for which member states must designate Special Protection Areas (SPAs) for their survival.
- 8.2.4 The provisions of the Birds Directive are transposed into UK law by the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended) (Ref 8.3).

### Conservation of Habitats and Species Regulations 2017 (as amended)

- 8.2.5 These Regulations (abbreviated to “The Habitats Regulations”) provide for the designation of SPAs and SACs as part of the national site network of protected areas across the UK (Ref 8.4). The Habitats Regulations were amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. The Habitats Regulations also provide protection for EPS from deliberate capture, killing or disturbance and make it an absolute offence to destroy or damage the resting site or breeding site of an EPS. Those EPS which may be relevant to the proposed Development include dormouse *Muscardinus avellanarius*, great crested newt *Triturus cristatus* and all horseshoe bat *rhinolophidae* and typical bat *vespertilionidae* species.

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

- 8.2.6 The WCA (Ref 8.3) provides for the designation of Sites of Special Scientific Interest (SSSIs), which are selected as the best national examples of habitat types, sites with notable species, and sites of geological importance (the latter of which are beyond the scope of this Chapter).
- 8.2.7 Full protection is given under section 9 of the WCA to certain animals listed in Schedule 5, including those that may be relevant to the proposed Development including dormouse and all bat species. Partial protection is also given under section 9 to certain other species, including reptiles.
- 8.2.8 All wild birds, their nests and eggs are fully protected under section 1 of the Act. In addition, Schedule 1 species such as the barn owl *Tyto alba* have additional protection, making it an offence to intentionally or recklessly disturb Schedule 1 birds.
- 8.2.9 Schedule 9 of the Act provides a list of non-native invasive species. It is an offence, under section 14 of the Act to release or allow to escape into, or to plant or otherwise cause to grow in the wild any plant which is included in Part II of Schedule 9, such as Japanese Knotweed (*Fallopia japonica*).

### Natural Environment and Rural Communities (NERC) Act 2006

- 8.2.10 The NERC Act 2006 (Ref 8.5) requires that any public body or statutory undertaker in England and Wales must have regard to the purpose of conservation of biological diversity in the exercise of their functions. The intention is to help ensure that biodiversity becomes an integral consideration in the development of policies, and that decisions of public bodies work with the grain of nature and not against it. Section 40 of the NERC Act specifies the requirements for conserving biodiversity and section 41 requires the Secretary of State to publish a list of habitats and species that are of principal importance for the conservation of biodiversity in England. This list was developed in consultation with Natural England and consists of 56 Habitats of Principal Importance and 943 Species of Principal Importance. The Habitats and Species of Principal Importance that are relevant to the proposed Development, include, but

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are not limited to; broadleaved woodland, corn bunting (*Emberiza calandra*), song thrush (*Turdus philomelos*), great crested newt, otter (*Lutra lutra*), water vole (*Arvicola amphibius*), common lizard (*Zootoca vivipara*) and grass snake (*Natrix helvetica*).

Environment Protection Act 1990 (as amended)

- 8.2.11 The Environmental Protection Act (EPA) (Ref 8.6) imposes a duty of care with regard to the control of waste disposal. The EPA makes it an offence to consign or dispose of invasive plant material (as listed under Schedule 9 of the WCA) in a way that contravenes the waste regulations (Ref 8.7). If invasive plants are located within the Site Boundary, this legislation will need to be considered.

Hedgerows Regulation 1997

- 8.2.12 The Hedgerows Regulations 1997 (Ref 8.8) are intended to protect important countryside hedgerows from destruction or damage. “Important” hedgerows are those that meet a number of criteria as defined under Schedule 1 to the Hedgerows Regulations.

The Protection of Badgers Act 1992

- 8.2.13 The Protection of Badgers Act 1992 (Ref 8.9) makes it an offence to kill, injure or take a badger. It also offers protection to badger setts, making it illegal to intentionally damage, destroy, obstruct access to or allow a dog to enter a sett, or to disturb a badger while it is in the sett.

## Bills

Environment Bill 2020-1

- 8.2.14 The Environment Bill 2020-1 (Ref 8.10) sets out plans to protect and improve the natural environment in the UK. This Bill will allow for long-term targets to be set in relation to the natural environment. As part of this plan, an ‘environmental net gain’ approach has been proposed for all developments. The key features of the Bill are; to protect ancient woodlands and grasslands, high flood risk areas and the highest quality agricultural land; to impose high environmental standards upon all new builds; and to enhance Green Belt land around developments.

## Policy

National Planning Policy Framework (NPPF) 2019

- 8.2.15 The NPPF (Ref 8.11) sets out how the planning system should protect and enhance nature conservation interest.
- 8.2.16 Section 15 of the NPPF is concerned with conserving and enhancing the natural environment and states that the planning system should achieve this by ‘*minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government’s commitment to halt the overall decline in biodiversity*’. When determining planning applications, it states that local planning authorities should aim to conserve and enhance biodiversity and to refuse planning permission ‘*if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for*’ with regard to any protection afforded to sites, habitats and species. The proposed Development will conserve and enhance biodiversity value through the identification and mitigation of significant ecological impacts.

Cambridge local plan

- 8.2.17 The Cambridge Local Plan (Ref 8.12) has two policies related to ecology that are relevant to the proposed Development. These are Policy 69 ‘Protection of sites of biodiversity and geodiversity importance’ and Policy 70 ‘Protection of priority species’.

Policy 69 states:

*‘In determining any planning application affecting a site of biodiversity or geodiversity importance, development will be permitted if it will not have an adverse impact on, or lead to the loss of, part or all of a site identified on the Policies Map. Regard must be had to the*

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*international, national and local status and designation of the site and the nature and quality of the site's intrinsic features, including its rarity.*

*Where development is permitted, proposals must include measures:*

- *To minimise harm;*
- *To secure achievable mitigation and/or compensatory measures; and*
- *Where possible enhance the nature conservation value of the site affected through habitat creation, linkage and management.'*

Policy 70 states:

*'Development will be permitted which:*

- *Protects priority species and habitats; and*
- *Enhances habitats and populations of priority species*

*Proposals that harm or disturb populations and habitats should:*

- *Minimise any ecological harm; and*
- *Secure achievable mitigation and/or compensatory measures, resulting in either no net loss or a net gain of priority habitat and local populations of priority species.*

*Where development is proposed within or adjoining a site hosting priority species and habitats, or which will otherwise affect a national priority species or a species listed in the national and Cambridgeshire-specific biodiversity action plans (BAPs), an assessment of the following will be required:*

- *Current status of the species population*
- *The species' use of the site and other adjacent habitats;*
- *The impact of the proposed development on legally protected species, national and Cambridgeshire-specific BAP species and their habitats; and*
- *Details of measures to fully protect the species and habitats identified.*

*If significant harm to the population or conservation status of a protected species, priority species or priority habitat resulting from a development cannot be avoided, adequately mitigated or, as a last resort, compensated for, then planning permission will be refused.'*

- 8.2.18 The policies will ensure that development would only be supported where it can be adequately demonstrated that proposals will not have an adverse effect on biodiversity; and that, where required, suitable mitigation measures are acceptable and deliverable.

#### South Cambridgeshire Local Plan

- 8.2.19 The South Cambridgeshire Local Plan (Ref 8.13) has two policies related to ecology that are relevant to the development. These are Policy NH/4; 'Biodiversity' and Policy NH/5: Sites of biodiversity or geological importance'.

Policy NH/4 states:

*'development proposals where the primary objective is to conserve or enhance biodiversity will be permitted.*

*New development must aim to maintain, enhance, restore or add to biodiversity.*

*If significant harm to the population or conservation status of a Protected Species, Priority Species or Priority Habitat resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission will be refused.*

*Where there are grounds to believe that a proposal may affect a Protected Species, Priority Species or Priority Habitat, applicants will be expected to provide an adequate level of survey information and site assessment to establish the extent of a potential impact.*

*Previously developed land (brownfield sites) will not be considered to be devoid of biodiversity.*

*Planning permission will be refused for development resulting in the loss, deterioration or fragmentation of irreplaceable habitats, such as ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss.*

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*Climate change poses a serious threat to biodiversity and initiatives to reduce its impact need to be considered.'*

Policy NH/5 states:

*'Proposed development likely to have an adverse effect on land within or adjoining a Site of Biodiversity or Geological Importance, as shown on the Policies Map (either individually or in combination with other developments), will not normally be permitted. Exceptions will only be made where the benefits of the development clearly outweigh any adverse impact.*

*In determining any planning application affecting Sites of Biodiversity or Geological Importance the Council will ensure that the intrinsic natural features of particular interest are safeguarded or enhanced having regard to:*

- *The international, national or local status and designation of the site;*
- *The nature and quality of the site's features, including its rarity value;*
- *The extent of any adverse impacts on the notified features;*
- *The likely effectiveness of any proposed mitigation with respect to the protection of the features of interest;*
- *The need for compensatory measures in order to re-create on or off the site features or habitats that would be lost to development.*

*Where appropriate the Council will ensure the effective management of designated sites through the imposition of planning conditions or Section 106 agreements as appropriate'.*

Cambridgeshire and Peterborough Biodiversity Group

- 8.2.20 The Cambridgeshire and Peterborough Biodiversity Group (Ref 8.14) combines a range of bodies including statutory and non-statutory government organisations and non-government organisations. This group sets out local priority species for conservation as well as Cambridgeshire and Peterborough additional species of interest (CPASI). The priority species which are relevant to the proposed Development include several bird and bat species, great crested newt, otter, water vole and reptiles such as grass snake and common lizard. Several bird, terrestrial invertebrate and plant species are listed as CPASI.

## Guidance

- 8.2.21 The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for ecological impact assessment in the UK and Ireland: terrestrial, freshwater, coastal and marine, 2018 (Ref 8.15) would be followed as the core guidance document for the assessment. Hereafter referred to as the CIEEM guidelines.
- 8.2.22 Biodiversity Metric 2.0 (JP029) (Ref 8.16), which is a tool to measure and record biodiversity value and assess losses and gains.
- 8.2.23 Biodiversity Net Gain – Principles and Guidance for UK Construction and Developments (Ref 8.17 and Ref 8.18), which offers practical advice to achieve net gain in the UK's land and freshwater environment.
- 8.2.24 Network Rail's Biodiversity Action Plan (Ref 8.19) which sets Network Rail's vision of a lineside managed sustainably for safety, performance, the environment, our customers and our neighbours and outlines ambitions for our biodiversity assets, and how we intend to protect, manage and enhance their condition over the next 15 years.
- 8.2.25 Network Rail's Environmental Sustainability Strategy (Ref 8.20) which outlines plans to create a cleaner, greener railway over the next 30 years including improved biodiversity of plants and wildlife.
- 8.2.26 Habitat and species specific guidance documents that have been used in this assessment are listed Table 8-1.

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Table 8-1 Habitat and species-specific guidance

Survey	Guidance
Plants and Habitats	Handbook for Phase 1 habitat survey (Ref 8.22) Hedgerows Regulations Guidelines (Ref 8.8) National Vegetation Classification: Users' handbook (Ref 8.44) Natural England's Biodiversity Metric 2.0 (Ref 8.16)
Great Crested Newts (Appendix 8.3)	HSI (Ref 8.23) eDNA guidance (Ref 8.24) Great Crested Newt Conservation Handbook (Ref 8.25) Great Crested Newt Mitigation Guidelines (Ref 8.26) Chartered Institute of Ecology and Environmental Management's (CIEEM) Technical Guidance document Competencies for Species Survey: Great Crested Newt (Ref 8.27)
Reptiles (Appendix 8.4)	Herpetofauna workers' manual. (Ref 8.28) Froglife Advice Sheet 10 (Ref 8.29)
Breeding Birds (Appendix 8.5)	Bird Monitoring Methods: A Manual of Techniques for UK Key Species (Ref 8.30)
Wintering Birds (Appendix 8.6)	Bird Monitoring Methods: A Manual of Techniques for UK Key Species (Ref 8.30)
Barn Owl (Appendix 8.5)	Barn Owl <i>Tyto alba</i> Survey Methodology and Techniques for use in Ecological Assessment (Ref 8.51)
Bats (Appendix 8.7)	Bat surveys for professional ecologists: Good practice guidelines (Ref 8.31) Core Sustainance Zones: Determining zone size (Ref 8.32)
Otter and Water Vole (Appendix 8.8)	Water Vole Conservation Handbook (Ref 8.33) The Water Vole Mitigation Handbook (Ref 8.34) CIEEM Competencies for Species Survey: Water Vole (Ref 8.35) CIEEM competencies for Species: Eurasian Otter (Ref 8.36)
Badger (Confidential Appendix 8.9)	Harris, Cresswell and Jefferies (1989) (Ref 8.37)

## Consultation and Scoping

### Consultation

8.2.27 Table 8-2 provides a summary of Consultee issues raised with respect to biodiversity during informal scoping consultation and how they have been addressed.

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Table 8-2 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Natural England / Julie Lunt (Operations Delivery) / 26th June 2020	Natural England has advised that it is not a priority for them to comment on the detail of this EIA. They expect the final ES to include all necessary information as outlined in Part 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2017.	All necessary information as outlined in the Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 as amended has been included within this document.
Environment Agency / Neville Benn (Senior Planning Advisor / 3rd March 2020	No comments in relation to biodiversity.	N/A
Cambridgeshire County Council (CCoC) / Deborah Ahmad (Ecology Officer / 11th September 2020	Request for ecological work to include relevant associated infrastructure enhancements.	This assessment considers relevant infrastructure enhancements associated with the proposed Development in section 8.4.
	Requested for the avoidance of important flora present within Triangle North of Long Road County Wildlife Site (CWS) and for opportunities to enhance this site to be exploited.	No direct impacts are proposed within the Triangle North of Long Road CWS. A full assessment of any indirect effects has been provided in section 8.5.
	Asked for avoidance of impacts on the important ecological features of Hobson's Park, appropriate mitigation and compensation for residual impacts. Proposed infrastructure and increased visitor pressure on the park should be taken into account.	A full impact assessment, including increased visitor pressure, has been undertaken for Hobson's Park and appropriate mitigation and compensation for residual impacts has been provided in section 8.4 and 8.5.
	Requested appropriate habitat and National Vegetation Classification (NVC) surveys are undertaken. Requested impacts on priority habitats are avoided or adequately mitigated. Highlighted concern over loss of Open Mosaic Habitats on Previously Developed Land and requested creation of these habitats where possible.	The area of Open Mosaic habitat is within the Triangle North of Long Road. This area is outside the site boundary and as such, no impacts are anticipated.
	Requested the use of clear span bridges over watercourses rather than culverts to preserve their integrity as wildlife corridors.	This has been noted and considered within the design and assessment in section 8.4..



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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	Requested that plants are assessed in their own right, particularly notable/important plants translocated from the Cambridge Guided Busway development (e.g. Dittander <i>Lepidium latifolium</i> , Wild Liquorice <i>Astragalus glycyphyllos</i> and Twiggy Mullein <i>Verbascum virgatum</i> ).	Notable and/or protected plant species are fully assessed within this document in section 8.3 to 8.5.
	Stated that great crested newt may not have yet colonised the balancing ponds and therefore there should be contingency within the design of the proposed Development to resurvey these ponds for this species.	Pre-construction surveys of ponds and appropriate licencing has been recommended in this assessment in section 8.4.
	Highlighted the value of the rail corridor as a commuting and foraging route for bats and requested detailed assessment is undertaken and opportunities to strengthen the habitat connectivity for bats are explored.	This has been noted and considered within the assessment in section 8.3 and 8.4..
	Requested consideration is given to impact on priority species and Cambridgeshire and Peterborough Additional Species of Interest.	Both priority species and additional species of interest have been considered within this assessment in section 8.3 to 8.5.
	Requested the biodiversity impact assessment demonstrates the 10 principles of biodiversity net gain set out in CIEEM's 2016 & 2019 guidance documents. Requested biodiversity enhancement aims to deliver local / strategic priorities. Stated that a target of 20% biodiversity net gain was appropriate. This target will be further discussed with Greater Cambridge Shared Planning (GCSP) and the CCoC.	CIEEM's 2016 & 2019 guidance documents have been used to inform this document.  The proposed Development aims to deliver a minimum of 10% net gain using the Defra Metric 2.0 calculation tool. As the site cannot be expanded further, other options including purchasing additional land, purchasing biodiversity units and working with 3 <sup>rd</sup> parties are currently being explored to ensure biodiversity net gain. Biodiversity net gain is discussed between paragraphs 8.5.113 to 8.5.117 of this document.
	Expressed concern that Network Rail are using their in-house model for biodiversity metrics rather than the Defra metric 2.0 model or a Warwickshire model that has been locally adapted for Cambridgeshire. Requested the workings of the metric must be transparent and deviations from the Defra metric 2.0 / Warwickshire model for Cambridgeshire must be	Defra metric 2.0 model BNG Calculator has been used for the ecological impact assessment. Biodiversity net gain is discussed in paragraphs

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	justified, particularly the “time taken to reach target condition”.	8.5.113 to 8.5.117 of this document
CCoC / Deborah Ahmad (Ecology Officer / 8th October 2020	Concern over proposed alterations to Hobson’s Park and potential for significant ecological impacts. Request for minimising impacts and adequate compensation to be provided.	Full impact assessment of Hobson’s Park has been undertaken in section 8.4 and 8.5.
	Raised the location of Triangle North of Long Road County Wildlife Site, Drawing 158454-ARC-00-TL-DRG-LEP-200005 revision P06 had been plotted incorrectly. Emphasised that any work within this site should be raised with CCoC and the Wildlife Trust for Bedfordshire, Cambridgeshire and Peterborough.	The triangle North of Long Road CWS boundary has been corrected on subsequent drawings. Need for liaison noted.
	Asked for invertebrate surveys to be undertaken in areas of Open mosaic habitat, early developing / ephemeral habitats and more established grassland.	Invertebrate surveys were not undertaken as the habitats onsite were not established enough to warrant survey. A desk assessment of invertebrates is provided in section 8.3.
	Comment raised that insufficient area within the Site Boundary is available to deliver measurable biodiversity net gain. Suggested that the Site Boundary is expanded to enable the expansion of Hobson’s Park and Nine Wells Local Nature Reserve (LNR) or widen the wildlife corridor along the Hobson’s Brook, linking with other habitats of biodiversity value.	The proposed Development aims to deliver a minimum of 10% net gain using the Defra Metric 2.0 calculation tool. As the site cannot be expanded further, other options including purchasing additional land, purchasing biodiversity units and working with 3 <sup>rd</sup> parties are currently being explored to ensure biodiversity net gain. Biodiversity net gain is discussed between paragraphs 8.5.113 to 8.5.117 of this document.
GCSP / Guy Belcher (Biodiversity Officer) / 19th June 2020	Clarification that the (Arcadis) survey record for marsh warbler <i>Acrocephalus palustris</i> is an error.	Survey record corrected to reed warbler <i>Acrocephalus scirpaceus</i> in all reports.
	City Council are looking for measurable net gain, as per the NPPF. There is no set target for net gain; larger developments are looking at minimum of 10% (as recommended in draft Environment Bill). Given that the station is proposed on land already marked for biodiversity mitigation, discussion to be had on whether this should be increased; cumulative effect on net gain needs to be investigated (Cambridge	The proposed Development aims to deliver a minimum of 10% net gain using the Defra Metric 2.0 calculation tool. As the site cannot be expanded further, other options

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	South East Transport (CSET) proposing development around Nine Wells LNR, there is therefore a potential opportunity to look at a combined offer for off-site mitigation).	including purchasing additional land, purchasing biodiversity units and working with 3 <sup>rd</sup> parties are currently being explored to ensure biodiversity net gain. Biodiversity net gain is discussed between paragraphs 8.5.113 to 8.5.117 of this document.
	Stated Hobson's Conduit Trust are proposing their vision for enlarging Nine Wells LNR.	This has been noted.
	Asked if any work has been undertaken to understand anticipated footfall with Hobson's Park. Council have been informed pedestrian flows are part of the Transport Assessment, which links to other assessments – ecology impacts, socio-economics and health.	The implications of increased activity in Hobson's Park have been assessed in section 8.4 and 8.5.
	Requested for the assessment to consider impacts during construction on local species, ways to protect species during construction and restoration schemes post-construction as quickly as possible. Council have been informed protection and mitigation may be tied into offsetting and opportunities would be explored to use areas south around Hobson's Brook for mitigation and offsetting, close to habitats that could be lost so species can move into new habitats nearby.	A full assessment of construction impacts has been made and are detailed in full in Section 8.5
South Cambridgeshire District Council (SCDC) / Daniel Weaver (Senior Ecologist) / 9th September 2020	Stated that there are records of water vole, reptiles, and invasive species in Hobson's Brook so these need to be assessed. Granham's Farm has records of bats and great crested newts so in terms of protected species there would need to be proper assessments prior to any permission being given.	A full assessment of all species likely to present within the Site Boundary are detailed in full in Section 8.5.
Royal Society for the Protection of Birds / Daniel Pullen / 9th June 2020	Unlikely to engage with the proposed Development formally as this seems unlikely to affect any nationally/internationally designated sites or priority species.	N/A
The Wildlife Trust BCN / Martin Baker / 11th September 2020	Expectation to adequately cover protected species and designated nature conservation sites.	A full assessment of all designed sites and protected species likely to be present are detailed in full in Section 8.5
	Concern over adequate coverage of the impacts arising from the loss, damage and disturbance to the new natural greenspaces provided at Hobson's Park and need for significant compensatory measures.	A full assessment of all impacts to Hobson's Park has been undertaken in section 8.4 and 8.5.
	Commented that no details are provided for the bespoke Network Rail method of assessing	Defra metric 2.0 model BNG Calculator has been

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	Biodiversity Net Gain that we would use, so cannot determine if it appropriately or adequately reflects recent improvements to methods being tested through the Defra / Natural England Biodiversity Metric 2.0.	used for the ecological impact assessment. Biodiversity net gain is discussed in paragraphs 8.5.113 to 8.5.117 of this document.

## Scoping

8.2.28 Table 8-3 provides a summary of consultee responses contained within the Scoping Opinion in relation to biodiversity, and the corresponding location in the ES where they are addressed.

Table 8-3 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Department for Transport / Natasha Kopala	Records of protected species should be sought from appropriate local biological record centres, nature conservation organisations and 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.	Desk study methodology can be found in paragraph 8.2.32. Results of desk study and wider context can be found for each species in Section 8.3.
	ES should consider including as a possible significant effect the potential medium-term loss of grassland and associated invertebrates from the proposed spreading of topsoil on Hobsons Park. This has the potential to be over and above the immediate footprint of the new station and track and is not currently explicit in the EIA Scoping Report	The spoil spreading on topsoil in the park is no longer assumed as part of the proposed Development. A full assessment of the habitats within the park can be found in section 8.5.
Natural England / Clare Foster	The scheme appears unlikely to pose a risk to any statutorily designated sites for nature conservation. We welcome the proposed approach to minimising impacts to the natural environment including locally designated sites such as Nine Wells Local Nature Reserve and Hobson's Park, watercourses and hydrology	N/A
	Our advice is that the EIA should assess the potential impacts of scheme options, through application of the ecological mitigation hierarchy, to ensure that adverse impacts on the natural environment are avoided wherever possible, including impacts to locally designated sites. Any adverse impacts should be appropriately mitigated, taking advice from relevant stakeholders including the Wildlife Trust and the Councils' ecologist/s.	A full impact assessment has been undertaken, including impacts on local sites. This can be found in Section 8.5.
	Natural England is supportive of the project aim to deliver at least 10% biodiversity net gain in accordance with paragraph 170 of the National Planning Policy Framework (NPPF) and Natural Cambridgeshire's 'doubling nature' aspirations. Our advice is that ecological enhancements should seek to buffer, enhance and connect existing priority habitats to benefit wildlife and people.	The project aim is to deliver 10% biodiversity net gain.  The proposed Development proposes to install bat and bird boxes on suitable buildings to enhance the site for species of

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Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
		conservation concern. Further enhancements are also proposed along Hobsons Brook through scrub clearance and plug planting.
GCSP / Charlotte Burton	Support the proposal to scope in ecology for both the construction and operational phase of the proposed Development.	Full impact assessment for construction and operation is provided in Section 8.5.
	Agrees with the prescribed site value for assessing impacts, particularly as Hobsons Park forms an important green corridor within an urban setting and already provides habitat mitigation for adjacent development sites.	Full details of receptor valuation can be found in Section 8.3.
	Pleased to see that adjacent applications with the potential to have a cumulative effect have been identified for consideration	A full assessment of cumulative effects are found in Paragraphs 8.5.133 to 8.5.137
	Supports the proposed protected and notable species identified for targeted survey work.	Targeted surveys for all protected species are provided in Table 8-5.
	Suggests that 6.5 (Description of Possible Significant Effects) includes the potential medium-term loss of grassland and associated invertebrates from the proposed spreading of topsoil on Hobsons Park. This has the potential to be over and above the immediate footprint of the new station and track and is not currently explicit in the document.	The spoil spreading on topsoil in the park is no longer assumed as part of the proposed Development. A full assessment of impacts within the park can be found in section 8.5
	Supports the use of the DEFRA biodiversity metric to determine a minimum 10% measurable net gain from the proposals. Initial assessments suggest offsite mitigation may be required to deliver this and as such any proposed areas for offsite mitigation should be included within the EIA and survey work.	The proposed Development aims to deliver a minimum of 10% net gain using the Defra Metric 2.0 calculation tool. As the site cannot be expanded further, other options including purchasing additional land, purchasing biodiversity units and working with 3 <sup>rd</sup> parties are currently being explored to ensure biodiversity net gain. Biodiversity net gain is discussed in paragraphs 8.5.113 to 8.5.117 of this document.

## The Study Area

- 8.2.29 The industry guidelines for ecological impact assessment (hereafter referred to as the CIEEM Guidelines (Ref 8.15) require the establishment of a Zone of Influence (ZoI) for the proposed Development which is defined in the guidelines as ‘the area over which ecological features (habitats and species) may be subject to significant effects as a result of the proposed Development and associated activities’.
- 8.2.30 For some ecological features, the ZoI extends beyond the Site Boundary; for example, where there are ecological or hydrological links beyond the boundary. The ZoI also varies for each ecological feature, depending on their sensitivity to the environmental changes which may result from the proposed Development. The ZoI has been ascertained through consideration of the likely construction and operation phase impacts, taking into account the desk study, responses from consultees, records of protected species and the findings of the survey work. The Site Boundary encompasses the permanent and temporary land take as well as any areas of required for landscaping and mitigation measures.
- 8.2.31 The ‘Wider Study Area’ refers to the area over which the desk-based assessment has been undertaken. ‘Study Area’ refers to the area within which field surveys have been undertaken. Both the Wider Study Area and the Study Area have been determined on a case-by-case basis and include the area within the Site Boundary (as shown on Figures 8.1 to 8.20 in Appendix 8.1) and extend an appropriate distance depending on the ecological feature, potential impact pathways, survey type and seasonality.
- 8.2.32 Both the distances covered by the ZoI, the Wider Study Area and the Study Area are outlined in Table 8-4 below.

Table 8-4 ZoI and Study Area for potentially Important Ecological Features

Potential Important Ecological Feature	ZoI	Wider Study Area	Study Area
Internationally designated sites	Considered within and up to 10km from the Site Boundary.  Reviewed on a case-by-case basis and extended as necessary where potential impact pathways associated with the proposed Development could feasibly extend beyond this distance and affect a designated site’s qualifying features.	Site Boundary plus 10km	N/A
Nationally designated sites	Considered within and up to 5km from the Site Boundary depending on designated site qualifying features.  Reviewed on a case-by-case basis and extended as necessary where potential impact pathways associated with the proposed Development could feasibly extend beyond this distance and affect a designated site’s notifying features.	Site Boundary plus 5km	N/A
Locally designated sites	Considered within and adjacent to the Site Boundary.	Site Boundary plus 2km	N/A

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Potential Important Ecological Feature	Zol	Wider Study Area	Study Area
Plants and habitats	<p>Considered within the Site Boundary.</p> <p>Significant effects on plants and habitats outside the proposed Development would not be anticipated given the implementation of environmental measures.</p>	Site Boundary plus 2km	Site Boundary
Invasive non-native plant species	Considered within and adjacent to the Site Boundary.	Site Boundary plus 2km	Site Boundary
Terrestrial invertebrates	<p>Considered within the Site Boundary.</p> <p>The potential for significant effects at a population level is not likely to extend beyond the Site Boundary.</p>	Site Boundary plus 2km	No targeted surveys were undertaken for these species.
Aquatic invertebrates	Considered within the assessment, but detailed survey work is not considered necessary for this group due to the limited extent of habitats suitable for supporting aquatic invertebrates in the vicinity of the proposed Development.	Site Boundary plus 2km	No targeted surveys were undertaken for these species.
Fish	Considered within the assessment, but detailed survey work is not considered necessary for this group due to the limited extent of habitats suitable for supporting fish in the vicinity of the proposed Development.	Site Boundary plus 2km	No targeted surveys were undertaken for these species.
Great crested newt	<p>Considered within and up to 500m from the Site Boundary.</p> <p>Great crested newt have been recorded up to 500m from their breeding ponds. Disturbance to great crested newt could therefore feasibly occur up to this distance.</p>	Site Boundary plus 2km	Site Boundary plus 500m
Other amphibians	<p>Considered within the Site Boundary.</p> <p>The potential for significant effects at a population level is not likely to extend beyond the Site Boundary.</p>	Site Boundary plus 2km	No targeted surveys were undertaken for these species.



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Potential Important Ecological Feature	Zol	Wider Study Area	Study Area
Reptiles	<p>Considered within the Site Boundary.</p> <p>The potential for significant effects at a population level is not likely to extend beyond the Site Boundary.</p>	Site Boundary plus 2km	Targeted surveys of specific areas within the Site Boundary where significant loss of potentially important reptile habitat is possible.
Birds (breeding and wintering)	Considered within and up to 500m from the Site Boundary.	Site Boundary plus 2km	Site Boundary plus 250m
Bats	Considered within and up to 2km from the Site Boundary	Site Boundary plus 10km	Site Boundary plus 50m
Dormouse	Due to lack of dormouse records within the Study Area and presence of unsuitable habitat, dormouse are considered to be absent from the Site.	Site Boundary plus 2km	As dormouse are considered absent no targeted surveys were undertaken.
Otter	<p>Considered within the Site Boundary and to extend 250m from the boundary.</p> <p>The area over which otter could reasonably be subject to significant effects at a population level as a result of the proposed Development, the Zol would not be expected to extend beyond 250m of the Site Boundary</p>	Site Boundary plus 2km	Site Boundary plus 250m
Water Vole	<p>Considered within and up to 250m from the site Boundary.</p> <p>The area over which water vole could reasonably be subject to significant effects at a population level as a result of the proposed Development, the Zol would not be expected to extend beyond 250m of the Site Boundary</p>	Site Boundary plus 2km	Site Boundary plus 250m
Badger	Considered within and up to 30m from the Site Boundary.	Site Boundary plus 2km	Site Boundary plus 30m
Other mammals (brown hare, harvest mouse and hedgehog),	Considered within the Site Boundary	Site Boundary plus 2km	Incidental sightings were recorded within the Site Boundary



## Methodology for Establishing Baseline Conditions

8.2.33 The existing ecological baseline has been established through both desk study data analyses and field surveys (as detailed further below).

### Desk Study

8.2.34 Existing ecological baseline data has been gathered from within the Wider Study Areas for all the ecological features described in Table 8-5, below. Data sources have included:

- *The Multi-agency Geographic Information for the Countryside* (MAGIC) website (Ref 8.21) was reviewed for statutory designated sites of nature conservation value within 2km of the Site Boundary, extended to 10km for SACs designated for bats;
- MAGIC was also reviewed for ancient woodland sites and Habitats of Principal Importance within the Site Boundary, and EPS licences within 2km of the Site Boundary;
- Cambridgeshire and Peterborough Environmental Records Centre (CPERC) for records of non-statutory nature conservation sites, identified as CWS or City Wildlife Sites (CiWS) depending on their attributes, along with records of protected and notable species within the last 10 years; and
- Cambridgeshire and Peterborough Biodiversity Group data (Ref 8.14) was reviewed to identify any locally important species that could be present within the Site Boundary.

### Field Study

8.2.35 An extended Phase 1 habitat survey of the Site Boundary in accordance with Joint Nature Conservation Committee (JNCC) methodology (Ref 8.22) was undertaken in May 2019 (see Figure 8.2, Appendix 8.1). Further ecological surveys were undertaken in 2019 and 2020, as identified in Table 8-5, below. A full account of the methods, survey locations and results of the surveys listed can be found in Appendices 8.2 to 8.9.

8.2.36 Based on a review of desk study information and suitability of habitats identified during the phase 1 surveys, targeted surveys were not undertaken for the following protected species:

- Terrestrial invertebrates;
- Aquatic invertebrates;
- Fish;
- Common amphibians;
- Dormouse; and
- Other mammals (brown hare, harvest mouse and hedgehog).

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Table 8-5 Summary of field surveys undertaken

Survey	Survey methodology	Date of surveys
Plants and Habitats	<p>An extended Phase 1 habitat survey was undertaken between 23 and 24 May 2019. Due to changes in the Site Boundary, an updated survey of additional areas was undertaken in October 2020. Dominant habitat types were mapped following JNCC standard methodology (Ref 8.22) and the potential for habitats to support protected/notable species were recorded. Any non-native invasive species identified during this survey were noted and mapped.</p> <p>A National Vegetation Classification (NVC) survey of the most southerly field near Shepreth junction was undertaken as the Phase 1 habitat survey identified this area as having potential for higher botanical value. The NVC survey comprised a quadrat-based sampling approach following the NVC protocol, as outlined in the National Vegetation Classification: Users' handbook (Ref 8.44)</p> <p>Biodiversity net gain calculations were carried out using the Defra Biodiversity Metric 2.0 (Ref 8.10). Each habitat, pre- and post-construction, within the Study Area, was assigned a value for its distinctiveness (i.e. its general biodiversity value), condition, ecological connectivity and strategic significance. These were then used to give a figure for the number of biodiversity units that each habitat generates pre- and post-developm</p>	<p>Phase 1 - May 2019 &amp; October 2020</p> <p>NVC – January 2021</p>
Great Crested Newts (Appendix 8.3)	<p>A Habitat Suitability Index (HSI) assessment and eDNA survey of all ponds within the ZOI was undertaken in 2019.</p> <p>The eDNA survey identified two waterbodies for which great crested newt were confirmed present. Population class estimates surveys, consisting of bottle trapping, torchlight surveys and egg searching, were undertaken at these waterbodies in April-May 2020.</p>	<p>HSI and eDNA - April - May 2019</p> <p>Population surveys - April - May 2020</p>
Reptiles (Appendix 8.4)	Artificial refugia were laid out in May 2020 within suitable habitats within the Site Boundary. Surveying was undertaken from May to June and in September consisting of seven survey visits – using direct observation and artificial refugia searches.	May – September 2020
Breeding Birds (Appendix 8.5)	Three breeding bird survey visits were undertaken to establish breeding bird usage within the Study Area. The locations of birds seen and heard were mapped using standard British Trust for Ornithology (BTO) two letter codes with notes added about activity. Breeding activity was then categorised using BTO criteria.	April – June 2020
Wintering Birds (Appendix 8.6)	Six winter bird surveys were undertaken to understand the wintering bird assemblage within the Study Area. The location and number of birds seen and heard were mapped using standard BTO two letter codes with notes added regarding activity.	October 2020 – March 2021

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Survey	Survey methodology	Date of surveys
Bats (Appendix 8.7)	<p>Bat surveys involved a habitat assessment of the Site Boundary and an initial assessment of suitable structures and mature trees were identified according to current guidelines (Ref 8.31).</p> <p>Ground level visual inspection of trees within the Study Area to identify potential roost features and / or evidence of roosting bats.</p> <p>Daytime external ground assessment of four bridge structures to search for evidence of use by bats and features offering roosting potential and / or providing access into the interior of structures.</p> <p>Emergence / re-entry surveys were undertaken at the four bridge structures to identify the presence of roosting bats.</p> <p>Song Meter 4 (SM4) static bat detectors were positioned in fixed locations in habitats that were suitable for bat activity (where access is allowed) and left <i>in situ</i> for 5 nights from April to October.</p> <p>Manned walked transects using hand-held Bat logger detectors were used to complement the static detector results. The transect route included stopping points by the static detectors and in suitable habitat that was accessible.</p>	<p>Habitat Assessment: May 2019</p> <p>Tree assessments: April 2020</p> <p>Built structures: June 2020 - August 2020</p> <p>Statics surveys: April - October 2019</p> <p>Walked transect once a month from April - October 2019</p>
Otter and Water Vole (appendix 8.8)	<p>Suitable waterbodies that could support water vole and/or otter were identified and the relative suitability of habitat for these species assessed using the following factors such as current, channel width, water depth, bank profile, riparian habitat and terrestrial land use.</p> <p>Two survey visits were undertaken at each waterbody to identify signs of otter (holts, lying-up sites, spraints, etc.) or water vole (burrows, feeding signs, latrines, etc.) and to establish the presence of these species.</p>	June-October 2020
Badger (Appendix 8.9)	A walkover survey of the Site Boundary plus 30m was undertaken by searching for the characteristic signs of badger activity including setts, latrines, paths, footprints, hairs and feeding signs. Setts were then classified depending on their size and use and levels of activity noted.	August 2020

## Forecasting the Future Baseline

8.2.37 To account for changes in the future baseline, a future 'do nothing' scenario (also referred to as the 'Do Minimum scenario') is considered for the ES. This provides a forecast of what the future baseline conditions will be at the 'time of proposed Development proceeding', accounting for all factors, but without the proposed Development under consideration. To enable direct comparison between this and the 'post development' impact predictions made during the EIA, this future baseline will be set at the time of the proposed Development proceeding (2023). It will further consider any additional changes in the future baseline at the opening year of the proposed Development (2026) and throughout the operational phase.

## Defining the Importance/Sensitivity of resource

8.2.38 The importance of an ecological feature is considered within a defined geographical context, as outlined in the CIEEM Guidelines (Ref 8.21) which breaks down geographical categorisation as follows:

- International and European;
- National (i.e. England);
- Regional (i.e. the East of England);
- County (i.e. Cambridgeshire);
- Local (within the Zol);
- Site (within or adjacent to red line boundary); and
- Negligible (considered below site value).

8.2.39 The assessment has collated the existing baseline information to predict confidently the significant effects of the construction and operational phases of the proposed Development, on Important Ecological Features (IEFs). For the purpose of this Ecological Impact Assessment (EclA), IEFs are defined as:

- Ecological features that are of Site or greater importance for biodiversity; and/or
- Ecological features that should be considered due to their legal status.

8.2.40 For example, while invasive non-native plant species are not considered to be of importance for biodiversity, they are included as an IEF in this assessment as they are listed under Schedule 9 to the WCA (for which it is an offence to plant or otherwise cause to grow in the wild) and therefore are important in the context of their negative affect on biodiversity.

## Methodology for Assessing Impacts

### Impact Characterisation

8.2.41 Following the identification of IEFs within the Study Area/Wider Study Area, the potential effects within the Zol of the proposed Development on the IEFs has been assessed. Potential effects are characterised and described in detail using the following parameters, as set out in the CIEEM Guidelines (Ref 8.15):

- Positive or negative;
- Extent (the area over which the effect occurs);
- Magnitude (the 'size' or 'amount' of an effect);
- Duration (the time for which the effect is expected to last prior to recovery or replacement of the resource or feature);
- Frequency and timing (some changes may only cause an impact if they happen to coincide with critical life-stages or seasons e.g. bird nesting season); and
- Reversibility (permanent or temporary).

### Assessing Significance

8.2.42 The CIEEM Guidelines (Ref 8.15) define a significant effect as 'an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general'.

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- 8.2.43 The significance of an effect has been determined on the basis of an analysis of the factors that characterise the effect, irrespective of the importance of the feature. Where a significant effect is identified, the importance of the feature (see above) is taken into account to help determine the geographical scale at which the effect is significant. Thus, any negative effect which is considered to significantly affect the integrity of a feature of, for example, national importance, will be identified as being a nationally significant effect.
- 8.2.44 The assessment considers the implementation of standard environmental measures and specific mitigation measures as outlined in Section 8.4 of this Chapter to determine whether effects are likely to be significant.
- 8.2.45 In addition, the potential need for mitigation for IEFs is identified in situations where a significant effect is not anticipated, but mitigation is warranted in order to address legislative requirements.
- 8.2.46 The approach to determining the importance of ecological features and the significance of effects described above is in accordance with the CIEEM Guidelines (Ref 8.15). This differs from the approach used for other environmental disciplines in this ES.

## Limitations and Assumptions

### Limitations

- 8.2.47 Data provided by third parties such as biological records centres frequently do not include negative survey data (data showing where surveys have occurred, and species absence has been proven likely). Certain areas such as nature reserves, have been well studied whereas other areas (for example, private farmland) have not been well studied. For this reason, the absence of desk-study records for a species has not been taken to indicate species absence.
- 8.2.48 Limitations of the field surveys are outlined below with full details provided within the Technical Appendices 8.1 to 8.8.
- Land access was incomplete during the extended Phase 1 habitat survey. Where access was not granted or was limited due to health and safety (i.e. active railway line), habitats were identified from boundary areas, supported by aerial imagery. This represented a minor limitation as notable or invasive plants could not be identified if present and habitats could not be fully assessed for protected and notable species, such as badger setts. A precautionary approach was taken however, and habitats that could not be fully assessed were not ruled out for further assessment.
  - Weather conditions were suboptimal for some of the targeted protected species surveys namely reptiles (Appendix 8.4), breeding birds (Appendix 8.5) and bats (Appendix 8.7). However, surveys were either rescheduled or species were found to still be active. As such, it was not envisaged that these would have any significant influence on the outcome of the survey results.
  - Progression of some design elements resulted in the change in the Site Boundary and ZOI for some receptors. Where possible, surveys were undertaken in October 2020 resulting in surveys undertaken either outside the optimal survey season (plants and habitats) or a reduced surveyed effort then recommended (bats (Appendix 8.7), otter and water vole (Appendix 8.8)).
  - The great crested newt eDNA surveys (Appendix 8.3) were undertaken towards the end of the accepted seasonal period for collection. Consequently, many of the waterbodies had dried up or the water level was too low to sample. Such waterbodies would not have been suitable for supporting breeding great crested newt, although may support great crested newt in wetter years. Some presence or absence surveys were hampered by dense vegetation or one survey by high turbidity (measure of the quality of water through amount of suspended particles). However, sufficient bottle traps were deployed to ensure data validity and great crested newt eggs found during surveys to provide confidence in the results.
  - Eight waterbody assessments for otter and water vole (Appendix 8.8) were limited for various reasons including the presence of nesting birds, dense vegetation and water

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levels. Professional judgement has been used to address any gaps in survey data which has been informed by data derived from the desk study.

- 8.2.49 None of those limitations are considered sufficient to materially affect the assessment of likely effects.

### Assumptions

- 8.2.50 This assessment has used the 'do nothing' method for forecasting the future baseline. In the absence of the proposed Development, it is anticipated that farmland, hedgerows, woodlands, grassland and scrub would continue to be managed as they are currently. No significant change to watercourses or ponds is anticipated in the foreseeable future, although it is recognised that some waterbodies may disappear, and others may be created during this time.
- 8.2.51 Professional judgement has been exercised in determining the importance of biodiversity resources. Where a biodiversity resource falls into more than one category, the highest level of importance has been applied. Contextual information pertaining to the conservation status, rarity and diversity of habitats and species has been used to inform the valuation of biodiversity resources, where it exists.
- 8.2.52 Likely significant effects would not be predicted on features that are of negligible importance. This includes areas of habitat, species populations or communities that are not considered to appreciably enrich the habitat resource within the local (or greater) context, including features of importance for migration, dispersal or genetic exchange. Examples of such features include areas of heavily modified habitats that support a low species diversity or populations of species that are common, widespread and not threatened.
- 8.2.53 The assessment has been developed on the assumption that consent is granted, and construction commences in 2023, but the construction programme may / will be refined once contractors are appointed and as the detailed design is developed. The basis of assessments is representative of the reasonable worst case, which has been used consistently across the environmental assessments / appraisals.

## 8.3 Baseline

### Existing Baseline

- 8.3.1 The following section provides a summary of the baseline conditions present within the Site Boundary and within the ZOI at the time of writing, further detail is presented in the baseline reports (Appendices 8.2 to 8.9).

### Designated Sites

- 8.3.2 Table 8-6 and Table 8-7 below, detail the statutory and non-statutory designated sites identified as part of the desk study. Their locations are presented below on Image 8-1 and on Figure 8.1, Appendix 8.1.





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Statutory Designated Sites

Table 8-6 Statutory designated sites scoped in / out for detailed assessment

Site Name	Distance from the site	Description	Scoped in/out	Reason for scoping in/out	Importance
Eversden and Wimpole Wood SAC	11km West	The site comprises a mixture of ancient coppice woodland (Eversden Wood) and high forest woods likely to be of more recent origin (Wimpole Woods). A colony of barbastelle <i>Barbastella barbastellus</i> is associated with the trees in Wimpole Woods. These trees are used as a summer maternity roost where the female bats gather to give birth and rear their young. Most of the roost sites are within tree crevices. The bats also use the site as a foraging area. Some of the woodland is also used as a flight path when bats forage outside the site.	Out	<p>There would be no direct land take and due to the proximity of the proposed Development, there is no potential for indirect effects due to hydrology or air quality.</p> <p>Although, this SAC is designated for long-distance commuting species, in particular Barbastelle's bats. The area surrounding the communal barbastelle roost within which habitat availability and quality would have a significant influence on the resilience and conservation status of the colony using the roost (i.e. the core sustenance zone) is reported to be 6km. Given the distance of the SAC and from the Site, the availability of suitable habitat closer to the SAC, and the low number of barbastelle recorded using the Study Area (i.e. one record in September 2020). There was considered to be no impacts associated with the proposed Development.</p>	International



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Site Name	Distance from the site	Description	Scoped in/out	Reason for scoping in/out	Importance
Whittlesford-Thriplow Hummocky Fields SSSI	3.5km South	This site supports the nationally rare species grass poly <i>Lythrum hyssopifolia</i> , which is now confined in mainland Britain to a small areas, including south Cambridgeshire where it occurs together with a number of scarce bryophytes. The site also supports the nationally uncommon fairy shrimp <i>Chirocephalus diaphanus</i>	Out	No direct habitat loss and no impact pathways identified over this distance	National
Thriplow Peat Holes SSSI	4.7km South	The Thriplow Peat Holes hold remnants of relic fen and alder carr habitats which are now very restricted both nationally and especially locally. The vegetation of the Alder carr is characteristically Alder <i>Alnus glutinosa</i> , Ash <i>Fraxinus excelsior</i> and Grey Willow <i>Salix cinerea</i> , together with Guelder Rose <i>Viburnum opulus</i> . Herbs include Common Reed <i>Phragmites australis</i> , Herb Bennet <i>Geum urbanum</i> and Herb Robert <i>Geranium robertianum</i> .	Out	No direct habitat loss and no impact pathways identified over this distance	National
Gog Magog Golf Course SSSI	2.9km East	Covers approximately 88.44 ha. Characterised by calcareous chalk grassland. Various botanical species are present with nationally rare Moon Carrot <i>Seseli libanotis</i> and nationally scarce Perennial Flax <i>Linum perenne subsp. anglicum</i>	Out	No direct habitat loss and no impact pathways identified over this distance	National
Cherry Hinton Pit SSSI	1.8km East	This area is primarily notified for the populations of three nationally rare plant species listed in the British Red Data Book. These are Great Pignut <i>Bunium bulbocastanum</i> , Moon Carrot and Grape Hyacinth <i>Muscari neglectum</i> . The nationally scarce plant Perennial Flax has been recorded. The chalk grassland is dominated by the grass Upright Brome <i>Bromus erectus</i> and holds a number of the nationally rare plants as well as typical chalkland species such as Wild Thyme <i>Thymus praecox</i> , Yellowwort <i>Blackstonia perfoliata</i> and Kidney Vetch <i>Anthyllis vulneraria</i> .	Out	No direct habitat loss and no impact pathways identified over this distance	National

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Site Name	Distance from the site	Description	Scoped in/out	Reason for scoping in/out	Importance
Roman Road SSSI	2.9km East	The Roman Road supports species-rich calcareous grassland communities of a type which is now scarce. Thick hedgerows and small copses along this 'green lane' enhance the value of the grassland for invertebrates. The grassland communities range from short swards characterised by the presence of grasses such as Sheep's Fescue <i>Festuca ovina</i> and Quaking-Grass <i>Briza media</i> , together with a rich variety of herbs, to tall grassland dominated by False-oat Grass <i>Arrhenatherum elatius</i> with Upright Brome. The many herbs recorded include characteristic species such as Salad Burnet <i>Poterium sanguisorba</i> , Dropwort <i>Filipendula vulgaris</i> and Wild Carrot <i>Daucus carota</i> , together with Harebell <i>Campanula rotundifolia</i> , Purple Milk-vetch <i>Austragalus danicus</i> and Greater Knapweed <i>Centaurea scabiosa</i> .	Out	No direct habitat loss and no impact pathways identified over this distance	National
Dernford Fen SSSI	2.1km South East	This site represents a relic of rough fen and carr. These habitat types are now rare in the county and in eastern England as a whole. The vegetation ranges from dry grassland and scrub to relic fen, reedbed and alder carr. The grassland is of the neutral type on calcareous loam and is characterised by the presence of such species as Creeping Bent <i>Agrostis stolonifera</i> , Red Fescue <i>Festuca rubra</i> , Quaking-grass, Pale Sedge <i>Carex flacca</i> and Lady's Bedstraw <i>Galium verum</i> . The relic fen areas hold Reed <i>Phragmites communis</i> , Saw Sedge <i>Cladium mariscus</i> and Marsh Orchids <i>Dactylorhiza</i> spp. of additional note is the presence of two uncommon fenland orchids, the Marsh Helleborine <i>Epipactis palustris</i> and the Fragrant Orchid <i>Gymnadenia conopsea</i> subsp. <i>densiflora</i> . The fen grades into reedbed and well-developed Alder carr. Areas of open pools within the site together with ditches and the chalk stream along the boundary further enhance the diversity of this site. The variety of vegetation types and open water within the site provides valuable	Out	No direct habitat loss and no impact pathways identified over this distance	National

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Site Name	Distance from the site	Description	Scoped in/out	Reason for scoping in/out	Importance
		habitat for fauna, in particular for amphibians and reptiles. The area is also noted for its breeding warblers.			
Sawston Hall Meadows SSSI	4.7km South East	This 7.4 ha area of meadows overlying spring-fed peat over chalk supports plant and animal communities which are generally scarce and poorly represented in the county. The drier grassland is characterised by the presence of Tor-grass <i>Brachypodium pinnatum</i> and Yorkshire Fog <i>Holcus lanatus</i> and supports a variety of herbs including common milkwort <i>Polygala vulgaris</i> and Spotted-Orchid <i>Orchis fuchsii</i> . The site is additionally noted for the presence of the nationally rare umbellifer Cambridge Milk-parsley <i>Selinum carnifolia</i> . Also present is Saw Wort <i>Serratula tinctoria</i> and the Great Fen-sedge <i>Cladium mariscus</i> .	Out	No direct habitat loss and no impact pathways identified over this distance	National
Nine Wells LNR	0.1km East	Covers approximately 1.18 ha. Characterised by several chalk springs that issue to Hobson's Brook. Previously it was designated an SSSI until certain notable freshwater invertebrates were lost to a drought, improving conditions '(via a groundwater recharge scheme) have led to interest in reintroduction.	Out	This LNR is located upstream from the development and as such, no impacts from hydrological effects are not anticipated.  As detailed in Chapter 7: Air Quality, changes in air quality are only considered to have an effect on sites <50m from the boundary during construction and 200m from the affected road network during operation. As Nine Wells LNR is 90m from the site and 300m from the nearest road, no effect from changes in air quality are anticipated.	County
Sheep's Green and Coe Fen LNR	0.6km North West	Covers approximately 16.87 ha. Characterised by semi-improved grassland, that is seasonally flooded. Various veteran Willows <i>Salix</i> spp. are present	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due	County

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Site Name	Distance from the site	Description	Scoped in/out	Reason for scoping in/out	Importance
				to air quality. However, as the LNR is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	
Paradise LNR	1.4km North West	Covers approximately 2.19 ha. Characterised by woodland with a central marsh area, wet woodland and riverside Willows <i>Salix</i> spp. Species such as Butterbur <i>Petasites</i> spp. and Musk beetle <i>Aromia moschata</i> are present	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the LNR is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	County
Byron's Pool LNR	1.5km West	Covers approximately 4.36 ha. Characterised by woodland dominated by non-native Sycamore <i>Acer pseudoplatanus</i> and Horse Chestnut <i>Aesculus hippocastanum</i> , with other native species present. Supports the rare Arched Earthstar fungus <i>Geastrum fornicatum</i> . The river supports Banded Demoiselle damselflies <i>Calopteryx splendens</i> , and Daubenton's bats <i>Myotis daubentonii</i> .	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the LNR is hydrologically linked to the Proposed Development, there is potential for indirect effects due to hydrology. There is also potential for effects on long-distance commuting species, in particular Daubenton's bats.	County
Barnwell II LNR	1.9km Northeast	Barnwell East was declared a Local Nature Reserve in 1992 following demands for the site to be developed for football pitches and housing. Habitats include grassland, scrub and pond. Species include blackthorn, hawthorn and wild rose scrub, bee orchids in early summer. Birds include blackcap, willow warblers, redwings and fieldfares. Frogs and toads breed on site and grass	Out	No direct habitat loss and no impact pathways identified over this distance	County

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Site Name	Distance from the site	Description	Scoped in/out	Reason for scoping in/out	Importance
		snakes occur. Butterflies include common blue and meadow brown.			
Coldham's Common LNR	1.9km North	Coldham's Common is one of the largest open spaces in Cambridge, covering an area of 42.45 hectares. It is widely used by people for a variety of different activities and is fundamentally important for its natural habitats and the biodiversity they support.	Out	No direct habitat loss and no impact pathways identified over this distance	County

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Non-Statutory Designated Sites

Table 8-7 Non-statutory designated sites scoped in / out for detailed assessment

Site Name	Distance from site	Description	Scoped in/out	Reason for scoping in/out	Importance
Eight-acre Wood and Seven acres wood CiWS	1.4km West	This site qualifies as a CiWS for woodland	Out	No direct habitat loss and no impact pathways identified over this distance	County
Bentley Road Paddocks CiWS	0.3km West	The site qualifies as a CiWS for neutral grassland. It also should have consideration as semi-natural habitat adjacent to a chalk stream	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the CiWS is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	County
Cambridge Botanic Gardens CWS	0.2km North West	This 15ha site qualifies as a CWS because it is a Grade C site in the JNCC Invertebrate Register and also because it is a Site of Importance in the Bryophyte Site Register for Cambridgeshire	Out	No direct habitat loss and no impact pathways identified over this distance	County
Cherry Hinton Brook CWS	1.5km East	The site qualifies as a CWS because it is a chalk stream, and because it supports a breeding population of water vole	Out	No direct habitat loss and no impact pathways identified over this distance	County

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Site Name	Distance from site	Description	Scoped in/out	Reason for scoping in/out	Importance
Clare Wood CiWS	0.4m West	The site is a CiWS along Hobson's Brook for woodland	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the CiWS is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	County
Coe Fen CWS	1.2km North West	The site qualifies as a CWS for pollard Willows. It may still support a population of a vascular plant species, which is rare in the county (the aquatic Whorl-grass ( <i>Catabrosa aquatica</i> )), which is present in the adjacent Sheep's Green. The central ditch is likely to be sufficiently diverse to qualify as a City Wildlife Site in its own right under the diverse linear water body criterion.	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the LNR is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	County
Grantchester Road Plantations CiWS	1.8km West	This site qualifies as a CiWS for woodland	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the LNR is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	County

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Site Name	Distance from site	Description	Scoped in/out	Reason for scoping in/out	Importance
Hedgerow west of Barbaham Road CiWS	0.3m East	This hedgerow along with associated grass verge and path site qualifies as a CiWS for hedgerows	Out	No direct habitat loss and no impact pathways identified over this distance	County
Hobson's Brook (Mid and South) CiWS	Within Site Boundary	This site qualifies as a CiWS as a chalk stream, as a number of smaller sites, e.g. Hobson's Conduit and Vicar's Brook	In	As the CiWS is within the construction ZoI, there are potential construction impacts and as such this site has been scoped in	County
Little St Mary's Churchyard CiWS	1.6km North	A small (0.23 ha) site which qualifies as a CiWS for non-vascular plants, due to presence of a nationally scarce moss <i>Rhynchostegiella curviseta</i>	Out	No direct habitat loss and no impact pathways identified over this distance	County
Long Road Plantation CiWS	Adjacent to Site Boundary	A belt of broadleaved woodland south of Long Road	In	There would be no direct land take. However, there is potential for indirect effects associated with air quality (i.e. dust) due to the close proximity to the proposed Development.	County
Lower Vicar's Brook CWS	0.7km North West	This site is a CWS because it is a chalk stream with adjacent semi-natural habitat (criterion 2.14). It may deserve County Wildlife Site status, since it may still support a population of a vascular plant species, which is rare in the county (Whorl Grass)	In	No direct habitat loss is anticipated and due to the proximity of the proposed Development, there is no potential for indirect effects due to air quality. However, as the CWS is hydrologically linked to the proposed Development, there is potential for indirect effects due to hydrology.	County



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Site Name	Distance from site	Description	Scoped in/out	Reason for scoping in/out	Importance
Meadows and Drain CiWS	1.7km West	The site qualifies as a CiWS as an area of undeveloped floodplain directly associated with the River Cam CWS	In	Although, this CWS is 1.7km from the Site at its closest point, ditches and streams on the site link to the River Cam providing impact pathways between this site and works.	County
Mill Road Cemetery CiWS	1.1km North	A 4 ha site comprising neutral-calcareous grassland area with scattered trees and shrubs	Out	No direct habitat loss and no impact pathways identified over this distance	County
Netherhall Farm Meadow CWS	1.3km East	This site qualifies as a CWS as it contains more than 0.05ha of CG3 Upright Brome calcareous grassland community. It also supports frequent numbers of at least eight neutral grassland indicator species	Out	No direct habitat loss and no impact pathways identified over this distance	County
Norman Cement Pits CiWS	1.8km East	This site qualifies as a CiWS for scrub having blocks of scrub over 0.5ha in area with four or more woody species. It also qualifies as a habitat mosaic; a site over 1 ha in size with a mix of scrub, hedgerows, woodland, open water swamp, semi-improved grassland and ruderal communities.	Out	No direct habitat loss and no impact pathways identified over this distance	County
CU Officer training Corps Pit CiWS	1.2km East	The site qualifies as a CiWS for calcareous grassland, and also for neutral grassland and scrub	Out	No direct habitat loss and no impact pathways identified over this distance	County
Old Mill Plantation CiWS	1.9km West	This site qualifies as a CiWS for woodland	Out	No direct habitat loss and no impact pathways identified over this distance	County

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Site Name	Distance from site	Description	Scoped in/out	Reason for scoping in/out	Importance
Perse Girl's School Reedbed CiWS	1.3km North West	A 0.44 ha CiWS for reedbed close to the River Cam, qualifying as it is an area of undeveloped floodplain directly associated with the River Cam County Wildlife Site	In	Although, this CWS is 1.3km from the Site at its closest point, ditches and streams on the site link to the River Cam providing impact pathways between this site and works.	County
Red Cross Lane Drain CiWS	0.3km East	This CiWS supports five or more neutral grassland indicator species in frequent numbers.	Out	No direct habitat loss and no impact pathways identified over this distance	County
River Cam CWS	Distance variable due to linearity of site	A CWS (divided into ten separate CWS) for the main river channel, subsidiary channels and associated habitat	In	Although, this CWS is 0.5km from the Site at its closest point, ditches and streams on the site link to the River Cam providing impact pathways between this site and works.	County
River Granta CWS	0.9km South	Tributary of the River Cam.	In	Although, this CWS is 1.5km from the Site at its closest point, ditches and streams on the site link to the River Granta providing impact pathways between this site and works.	County
Sheep's Green CWS	1.3km West	This site qualifies as a CWS for pollard willows. It also qualifies for supporting a population of a vascular plant rare in Cambridgeshire (the aquatic Whorl-grass). The southern triangle of Sheep's Green should be considered for inclusion, because of its mature pollards. The line of younger pollards along Lammas Land should be considered for inclusion in the River Cam CWS	In	Although, this CWS is 1.3km from the Site at its closest point, ditches and streams on the site link to the River Cam providing impact pathways between this site and works.	County

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Site Name	Distance from site	Description	Scoped in/out	Reason for scoping in/out	Importance
Skaters Meadow Group CiWS	1.8km North West	The site qualifies under CiWS criteria for neutral grassland, pollard willows, and as part of the riparian habitat in the River Cam valley. It also deserves consideration under criteria for Greater Pond-sedge <i>Carex riparia</i> swamp, Lesser Pond-sedge <i>Carex acutiformis</i> swamp, hydrosere zonation, and two or more fen types. Additionally, this site has previously qualified as a CWS for the damp neutral grassland interest	In	Although, this CiWS is 1.8km from the Site at its closest point, ditches and streams on the site link to the River Cam providing impact pathways between this site and the proposed works.	County
Triangle north of Long Road CWS	Within Site Boundary	The site qualifies as a CWS because of the presence of a Nationally Scarce vascular plant species (Spreading Hedge-parsley <i>Torilis arvensis</i> ). Historically the site also qualifies as a City Wildlife Site for calcareous grassland	In	There would be no direct land take. However, there is potential for indirect effects associated with air quality (i.e. dust) and changes in hydrology due to the close proximity to the proposed Development.	County
Trumpington Road woodland CiWS	0.8m West	This site qualifies as a CiWS for woodland	In	No direct habitat loss and no impact pathways identified during construction. However, as this site is located within 200m of the affected road network, there is potential for operational effects due to air quality from changes in traffic levels.	County

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**Plants and Habitats**

- 8.3.3 A full description of the plants and habitats baseline conditions is presented in the Preliminary Ecological Appraisal report (Appendix 8.2, document number 158454-ARC-00-ZZ-ASS-EEN-000003, Ref 8.38). A summary of the key plant and habitat features present within the Study Area is provided below.
- 8.3.4 The plants and habitats baseline was used to inform the Biodiversity Net Gain Assessment. Full details can be found in Appendix 8.10. The baseline habitats within the site boundary currently delivers 346.54 biodiversity units for area-based habitats, 4.83 units from hedgerows and 6.07 units from rivers.
- 8.3.5 The desk study returned nine recent records of eight different species of notable or protected plant species. All records related to locations outside the Site Boundary within CWSs and the Nightingale Recreation Ground.
- 8.3.6 Priority habitats in Cambridge are lowland calcareous grassland, lowland meadows, wet woodland, ancient/ and species-rich hedgerows; lowland mixed deciduous woodland and open mosaic habitats (Ref 8.14).

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Table 8-8 Summary and evaluation of plants and habitats within the ZOI

Habitat	Description	Level of Importance	Justification
Broad-leaved semi-natural woodland	Two isolated parcels of woodland supporting Ash and Horse-chestnut <i>Aesculus hippocastanum</i> .	County	<ul style="list-style-type: none"> <li>This is included as a Habitat of Principal Importance (HoPI) under the NERC Act 2006</li> <li>It is a Local Biodiversity Action Plan (BAP) Priority Habitat for Cambridgeshire and Peterborough</li> <li>It is likely to appreciably enrich the habitat resource at a County level and provide habitat features that are of importance for migration, dispersal and genetic exchange of species</li> </ul>
Broad-leaved plantation woodland	<p>The plantation woodland within Triangle North of Long Road CiWS (Figure 8.1, Appendix 8.1) has been classified as plantation woodland as per the citation. However, areas of the woodland appear to be more semi-natural, supporting Ash, Hawthorn, Horse-chestnut and Whitebeam <i>Sorbus aria</i>.</p> <p>There is another area of plantation woodland to the south of Long Road as well as large areas of new tree planting within Hobson's Park.</p>	Local	<ul style="list-style-type: none"> <li>Widespread and common throughout the landscape</li> <li>Structurally-poor with limited species diversity</li> <li>This habitat is likely to appreciably enrich the habitat resource within the local context, supporting species and features of importance for migration, dispersal, or genetic exchange</li> </ul>
Dense and scattered scrub	Scrub was present at the margins of other habitats, such as along ditches, and along the railway, supporting Bramble <i>Rubus fruticosus</i> agg. and Hawthorn.	Local	<ul style="list-style-type: none"> <li>Widespread and common throughout the landscape</li> <li>This habitat is likely to appreciably enrich the habitat resource within the local context, supporting species and features of importance for migration, dispersal, or genetic exchange</li> </ul>
Parkland trees (not considered veteran)	<p>There were several individual parkland trees present throughout Hobson's Park.</p> <p>Lines of mature trees adjacent to buildings to the east of the railway.</p>	Local	<ul style="list-style-type: none"> <li>Widespread and common throughout the landscape</li> <li>This habitat is likely to appreciably enrich the habitat resource within the local context, supporting species and features of importance for migration, dispersal, or genetic exchange</li> </ul>

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Habitat	Description	Level of Importance	Justification
Semi-improved Neutral grassland	Much of the newly created landscaped area within the Hobson's Park appeared to support a good mix of species, probably due to a wildflower seed mix being sown in the area.	County	<ul style="list-style-type: none"> <li>This is included as a HoPI under the NERC Act 2006</li> <li>It is a Local BAP Priority Habitat for Cambridgeshire and Peterborough</li> <li>It is likely to appreciably enrich the habitat resource at a County level and provide habitat features that are of importance for migration, dispersal and genetic exchange of species</li> </ul>
Semi-improved calcareous grassland	One field near Shepreth Junction (see National Vegetation Classification, NVC survey below).	County	<ul style="list-style-type: none"> <li>This is included as a HoPI under the NERC Act 2006</li> <li>It is a Local BAP Priority Habitat for Cambridgeshire and Peterborough</li> <li>It is likely to appreciably enrich the habitat resource at a County level and provide habitat features that are of importance for migration, dispersal and genetic exchange of species</li> <li>Assessed on a precautionary basis as NVC survey was undertaken outside optimal survey season.</li> </ul>
Poor semi-improved neutral grassland	There were several areas of grassland with more limited plant diversity than those above.	Local	<ul style="list-style-type: none"> <li>Widespread habitat in the UK but less common within an arable landscape</li> <li>This habitat is likely to appreciably enrich the habitat resource within the local context, supporting species and features of importance for migration, dispersal, or genetic exchange</li> </ul>
Improved grassland	Two horse grazed fields were present adjacent to the railway to the south of the Site Boundary.	Site	<ul style="list-style-type: none"> <li>Widespread habitat in the UK, limited area of habitat within the Zol</li> <li>Structurally poor, heavily modified and supports a low species diversity</li> </ul>
Amenity grassland	Present within the sports grounds in the Study Area, dominated by Perennial Ryegrass <i>Lolium perenne</i> and White Clover <i>Trifolium repens</i> .	Site	<ul style="list-style-type: none"> <li>Common and widespread habitat of low species diversity and poor structural integrity</li> <li>Not considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal, or genetic exchange.</li> </ul>

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Habitat	Description	Level of Importance	Justification
Standing water (ponds)	Several waterbodies across the Study Area including attenuation ponds with variable water levels at time of survey. Plant species recorded included Common Reed and Watercress <i>Rorippa nasturtium-aquaticum</i> .	County	<ul style="list-style-type: none"> <li>This is included as HoPI under the NERC Act 2006</li> <li>It is a Local BAP Priority Habitat for Cambridgeshire and Peterborough</li> <li>It is likely to appreciably enrich the habitat resource at a County level and provide habitat features that are of importance for migration, dispersal and genetic exchange of species</li> </ul>
Standing water (ditches)	Several ditches were present across the Study Area. The majority of these dried out throughout the year. Species comprised Common Reed, Pendulous Sedge <i>Carex pendula</i> , Rosebay Willowherb <i>Chamerion angustifolium</i> .	Local	<ul style="list-style-type: none"> <li>Common and widespread throughout the Site Boundary and Zol</li> <li>This habitat is likely to appreciably enrich the habitat resource within the local context, supporting species and features of importance for migration, dispersal, or genetic exchange</li> </ul>
Running water	Hobsons Brook flows through the Site Boundary south to north and under the existing railway near Shepreth Junction. Hobsons Conduit flows from Nine Wells LNR, under the railway to the south of Addenbrookes Road and joins Hobson Brook. This is a chalk stream with trees and scattered scrub present along edges. A section of Hobson's Brook and Hobson's Conduit are designated as a CiWS and is known to support water vole, reptiles and invasive species.	County	<ul style="list-style-type: none"> <li>Uncommon habitat within the Zol</li> <li>This is included as HoPI under the NERC Act 2006</li> <li>It is a Local BAP Priority Habitat for Cambridgeshire and Peterborough</li> <li>It is likely to appreciably enrich the habitat resource at a County level and provide habitat features that are of importance for migration, dispersal and genetic exchange of species.</li> </ul>
Arable	Arable fields sown with beans and wheat were present to the south of Addenbrookes Road and Hobson Conduit.	Site	<ul style="list-style-type: none"> <li>Common and widespread throughout the Site Boundary and wider landscape</li> <li>Structurally poor, heavily modified and supports a low species diversity</li> </ul>

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Habitat	Description	Level of Importance	Justification
Hedgerow (species poor)	Several species-poor hedgerows were recorded in the south of the proposed Development. Hedge species included Hawthorn, Rose <i>Rosa</i> sp. and Elder <i>Sambucus nigra</i> .	County	<ul style="list-style-type: none"> <li>• Uncommon habitat within the Zol</li> <li>• This is included as a HoPI under the NERC Act 2006</li> <li>• It is a Local BAP Priority Habitat for Cambridgeshire and Peterborough</li> <li>• It is likely to appreciably enrich the habitat resource at a County level and provide habitat features that are of importance for migration, dispersal and genetic exchange of species</li> </ul>
Built-up areas	<p>Dominant in the north of the Study Area, but also present in the south (at Great Shelford) comprising office and residential buildings.</p> <p>Five bridges of differing construction including road, rail and a footbridge.</p>	Negligible	<ul style="list-style-type: none"> <li>• Common and widespread throughout the Zol (mainly in the north of the Study Area)</li> <li>• One bridge found to provide nesting habitat for house martin <i>Delichon urbicum</i></li> </ul>
Bare ground / exposed earth / hardstanding	Hardstanding was located in many places within the Study Area e.g. car parking, roads, ballast and the guided busway. Also present were tennis courts and other asphalt covered sports pitches.	Negligible	<ul style="list-style-type: none"> <li>• Common and widespread throughout the surrounding landscape and do not appreciably enrich the habitat resource within the local context.</li> <li>• Unlikely to support features of importance for migration, dispersal, or genetic exchange of species.</li> </ul>

Local BAP Priority Habitat (Ref 8.14)



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8.3.7 The most southerly field close to Shepreth Branch Junction comprised species characteristic of calcareous grassland. The habitat was difficult to fit into an NVC community, likely due to the time of year the surveys were undertaken. Table 8-9 below details the plants found during the survey.

Table 8-9 Plant species recorded during the field survey.

Latin Name	Common Name	Quadrat (Domin Scale)				Frequency	Domin Range
		1	2	3	4		
<i>Dactylis glomerata</i>	Cock's-foot	8	7	5	4	IV	4-8
<i>Bryophyta</i>	moss sp.	4	3	4	5	IV	3-5
<i>Holcus lanatus</i>	Yorkshire-fog	2	4	4	5	IV	2-5
<i>Festuca rubra</i>	Red Fescue	5	4	5	1	IV	1-5
<i>Plantago lanceolata</i>	Ribwort Plantain	2	4	4	3	IV	2-4
<i>Galium album</i>	Hedge Bedstraw	3	1	4	3	IV	1-4
<i>Leontodon hispidus</i>	Rough Hawkbit	1	4	2	4	IV	1-4
<i>Linum catharticum</i>	Fairy Flax	1	2	1	1	IV	1-2
<i>Vicia sepium</i>	Bush Vetch	3	3	3	3	IV	3
<i>Cynosurus cristatus</i>	Crested Dog's-tail		6	4	4	III	4-6
<i>Origanum vulgare</i>	Wild Marjoram	4	4		1	III	1-4
<i>Galium aparine</i>	Cleavers		1	2	1	III	1-2
Bare ground			4	3		II	3-4
<i>Glechoma hederacea</i>	Ground-ivy			3	2	II	2-3
<i>Caliergonella cupsidata</i>	Pointed Spear-moss		1		2	II	1-2
<i>Leucanthemum vulgare</i>	Oxeye Daisy			4	4	II	4
<i>Cerastium fontanum</i>	Common Mouse-ear	1	1			II	1
<i>Picris hieracioides</i>	Hawkweed Oxtongue		1		1	II	1
<i>Veronica chamaedrys</i>	Germander Speedwell				3	I	3

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Latin Name	Common Name	Quadrat (Domin Scale)				Frequency	Domin Range
		1	2	3	4		
<i>Rumex acetosa</i>	Common Sorrell			2		I	2
<i>Heracleum sphondylium</i>	Hogweed	2				I	2
<i>Medicago lupulina</i>	Black Medick	1				I	1
<i>Elymus repens</i>	Common Couch	1				I	1
<i>Hedera helix</i>	Common Ivy				1	I	1
<i>Urtica dioica</i>	Common Nettle	1				I	1
<i>Jacobaea vulgaris</i>	Common Ragwort	1				I	1
<i>Anthriscus sylvaticus</i>	Cow Parsley		1			I	1
<i>Crataegus monogyna</i>	Hawthorn (seedling)				1	I	1

## Invasive Non-Native Species

8.3.8 The desk study returned 28 recent records of 11 species of non-native invasive species. None of these species were recorded within the Site Boundary, with the majority relating to their presence by or within the River Cam. This included the following species:

- Canadian Waterweed *Elodea canadensis*
- False-acacia *Robinia pseudoacacia*
- Few-flowered Garlic *Allium paradoxum*
- Floating Pennywort *Hydrocotyle ranunculoides*
- Giant Hogweed *Heracleum mantegazzianum*
- Himalayan Cotoneaster *Cotoneaster simonsii*
- Wall Cotoneaster *Cotoneaster horizontalis*
- Indian Balsam *Impatiens glandulifera*
- Japanese Knotweed *Fallopia japonica*
- New Zealand Pigmyweed *Crassula helmsii*
- Nuttall's Waterweed *Elodea nuttallii*

8.3.9 One stand of Giant Hogweed was identified during the field survey on Long Road Guided Busway bridge adjacent to the Site Boundary. This species is listed in Schedule 9 to the WCA. Invasive non-native species are not considered to be a species of conservation concern and therefore are considered to be of Negligible importance for biodiversity. However, invasive non-native species are considered to be an IEF to ensure legislative compliance.

## Terrestrial Invertebrates

- 8.3.10 The desk study returned multiple records of terrestrial invertebrates within 2km of the Site Boundary, including a recent record for swallowtail butterfly *Papilio machaon*, protected under the WCA as well as several species of moth listed as a Species of Principal Importance under the NERC Act 2006 (Ref 8.5). The majority of the records were associated with the Cambridge Botanic Gardens, approximately 500m from the proposals.
- 8.3.11 The habitats within the Site Boundary were assessed for their suitability to support terrestrial invertebrates during the Phase 1 survey. The majority of the habitats within the Site Boundary lacked sufficient diversity or species richness to support notable invertebrate species, including those mentioned above. The recently planted semi-improved grassland within Hobson's Park is not yet sufficiently established to support a more diverse range of invertebrate species.
- 8.3.12 Given the lack of suitable habitats currently present within the Site Boundary, the invertebrate assemblage within the Zol is considered to be of Negligible importance for biodiversity, therefore not considered to be an IEF and are not considered further within this assessment.

## Aquatic Invertebrates

- 8.3.13 The desk study identified that Nine Wells LNR, located 150m east of the Site Boundary, was previously designated a SSSI for its notable freshwater invertebrate interest, but that the notable species had been lost to a drought in 1976 and has since been downgraded to an LNR. There were no recent records for notable freshwater invertebrates within Nine Wells LNR. However, an artificial recharge scheme was put in place to help maintain the flow of water from the spring at Nine Wells (Ref 8.52). This could lead to possible reintroductions in the future (Ref 8.39).
- 8.3.14 The pond and ditch habitat within the Site Boundary is considered to be suitable for common and widespread species only. As such, the invertebrate assemblage within the Zol is considered to be of Negligible importance for biodiversity and not considered to be an IEF. This receptor is therefore not considered further within this assessment. Hobson Brook is likely to support a more diverse invertebrate assemblage and therefore would be considered to be of higher (Site) importance for biodiversity, the assessment of effects on fish associated with the Brook is included within the assessment of effects on Hobson's Brook CWS as a whole. This specific receptor alone is therefore not considered further within this document.

## Fish

- 8.3.15 The desk study identified one record of European eel *Angilla anguilla* within 2km; this record was from Sheep Green CWS 1.3km from the Site Boundary. There is a hydrological link via Hobson's Brook and other ditches within the Site Boundary to this CiWS and also the River Cam, located 0.5km from the Site Boundary and is also known to support fish.
- 8.3.16 Fish were recorded at ponds P012 and P022 during the great crested newt surveys (See Appendix 8.2 and Appendix 8.3 for great crested newt survey results). Hobson's Brook as well as the ditch and pond habitat within the Site Boundary could provide suitable habitat for common and widespread fish species. However, the majority of the ditches and ponds appear to dry out frequently, and therefore the potential for fish to be present is considered low.
- 8.3.17 As such, the fish assemblage within the ditches and ponds within the Zol is considered to be of Negligible importance for biodiversity and not considered to be an IEF. Hobson Brook is likely to support a more diverse fish population and therefore would be considered to be of higher (Site) importance for biodiversity, the assessment of effects on fish associated with the Brook will be included within the assessment of effects on Hobson's Brook CiWS as a whole. This specific receptor alone is therefore not considered further within this document.

## Amphibians

### Great Crested Newts

- 8.3.18 A full description of the baseline conditions relating to great crested newts is presented in Appendix 8.3: Great Crested Newt Survey Report and Figure 8.3, Appendix 8.1. A summary of the key findings relating to great crested newts within the Zol is provided below.

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- 8.3.19 The desk study returned eight records for great crested newts within 2km of the Site Boundary. One waterbody (P022) had an EPS licence for great crested newts associated with it.
- 8.3.20 A total of 31 waterbodies were assessed for their potential to support great crested newts within 500m of the Site Boundary. Surveys for great crested newt eDNA undertaken in 2019 confirmed presence at waterbodies P028 and P029 by Addenbrooke's road. Targeted population class estimate surveys undertaken in 2020 found P028 to be dry and a small population of great crested newts present within P029 with a peak count of one adult great crested newt. The rough grassland, woodland and scrub habitat present within the proposed Development are considered suitable for supporting great crested newts.
- 8.3.21 A significant proportion of the national great crested newt population is present within Cambridgeshire (Ref 8.14) and given the small number of great crested newt present within the Zol, it is not considered likely these form a critical part of the wider population. As such, this species is considered to be of Local importance for biodiversity. For this reason and the following, great crested newts are considered to be an IEF:
- It is an EPS;
  - It is legally protected under Schedule 5 to the WCA;
  - It is listed as a SoPI; and
  - It is a Cambridgeshire and Peterborough BAP (Ref 8.14) Priority Species.

Other Amphibians

- 8.3.22 The desk study returned 15 recent records of common toad (*Bufo bufo*), none of which were observed within the Site Boundary. The waterbodies (ditches and ponds) do provide some suitable breeding habitat for common toad; however, as the majority of waterbodies dry up on a regular basis, so there is a low likelihood that common toad would be present with the Site Boundary. The terrestrial habitats (rough grassland, woodland, scrub) within the Site Boundary do provide foraging and hibernating opportunities. However, it is considered likely this species will be present, at most, in low numbers.
- 8.3.23 Common toad is listed as Species of Principal Importance in the NERC Act 2006 (Ref 8.5). Given the population present within the Site Boundary is likely to be, at best, small, they are considered to be of Negligible importance and likely significant effects would not occur as a result of the proposed Development, this species together with other common species of amphibian are not considered to be an IEF. As such, they are not considered further in this assessment.

**Reptiles**

- 8.3.24 A full description of the baseline conditions relating to reptiles is presented in Appendix 8.4: Reptiles Survey Report and Figure 8.4 in Appendix 8.1. A summary of the key findings regarding reptiles present within the Zol is provided below.
- 8.3.25 The desk study returned records for grass snake (*Natrix natrix*) and common lizard (*Zootoca vivipara*) within 2km of the Site Boundary.
- 8.3.26 Targeted surveys confirmed the presence of common lizard with the Site Boundary. Less than five individuals were recorded at any one time and therefore the population size is classified as 'Low'. No other reptile species were recorded during the surveys. However, grass snake has been previously recorded in close proximity to the proposed Development and may be present in low numbers as suitable habitat is present (open water associated with long-grass).
- 8.3.27 Although low numbers of reptiles were recorded within the Site Boundary, the reptile assemblage within the Zol is anticipated to be of Local importance for biodiversity and a potential IEF for the following reasons:
- They are legally protected under Schedule 5 to the WCA;
  - They are listed as a Species of Principal Importance on the NERC Act 2006 (Ref 8.5); and
  - They are a Cambridgeshire and Peterborough BAP (Ref 8.14) Priority Species.

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## Birds

Breeding Birds

- 8.3.28 A full description of the baseline conditions relating to breeding birds is presented in Appendix 8.5: Breeding Bird Survey Report and Figures 8.5 to 8.7 in Appendix 8.1. A summary of the key breeding bird assemblage features within the Zol is provided below.
- 8.3.29 The desk study identified several species listed under Schedule 1 of the WCA as well as species of conservation concern. Of the Schedule 1 species identified, the proposed Development and surrounding area were potentially suitable for kingfisher (*Alcedo atthis*) and barn owl. The desk study also identified a number of wetland birds using the wetland habitat as Hobson's Park reserve immediately adjacent to the Site Boundary.
- 8.3.30 There was a range of habitats suitable to support nesting and foraging birds within the Site Boundary and the wider Zol including woodland and scrub, hedgerow, grassland, arable, wetland and built habitats.
- 8.3.31 A total of 55 species were found to be present within the Zol, consisting of 48 likely breeding and seven non-breeding. Species were typical of the habitats within the Cambridgeshire area but included kingfisher (likely to be foraging within the wider Study Area) and a number of wetland species associated with the bird reserve and other waterbodies in Hobson's Park. A total of 19 species were either protected or notable species, the majority of which were associated with the grassland, arable or wetland habitat.
- 8.3.32 Table 8-10 below provides a summary of the protected and notable species present within the Study Area.

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Table 8-10 Protected and notable breeding bird species present within the Study Area

Species	Protection / Conservation Status	Peak Abundance	Estimated Breeding Pairs	% County Breeding Population (based on estimated breeding pairs)	Potential Presence within Site Boundary** / Suitable Habitat	Level of Importance within the Zol
<b>Songbirds and Allies</b>						
Corn bunting <i>Emberiza calandra</i>	Red / SOPI / CPS	11	10	20%*	On-site / Arable, Grassland	County
Dunnock <i>Prunella modularis</i>	Amber	4	2	0.9%	On-site / Woodland, Scrub, Hedgerow	Local
House martin <i>Delichon urbicum</i>	Amber	53	15	12%*	On-site / Built structures, Urban, Grassland	County
Linnet <i>Linaria cannabina</i>	Red / CPS	7	2	1.2%	On-site / Arable, Grassland	Local
Meadow pipit <i>Anthus pratensis</i>	Amber	1	Foraging only	N/A – Foraging only	On-site / Grassland	Site
Reed bunting <i>Emberiza schoeniclus</i>	Amber / CPS	15	4	0.6%	On-site / Farmland, Wetland	Local
Skylark <i>Alauda arvensis</i>	Red / CPS	87	54	7.8%*	On-site / Arable, Grassland	County
Song thrush <i>Turdus philomelos</i>	Red / SOPI / CPS	1	1	1%	On-site / Farmland, Woodland, Urban	Local
Starling <i>Sturnus vulgaris</i>	Red / SOPI	81	Foraging only	N/A – Foraging only	On-site / Farmland, Grassland	Local

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Species	Protection / Conservation Status	Peak Abundance	Estimated Breeding Pairs	% County Breeding Population (based on estimated breeding pairs)	Potential Presence within Site Boundary** / Suitable Habitat	Level of Importance within the ZOI
Stock dove <i>Columba oenas</i>	Amber	1	1	3%	On-site / Woodland	County
Swift <i>Apus apus</i>	Amber / CPS / CPASI	8	Foraging only	N/A – Foraging only	On-site / Built structures, Urban, Grassland	Local
Yellowhammer <i>Emberiza citrinella</i>	Amber / SOPI / CPS	3	3	6%*	On-site / Arable, Hedgerows	Local
<b>Waterbirds</b>						
Black-headed gull <i>Chroicocephalus ridibundus</i>	Amber	200	40	1.8%	Off-site / Wetland, Grassland, Arable	County
Common tern <i>Sterna hirundo</i>	Amber	3	3	N/A – Foraging only	Off-site / Wetland	Local
Herring gull <i>Larus argentatus</i>	Red / SOPI / CPS	17	Foraging only	N/A – Foraging only	Off-site / Wetland, Grassland, Arable	Local
Mallard <i>Anas platyrhynchos</i>	Amber	19	4	0.4%	On-site / Wetland, Ponds, Ditches	Local
Mute Swan <i>Cygnus olor</i>	Amber	4	1	1%	Off-site / Wetland, Ponds, Ditches	Local
Kingfisher	Sch 1 / Amber	1	Foraging only	N/A – Foraging only	Off-site / Wetland, Ponds, Ditches	Local
<b>Raptors</b>						

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Species	Protection / Conservation Status	Peak Abundance	Estimated Breeding Pairs	% County Breeding Population (based on estimated breeding pairs)	Potential Presence within Site Boundary** / Suitable Habitat	Level of Importance within the ZOI
Kestrel <i>Falco tinnunculus</i>	Amber	1	1	6%	On-site (foraging only) / Arable, Grassland	Local

\* Likely under-recorded across the county.

\*\*Based on presence of suitable habitat and distribution of species during the surveys

Sch 1 = Species protected under Schedule 1 to the WCA (Ref 8.3)

Red / Amber = Species of Conservation Concern (Ref 8.41)

SOP1 = Species of Principal Importance as listed under the NERC (2006) (Ref 8.5)

CPS = Cambridgeshire Priority Species (Ref 8.14)

CPASI = Cambridgeshire and Peterborough Additional Species of Interest (Ref 8.14)



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- 8.3.33 The general assemblage of breeding birds within the Study Area is considered to be of County value for biodiversity. This is because it supported species that are likely to form an important part of the County assemblage (especially black-headed gull, corn bunting, house martin, skylark and stock dove) and loss or disturbance of these populations would be likely to adversely affect the conservation status and distribution of birds at the County scale. Furthermore, the assemblage supports several species of conservation concern that are uncommon and priority species within Cambridgeshire.
- 8.3.34 The survey results indicated that the Study Area and habitat within the Site Boundary is not an important foraging resource for barn owl. Two barn owl boxes were found within 250m of the Site Boundary to the west of Shepreth Branch Junction. The box nearest the railway (Box B, Figures 8.5 to 8.7, Appendix 8.1) had been deliberately closed and was not accessible for use by barn owl. Another box (Box A, Figures 8.5 to 8.7, Appendix 8.1) at the edge of the western arable field, showed no signs of use by barn owl upon further inspection. There was no suitable breeding habitat for barn owl within the Site Boundary. The barn owl population within the Study Area is considered to be of no appreciable importance, since it is unlikely to form a critical part of the local (or wider) population.

Wintering Birds

- 8.3.35 A full description of the baseline conditions relating to wintering birds is presented in Appendix 8.6: Wintering Bird Survey Report and Figures 8.6 to 8.8 in Appendix 8.1. A summary of the key wintering bird assemblage features within the ZOI is provided below.
- 8.3.36 A total of 57 species were found to be present within the Study Area during the wintering period (October to March). Species were typical of the habitats within the Cambridgeshire area with the addition of wetland species associated with the main waterbody at the bird reserve in Hobson's Park. A total of 25 species were protected or notable, the majority of which were associated with grassland, arable or wetland habitat.
- 8.3.37 Table 8-11 Protected and notable wintering bird species within the below provides a summary of the protected and notable species present.

Table 8-11 Protected and notable wintering bird species within the Study Area

Species	Scientific Name	Protection / Conservation Status	Peak Count (Abundance)	Potential Presence within Site Boundary / Suitable Habitat	Level of Importance within ZOI
<b>Songbirds and Allies</b>					
Dunnock	<i>Prunella modularis</i>	Amber, SOPI	2	On-site / Woodland, Scrub	Local
Fieldfare	<i>Turdus pilaris</i>	Sch1, Red	1	On-site / Arable, Grassland	Local
Grey Partridge	<i>Perdix perdix</i>	Red, SOPI, CPS	13	On-site / Grassland, Arable	County
Linnet	<i>Linaria cannabina</i>	Red, SOPI, CPS	2	On-site / Arable, Grassland	Local

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Species	Scientific Name	Protection / Conservation Status	Peak Count (Abundance)	Potential Presence within Site Boundary / Suitable Habitat	Level of Importance within ZoI
Meadow Pipit	<i>Anthus pratensis</i>	Amber	40	On-site / Grassland, Arable	Local
Redwing	<i>Turdus iliacus</i>	Sch1 / Red	2	On-site / Arable, Grassland	Local
Reed bunting	<i>Emberiza schoeniclus</i>	Amber, SOPI, CPS	6	On-site / Ditch habitat	Local
Skylark	<i>Alauda arvensis</i>	Red, SOPI, CPS	60	On-site / Grassland / Arable	Local
Song Thrush	<i>Turdus philomelos</i>	Red, SOPI, CPS	1	On-site / Woodland, Scrub	Local
Starling	<i>Sturnus vulgaris</i>	Red, SOPI	70	On-site / Grassland, Arable	Local
Stock dove	<i>Columba oenas</i>	Amber	22	On-site / Grassland, Arable	Local
Yellowhammer	<i>Emberiza citrinella</i>	Red, SOPI, CPS	1	On-site / Grassland, Arable	Local
<b>Waterbirds</b>					
Black-headed gull	<i>Chroicocephalus ridibundus</i>	Amber	255	On-site / Grassland, Arable	Local
Common gull	<i>Larus canus</i>	Amber	1	On-site / Grassland, Arable	Local
Gadwall	<i>Mareca strepera</i>	Amber	2	Off-site / Wetland	Local
Herring Gull	<i>Larus argentatus</i>	Red, SOPI, CPS	8	On-site / Grassland, Arable	Local
Kingfisher	<i>Alcedo atthis</i>	Sch 1, Amber	1	On-site / Hobsons Brook conduit	Local

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Species	Scientific Name	Protection / Conservation Status	Peak Count (Abundance)	Potential Presence within Site Boundary / Suitable Habitat	Level of Importance within Zol
Lapwing	<i>Vanellus vanellus</i>	Red, SOPI, CPS	15	Off-site / Arable, Wetland	Local
Mallard	<i>Anas platyrhynchos</i>	Amber	23	Off-site / Wetland, Ditches	Local
Mute Swan	<i>Cygnus olor</i>	Amber	4	Off-site / Wetland	Local
Pochard	<i>Aythya ferina</i>	Red	2	Off-site / Wetland	Local
Shoveler	<i>Anas clypeata</i>	Amber	5	Off-site / Wetland	Local
Snipe	<i>Gallinago gallinago</i>	Amber	63	Off-site / Wetland	Local
Teal	<i>Anas crecca</i>	Amber	5	Off-site / Wetland	Local
<b>Raptors</b>					
Kestrel	<i>Falco tinnunculus</i>	Amber	1	On-site / Grassland, Arable	Local

Sch 1 = Species protected under Schedule 1 of the WCA (Ref 8.3)

Red / Amber = Species of Conservation Concern (Ref 8.41)

SOPI = Species of Principal Importance as listed under the NERC (2006) (Ref 8.5)

CPS = Cambridgeshire Priority Species (Ref 8.14)

8.3.38 Species that were found in low numbers or on only one occasion, indicated they were not reliant on the Study Area to sustain them or were not resident in the Study Area throughout the winter. Species with higher abundance and likely to be resident included grey partridge, meadow pipit, skylark, starling, stock dove, black-headed gull, mallard and snipe. A small number of lapwing were also present at the bird reserve in Hobson's Park and at a surface water pool in the western arable field. The lake and part of Hobson's Brook, south of Addenbrooke's road are likely to provide a foraging resource for kingfisher.

8.3.39 Given the diversity of species and habitats present across the Study Area, the overall assemblage of wintering birds is considered to be of County value for biodiversity.

## Mammals

### Bats

8.3.40 A full description of the baseline conditions relating to bats is provided in Appendix 8.7: Bat Survey Report and Figures 8.11 to 8.17 in Appendix 8.1. A summary of the key findings for bats within the Zol is provided below.

8.3.41 The desk study revealed two designated sites for which bats are a designating feature.

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- Eversden and Wimpole Wood SAC (11km west of the Site) - A colony of barbastelle is associated with the trees in Wimpole Woods.
  - Byron's Pool LNR (1.5km west) - The river corridor supports Daubenton's bats.
- 8.3.42 Seven species of bat were identified in flight within 5km of the Site Boundary by the desk study including common pipistrelle (*Pipistrelle pipistrellus*), Daubenton's bat, Nathusius' pipistrelle (*Pipistrellus nathusii*), noctule (*Nyctalus noctula*), serotine (*Eptesicus serotinus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and barbastelle (*Barbastella barbastellus*). In addition, several confirmed roosts were recorded as well as previous EPS licences for species including brown long-eared bats (*Plecotus auritus*), natterer's (*Myotis nattereri*), serotine, pipistrelle species which included a barbastelle roost at Netherhall Farm to the east of the proposed Development footprint. The majority of the records were clustered around the urban area of Cambridge to the north of the Site Boundary, for example Newtown and south of Romsey Town and at Great Shelford village to the south.
- 8.3.43 Many habitats were identified within the Site Boundary as being suitable for roosting, commuting and foraging bats, including bridges, open water, trees and grassland.
- 8.3.44 The preliminary roost assessments of trees within the Site Boundary identified two trees as having potentially suitable features for use by roosting bats (low suitability).
- 8.3.45 The preliminary roost assessment of the built structures (bridges) within the Site Boundary, identified four of the bridges as having suitable features for use by roosting bats (one moderately suitable and three low suitability, see Figure 8.12, Appendix 8.1). The dusk emergence and dawn re-entry surveys of the bridges identified a pipistrelle roost on Long Road Guided Busway bridge.
- 8.3.46 The transect surveys identified a range of bat species within the Site Boundary, the main species recorded comprised common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule, brown long-eared bat and myotis sp.
- 8.3.47 In addition to this, two barbastelle bat passes were also recorded during the transect surveys. Barbastelle is an Annex II species under the Conservation of Habitats and Species Regulations 2017 (Ref 8.4) and were recorded at Hobson's Park near Addenbrooke's Road (Nine Wells) bridge. These records are considered likely to be of foraging or commuting individuals that were not resident within the ZOI given the low number of passes recorded and the limited roosting opportunities suitable to support this species.
- 8.3.48 The static automated surveys identified moderate levels of bat activity, the main species recorded comprising noctule, common pipistrelle and soprano pipistrelle.
- 8.3.49 High value foraging habitat is present within the Site Boundary including woodland and woodland edges to the north, and hedgerows, ponds and Hobsons Brook to the west of the proposed Development. The majority of the grassland habitat within Site Boundary is semi-regularly mown or arable and therefore has been identified as sub-optimal habitat for foraging bats.
- 8.3.50 High value commuting habitat within the Site Boundary includes the woodland and woodland edges to the north and east, hedgerows and the Hobsons Brook to the west.
- 8.3.51 The railway line offers a linear feature suitable for commuting bats and the presence of scrub/wooded embankments along the track offers good foraging opportunities. This was confirmed during activity surveys whereby commuting and foraging bats were identified along the railway line.
- 8.3.52 A commuting route was identified from the woodland in the north, along the railway under the Long Road Railway Bridge and heading south towards the woodland east of the railway line.
- 8.3.53 The bat assemblage within the Study Area was considered to be of **County** importance for biodiversity and are IEF's for the following reasons:
- They are legally protected under Schedule 5 to the WCA and EPS under Schedule 2 to the Conservation of Habitats and Species Regulations 2017 (Ref 8.4);
  - Three species are listed as Species of Principal Importance under the NERC Act 2006 (Ref 8.5) (namely brown long-eared bat, noctule and soprano pipistrelle);

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- Four bat species are listed as a Cambridgeshire and Peterborough BAP (Ref 8.14) Priority Species (namely barbastelle bat, brown Long-eared bat, noctule and soprano pipistrelle;
- An Annex II species under the Habitats Directive (Ref 8.4) namely barbastelle bat was identified foraging although not considered to be roosting on-site; and
- Moderate levels of activity were recorded within the Study Area and the population is therefore likely to form a critical part of the County population, such that the loss of the population would be likely to adversely affect the conservation status and distribution of bats at a County scale.

Dormouse

- 8.3.54 There were no records for dormouse and the habitat within the Phase 1 habitat Study Area was identified as sub-optimal for use by dormouse, which prefer dense hedgerow networks, wood and scrub habitats. Dormice are considered to be absent from the Site Boundary and not considered further in this assessment.

Otter

- 8.3.55 A full description of the baseline conditions relating to otter are provided in Appendix 8.8: Otter and Water Vole Survey Report and Figure 8.18 in Appendix 8.1. A summary of the key findings for otter within the Zol is provided below.
- 8.3.56 The desk study identified several records of otter within 2km of the Site Boundary. Three of these were within the Zol.
- 8.3.57 No signs of otter were found during the surveys and habitats within the Site Boundary were considered unlikely to support holts but were considered potentially suitable for foraging and commuting.
- 8.3.58 It is considered unlikely that otters are resident within the Site Boundary but may utilise habitats in a transient manner. Given that otter are now widespread across Cambridgeshire (Ref 8.33), the population of otters within the Zol is considered to be of Site importance and therefore not considered to be an IEF.

Water Vole

- 8.3.59 A full description of the baseline conditions relating to water vole are provided in Appendix 8.8: Otter and Water Vole Survey Report and Figure 8.18 in Appendix 8.1. A summary of the key water vole features within the Zol is provided below.
- 8.3.60 The desk study identified several records of water vole within 2km of the Site Boundary.
- 8.3.61 Low populations of water vole were confirmed within four waterbodies and watercourses (P007, WB2, WB3, WB6), i.e. sections of Hobson's Brook as well as one pond to the west of the Busway. In addition, there was potential for water vole to be present within a further six waterbodies and watercourses when holding water (P014, P015, WB1, WB7, WB5, WB9) i.e. other contiguous sections of Hobson's Brook which were not accessible, Nine Wells Nature reserve and ditches south of Addenbrooke's Hospital.
- 8.3.62 Water vole are reported to be widespread across Cambridgeshire, but in isolated populations (Ref 8.42). Although a low population of water vole was recorded within the Zol, water vole are considered to be of **Local** importance and an IEF for the following reasons:
- Water vole is legally protected under Schedule 5 to the WCA;
  - Water vole is listed as endangered in England under the International Union for Conservation of Nature (IUCN) Red List;
  - Species of Principal Importance as listed under the NERC Act 2006 (Ref 8.5); and
  - It is a Cambridgeshire and Peterborough BAP (Ref 8.14) Priority Species;

Badger

- 8.3.63 A full description of the baseline conditions relating to badger are provided in Appendix 8.9: Badger Survey Report – Confidential and Figure 8.20, Appendix 8.1. Due to the vulnerability of badgers to persecution, Appendix 8.9 and Figure 8.20 are confidential, but are available on request where required. A summary of the key badger features within the Zol is provided below.

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- 8.3.64 The desk study identified six records for badger within 2km of the Site Boundary. The field surveys identified two outlier setts within the Zol, both outside the Site Boundary and confirmed the presence of suitable foraging habitat within the Site Boundary.
- 8.3.65 Badgers are not considered to be a species of conservation concern and therefore are considered to be of Negligible importance for biodiversity. However, badger and their setts are nonetheless afforded legal protection under the Protection of Badgers Act 1992 and therefore are considered to be an IEF.

Other Mammals

- 8.3.66 The desk study identified recent records for brown hare (*Lepus europaeus*), harvest mouse (*Micromys minutus*), polecat (*Mustela putorius*) and hedgehog (*Erinaceus europaeus*) within 2km of the Site Boundary.
- 8.3.67 Brown hare were seen during the Phase 1 habitat survey in March 2019 and the November 2020 wintering bird survey. The arable fields and rough grassland provide suitable habitat for supporting brown hare.
- 8.3.68 Overall, the habitats within the Site Boundary were considered sub-optimal for harvest mouse lacking field margins, reedbeds and cornfields. However, there are likely to be isolated areas of suitable habitat along the railway.
- 8.3.69 There were habitats (e.g. semi-improved grassland and woodland) suitable for hedgehog and polecat within the Site Boundary. However, the Cambridgeshire Mammal Group report the presence of polecat in the County as likely to be captive-bred animals from unauthorised escapes rather than natural spread from the west (Ref 8.42). As such, the polecat potentially present within the Zol are considered to be of Negligible value for biodiversity and therefore not an IEF. This species is not considered further in this assessment.
- 8.3.70 Hedgehog, harvest mouse and brown hare are reported to be widespread across the County (Ref 8.42) and could be present within the Zol in low numbers. Brown hare, harvest mouse and hedgehog are listed as Species of Principal Importance on the NERC Act 2006 (Ref 8.5). Given the population present within the Site Boundary is likely to be small, they are considered to be of Negligible importance and as likely significant effects on these receptors would not occur as a result of the proposed Development, neither species are considered to be an IEF. As such, they are not considered further in this assessment.

**Future Baseline**

- 8.3.71 The future baseline identifies any anticipated changes to the existing baseline over time in the absence of the proposed Development and is used as a basis against which to robustly predict the potential impacts of the proposed Development. The future baseline describes the biodiversity features as they would be at the time of the proposed Development proceeding (2023). They are influenced by future developments and factors that have a high degree of uncertainty such as future land management and climate change. Where information exists on planned future developments, this has been taken into consideration during the assessment.
- 8.3.72 Many habitats are considered to be resistant to changes in environmental conditions due to their wide biogeographic amplitude. However, there is still much uncertainty surrounding the effect that climate change will have on biodiversity, particularly where there is interaction with other pressures.
- 8.3.73 Long-term climatic predictions suggest that warmer, wetter winters and drier summers will become more frequent in England, with more extreme weather events likely (Ref 8.43). Combined with changes in land management, increased urbanisation and increased biotic pressures, climate change may lead to an increase in the population and distribution of some species in the UK, such as certain species of migratory birds, for example, but a decrease in other species, such as water vole. In the absence of robust datasets to predict the future status of the condition and extent of habitats and species populations, it is assumed that the future baseline will, in general, be relatively similar to its current state, and the value of the ecological features that are relevant to the proposed Development would be consistent with that of the existing baseline conditions described above.

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- 8.3.74 Hobson Park, which constitutes a large area within the Site Boundary, is mitigation / enhancement land for the Clay Farm residential development to the west of the Site Boundary. In the absence of the proposed Development, the management plan for the park would continue to promote the establishment of good quality species-rich neutral grassland. The recently planted woodlands and parkland trees within the Site Boundary would also be mature.
- 8.3.75 Although, there were no recent records for notable freshwater invertebrates within Nine Wells LNR, an artificial recharge scheme was put in place to help maintain the flow of water from the spring at Nine Wells (Ref 8.52). This could lead to possible reintroductions in the future (Ref 8.39).
- 8.3.76 There are a number of existing and planned developments in the local area, some of which are on the local plan, including residential housing, university buildings and other improvements to public transport, proposed within close proximity to the proposed Development. A list of these developments is included in Appendix 2.3. In the absence of the proposed Development, these developments would lead to an increase in visitor pressure within the park and surrounding area.

## 8.4 Design and Mitigation

- 8.4.1 Environmental considerations have influenced the design development process for the proposed Development, from early route options assessment through to refinement of the design. An iterative process has facilitated design updates and improvements, informed by environmental assessment and input from the proposed Development engineering teams, stakeholders and public consultation.
- 8.4.2 The proposed Development includes a range of environmental commitments. Commitments of relevance to biodiversity are set out in this section under the following categories:
- Good practice: standard approaches and actions commonly used on infrastructure development projects to avoid or reduce environmental impacts, typically applicable across the whole proposed Development.
  - Essential mitigation: any additional specific measures related to the proposed Development needed to avoid, reduce or offset potential impacts that could otherwise result in significant effects. Essential mitigation has been identified by environmental topic specialists, taking into account the embedded and good practice mitigation.
- 8.4.3 Embedded mitigation would be included on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77). Good practice and essential mitigation are included in the outline Code of Construction Practice (CoCP Part A) (see Appendix 2.4) as well as the requirement to secure protected species licences (where required) and production of Precautionary Methods of Working. Relevant embedded mitigation, good practice and essential mitigation to reduce effects on biodiversity are identified below.
- 8.4.4 Where mitigation is provided to address effects associated with either the construction phase or operational phase of the proposed Development, then it is described below under the associated subheadings, respectively. It is acknowledged that time lags may exist between the provision of a mitigation or a compensation measure and the offsetting of the effect in which that measure is intended. This has been accounted for in the assessment of likely effects outlined in Section 8.6, where relevant.

## Construction Approach and Mitigation of Construction Effects

### Good Practice

- 8.4.5 Construction phase lighting has been designed to reduce light spill on to important biodiversity features (see the CoCP Part A).
- 8.4.6 Surface water runoff would be managed through control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk. This includes appropriate measures to deal with treatment of potential pollutants that could feasibly leak into surface water runoff from haul routes and construction compounds. These mitigation measures would control runoff to surface water and the risk of pollution of local watercourses.



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- 8.4.7 Dust suppression measures documented in the CoCP Part A will be applied to mitigate dust deposition resulting in an adverse effect on the important habitats and designated sites located in the vicinity of the proposed Development. For full details refer to Section 7.4 of Chapter 7: Air Quality and Appendix 7-2.
- 8.4.8 Noise and vibration effects will be minimised through the consideration and choice of construction methodology, plant and equipment, careful programming of the works, avoiding works during the more sensitive night-time period, and monitoring to avoid exceedances of thresholds. These will be controlled through the CoCP Part A. For full details refer to Chapter 5: Acoustics Assessment Part 1 – Noise and Chapter 6: Acoustics Assessment Part 2 – Vibration.
- 8.4.9 Pre-construction surveys will be undertaken to ensure robust baselines are available to support detailed design of protected species mitigation strategies, including licensable species such as badgers, water vole, great crested newt and bats, and avoid the spread of invasive non-native species. The requirements for pre-construction surveys are set out in the CoCP Part A.
- 8.4.10 A pre-construction nest check for barn owl will be undertaken by a suitably licensed ecologist prior to the commencement of any works within 250m of the barn owl boxes in the south of the Study Area. If an active nest is found, an exclusion zone would be defined by the ecologist within which no works can commence until the nest is no longer active. The requirements for pre-construction nest checks for barn owl are set out in the CoCP Part A.
- 8.4.11 Invasive species will be identified prior to construction and be removed or treated to prevent their spread, following the CIRIA guidance (Ref 8.45). This is set in the CoCP Part A and Precautionary Methods of Working.
- 8.4.12 Temporary fencing will be used to demarcate important and protected habitats, preventing construction access to protect them from accidental damage. Important and protected habitats include ecological translocation sites, and retained woodland, trees, hedgerows, grassland etc particularly within Hobson's park. Fencing will be installed under the supervision of the Environmental Clerk of Works (ECoW) and in accordance with good practice guidance such as BS 5837:2012 Trees in relation to design, demolition and construction. Suitably qualified and experienced ECoW will be employed throughout the construction phase of the Development to supervise implementation of environmental mitigation and protection commitments (see CoCP Part A).
- 8.4.13 Where possible, wildflower grassland and planted trees removed from the park will be moved to a storage area and replanted following construction. If these plants do not survive, new trees will be planted and grassland will be sown (see CoCP Part A).
- 8.4.14 Where habitats that are known or assumed to support protected or notable species, clearance would take place in a phased, directional manner towards areas of contiguous retained habitat. This would encourage mobile species to actively move from the construction site into the wider landscape. These measures are set in the CoCP Part A and would be implemented under a suitable Precautionary Method of Working and the supervision of the ECoW.
- 8.4.15 To prevent animals from re-entering construction sites, herpetofauna fencing should be installed adjacent to any habitats. The extent of fencing should be determined by an ecologist and should be installed following vegetation clearance in advance of any construction works. This is set in the CoCP Part A.
- 8.4.16 Disturbance, and incidental mortality, of breeding birds would be avoided by timing vegetation clearance and structure removal outside of the bird nesting season (March to August inclusive) wherever possible. Where this is not possible, appropriate measures would be taken to avoid harming birds or their nests (such as temporary fencing around nesting sites where they are immediately adjacent to construction works), under supervision by a suitably experienced ECoW (see the CoCP Part A).
- 8.4.17 To avoid animals such as badgers becoming trapped, all excavations and pits would be suitably covered overnight to prevent this (see the CoCP Part A).



## Essential Mitigation

- 8.4.18 An iterative appraisal of the proposed Development design taking into account the design principles and good practice was undertaken to identify any potentially significant effects that would require essential mitigation. Effects on biodiversity that could be significant and therefore required further consideration for essential mitigation were identified as follows:
- Direct loss of wildlife habitat through land-take.
  - Direct mortality of species through construction activities.
  - Severance, by dividing habitats or wildlife corridors.
- 8.4.19 The land take associated with site compounds, working areas and associated infrastructure has been minimised at the design stage to reduce the potential adverse effects on important ecology receptors and reduce temporary habitat loss.
- 8.4.20 Habitat creation, to replicate areas of woodland, scrub and semi-improved grassland comparable to those lost to the proposals, has been applied to achieve biodiversity net gain, following the Defra biodiversity metric 2.0. This would allow for a minimum of 10% net gain to be achieved for the proposed Development. Habitat creation proposals that can be delivered within the site boundary are shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77).
- 8.4.21 Habitat creation, including tree and scrub planting, would be undertaken on a like-for-like basis or of higher quality. In areas where grassland would be created, the species mix would be herb-rich and focussed on locally prevalent species that would benefit local invertebrate populations.
- 8.4.22 Hedgerow habitat lost during construction will be compensated by creating new hedgerows at locations shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77), using native species of local provenance. Planting will be undertaken as early in the construction programme as reasonably practicable, having regard for the completion of potentially damaging construction activities within and adjacent to the planting area, and seasonal requirements for planting.
- 8.4.23 Ditch habitat lost during construction will be compensated by the creation of enhancement to existing ditches, as shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77).
- 8.4.24 Where directional habitat clearance is not considered appropriate to avoid potential mortality of protected species, a programme of trapping and translocation will occur to move animals away from the construction site and to established receptor sites with sufficient carrying capacity prior to habitat clearance occurring. Species or groups which may be subject to trapping and translocation are great crested newt (and all other native amphibian species found during this process) and reptiles.
- 8.4.25 Works deemed to be of detriment to great crested newt require an appropriate protected species mitigation licence from Natural England. It is likely the organisational licence held by Network Rail in the Eastern Region will be applied for works impacting on great crested newts. The licence would set out specific mitigation measures including species translocation, phased vegetation clearance, exclusion fencing installation, site supervision and habitat restoration.
- 8.4.26 Where protected species licences are not required, the approach to habitat clearance and the potential need to trap and translocate non-licensable species will be determined and undertaken by the ECoW (see CoCP Part A for further details).
- 8.4.27 Where suitable reptile habitat is present along the rail corridor the capture and translocation of animals may be impracticable. Reasons for this include the safety aspects of working along the live track and the difficulties of installing fencing in ballast. It is anticipated translocation using mats only will be undertaken within these areas providing appropriate method statements and health and safety measures can be undertaken. Phased vegetation clearance to disperse animals will be used elsewhere to encourage reptiles to move to the opposite side of the running rails, which will remain uncleared of vegetation.
- 8.4.28 To compensate for the temporary loss of terrestrial habitat, provision of hibernacula and refugia will be required providing hibernating, resting and foraging locations for amphibians

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and reptiles. Enhancement of breeding ponds of poor quality within the Site Boundary will be of benefit to great crested newt. Provision locations of hibernacula are shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77).

- 8.4.29 Bird nest boxes will be provided within areas of retained habitat (woodland and trees), to supplement the habitat creation by offsetting the loss of nesting opportunities whilst newly created habitats establish. A ratio of 10 assorted small nest boxes and one medium open fronted nest box per hectare of lost woodland / scrub would be adopted in accordance with BTO Field Guide No.23 (Ref 8.46), where it is reasonably practicable to erect this number of nest boxes. Boxes will be erected under the supervision of the ECoW.
- 8.4.30 Bat boxes will be installed within areas of retained habitat (woodland and trees) or on the exterior walls of the new buildings on site. The bat boxes that are suitable are detailed below, but other makes of boxes would also be suitable:
- Schwegler 2F Bat Box or similar woodcrete boxes that are suitable for small species such as pipistrelle. This box can be placed in a tree.
  - Schwegler 2FN Bat Box or similar woodcrete boxes that are suitable for larger bat species and small species, the box has two entrances. This box can be placed in a tree.
  - 1WI Schwegler Summer and Winter Bat Box or similar boxes are suitable for placing on exterior walls.
- 8.4.31 Woodcrete boxes have been recommended as they are constructed a material which is long lasting, and the design of the boxes means they require no maintenance; however, other materials do have similar thermal properties and could be considered. Care should be taken to avoid using boxes that are not long lasting or require cleaning. All boxes require annual inspections to ensure they remain in situ and are fit for purpose.
- 8.4.32 Noise reduction tarpaulin will be attached to fencing within 250m of the bird reserve in Hobson's park in order to mitigate for potential visual and noise disturbance to birds using the reserve.
- 8.4.33 If either of the barn owl boxes become active and works within 250m of the barn owl box are unavoidable during the breeding season, screening with noise reduction tarpaulin will be employed around the perimeter of the construction, under the supervision of the ECoW to prevent disturbance to barn owl during the breeding season.
- 8.4.34 Pre-construction surveys of any low potential bat trees shall be undertaken prior to tree removal. Providing the tree was fully inspected, the tree will be removed using standard tree removal methods. If the tree can not be fully inspected, the tree will be removing using soft-felling methods. If a bat were to be present during the pre-construction check, additional surveys and a Protected Species licence from Natural England will be required for tree removal.
- 8.4.35 Pre-construction surveys shall be undertaken to determine the location of water vole burrows. Works which have the potential to cause damage to bankside vegetation, where water voles are confirmed or assumed to be present, shall be micro-sited to avoid water vole burrows. If water vole burrows cannot be avoided through micro-siting, a water vole conservation licence or water vole displacement licence will be required. The licence will set out embedded mitigation measures, (e.g. species translocation, phased vegetation clearance, installing exclusion fencing, site supervision and habitat restoration) which will safeguard water vole and prevent the incidental injury or mortality of animals.
- 8.4.36 All construction works shall be set back 10m from any waterbodies for which water vole are known or assumed to be present. Areas of retained vegetation shall be fenced off with temporary fencing to avoid accidental damage.
- 8.4.37 All required Natural England licences and associated mitigation/compensation areas, working practices and method statements will be in place prior to any related construction works starting in areas where licensable species occur. Where protected species licences are relevant, these will determine the approach to habitat clearance within specific locations (see CoCP Part A for further details).

## Scheme Design and Mitigation of Operational Effects

### Good practice

- 8.4.38 As detailed in Section 18.4 of Chapter 18: Water Resources and Flood Risk, any typical small-scale accidental spills in parking/storage areas would be contained, and rainfall runoff will receive treatment prior to discharge to any watercourse. These control measures will be documented in CoCP Part A. These mitigation measures will control runoff to surface water and the risk of pollution of local watercourses.

### Essential Mitigation

- 8.4.39 Retained and new habitats established during construction will be managed during operation with having regard for Natural England's 'The Mosaic Approach: Managing Habitats for Species' (Ref 8.47) to improve both priority habitats and species. This means creating and maintaining a variety of habitats including:
- Sheltered areas – for example south-facing banks, scrub/brush piles, log piles.
  - Bare ground – a number of species rely on bare ground as a foraging and breeding resource.
  - Flower-rich habitats – a diverse floral assemblage would help support a wide range of species.
  - Scrub and scattered trees – these provide structural diversity but should not be planted in large blocks.
  - Sward diversity – where feasible introduce species that form varying swards (e.g. tussock-forming grass species).
  - Open water – many species rely on ponds and ditches for foraging and drinking resources.
- 8.4.40 Lighting has been designed to reduce impacts on important biodiversity features such as retained areas of woodland and bird reserve within Hobsons Park, for example. This includes directional lighting to reduce the impacts on insects and bats. The lighting design will be produced at the detailed design stage and submitted to the Local Planning Authority for approval to discharge the relevant deemed planning condition.
- 8.4.41 In order to facilitate the movement of animals for example water vole or kingfisher, clear span bridges will be utilised where a new permanent river crossing is proposed to ensure passage is maintained. Full details will be included the detailed design.
- 8.4.42 New pedestrian paths and cycle tracks have been carefully routed, particularly within Hobsons Park, to limit impacts of disturbance from increased footfall on sensitive features, such a nesting birds. The indicative alignment of the proposed pedestrian paths and cycle tracks are shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77) and will be incorporated in the detailed design.
- 8.4.43 Operational noise and vibration effects would be minimised through measures outlined in Chapters 5 and 6: Acoustics Assessment. These methods will be implemented as part of detailed design.
- 8.4.44 Operational phase monitoring surveys for protected species would be informed by the requirements of the relevant protected species licence.

### Enhancement

- 8.4.45 Enhancement will be achieved by maximising the value of the built areas through strategic placement of nest boxes for key bird species of conservation concern and bat boxes. These will be attached to a structure of any proposed building and will be of benefit to these species, which are declining nationally.

## 8.5 Assessment of Residual and Cumulative Effects

### Introduction

- 8.5.1 This section presents the assessment of predicted likely effects on terrestrial biodiversity receptors resulting from the construction and operational phases of the proposed Development. This is based on the design of the proposed Development and takes into account the mitigation as presented in Section 8.4.
- 8.5.2 The assessment takes into account the importance and level of impact criteria as presented in Section 8.2 Assessment Methodology. Professional judgement has been used, where necessary, to assess a reasonable worst-case when determining the level of impact and the significance of likely effects, where more than one significance rating could apply.

### Residual Effects for Construction

- 8.5.3 The likely effects of construction on ecological receptors include the following:
- Habitat loss – direct loss of habitat as a result of construction.
  - Direct mortality – construction activities resulting in injury or death.
  - Fragmentation/habitat severance – preventing animals dispersing and moving within the wider landscape.
  - Habitat degradation – causing the habitat to become sub-optimal, for example through pollution events.
  - Disturbance – noise and visual disturbance of species present, including from anthropomorphic influences.

### Statutory Designated Sites

- 8.5.4 The likely effects of construction on statutory designated sites include the following:
- Habitat degradation – direct and indirect impacts including deterioration in air quality from dust and emissions from construction vehicles and hydrological impacts from dewatering or alteration to surface or ground water flows.
  - Noise and visual disturbance of species present for sites that are located or partly located within the Site Boundary or those that support mobile species like birds or bats where these are a designated feature.
- 8.5.5 A total of three statutory designated sites are potentially impacted by the proposed Development as detailed below.

#### Byron's Pool LNR

- 8.5.6 Given the distance of Byron's Pool LNR from the Site Boundary (1.5km), no direct impacts through habitat loss or indirect impacts such as changes in air quality are anticipated as a result of the proposed Development.

#### **Disturbance of Species Present**

- 8.5.7 Byron's Pool LNR supports mobile species, in particular Daubenton's bats. The likely foraging and commuting route for Daubenton's bats from Byron's Pool LNR is north or south along the River Cam. Although Byron's Pool LNR is within 2km geographically, it is separated from the site by the residential area of Trumpington and is 5.7km away for bats commuting along the river corridor. Given the distance from Site by commuting route, the availability of good foraging habitat along the Cam River, close to Byron's Pool and the lack of records of Daubenton's bats using the Site, the predicted level of impacts will be 'no change', resulting in likely residual effects that are therefore Neutral and **Not Significant** at any level. The conservation status of these species and the integrity of the LNR will therefore be maintained as a result of the proposed Development.

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**Habitat Degradation**

- 8.5.8 Hobson's Brook and the River Cam provides a hydrological link to Byron's Pool LNR. As mentioned in Section 8.4, surface water runoff will be managed through control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk. Given these measures and the distance of this designated site from the proposed Development, the residual effect of the Project on this site will be Neutral and **Not Significant** at any level.

Sheep's Green and Coe Fen LNR

- 8.5.9 Given the distance of Sheep's Green and Coe Fen LNR from the Site Boundary (0.6km), no direct impacts through habitat loss or indirect impacts due to changes in air quality are anticipated as a result of the proposed Development.

**Habitat Degradation**

- 8.5.10 Hobson's Brook and the River Cam provides a hydrological link to Sheep's Green and Coe Fen LNR. As mentioned in Section 8.4, surface water runoff will be managed through control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk. Given these measures and the distance of this designated site from the proposed Development, the residual effect of the Project on this site will be Neutral and **Not Significant** at any level.

Paradise LNR

- 8.5.11 Given the distance of Paradise LNR from the Site Boundary (1.4km), no direct impacts through habitat loss or indirect impacts due to changes in air quality are anticipated as a result of the proposed Development.

**Habitat Degradation**

- 8.5.12 Hobson's Brook and the River Cam provide a hydrological link to Paradise LNR. As mentioned in Section 8.4 above, surface water runoff will be managed through control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk. Given these measures and the distance of this designated site from the proposed Development, the residual effect of the Project on these sites will be Neutral and **Not Significant** at any level.

**Non-statutory Designated Sites**

- 8.5.13 The likely effects associated with the construction phase include the following:

- Habitat loss
- Habitat degradation – direct and indirect effects including air quality and hydrology.
- Noise and visual disturbance of species present – for sites that are located or partly located within the Site Boundary or those that support mobile species e.g. birds or bats where these are a designated feature.

- 8.5.14 A total of 10 non-statutory designated sites are potentially impacted by the proposed Development as detailed below.

Hobson's Brook CiWS

- 8.5.15 Hobson's Brook CiWS comprised of a section of Hobson's Brook and Hobson's Conduit. A section of this CiWS lies within the Site Boundary. A 5m wide clear span bridge will be constructed over Hobson's Brook resulting in some habitat loss to bankside vegetation.

**Habitat Loss**

- 8.5.16 A proposed access bridge across Hobson's Brook will require some clearance of bankside vegetation to facilitate construction works. Vegetation clearance will be considered small-scale as the bridge will be approximately 5m wide and as mentioned in Section 8.4, working areas will be kept to a minimum. The bridge will be clear span and as such, the bankside vegetation will be allowed to regenerate following installation. In addition to this, enhancements to Hobson's Brook including dense scrub clearance and plug planting to increase species diversity would improve the condition of the conduit in the long term. This would result in a



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small-scale short-term temporary slight adverse impact to the bankside vegetation. Following mitigation, the residual effects of the proposed Development will be **Not Significant** at any level.

**Habitat Degradation**

- 8.5.17 During the construction of the new structure over Hobson's Brook, there is a higher risk of temporary impacts on surface water quality through the disturbance of the banks of the watercourses and through works being undertaken in closer proximity to them. However, as mentioned in Section 8.4, measures outlined in the CoCP Part A and Section 18.4 of Chapter 18: Water Resources and Flood Risk for avoiding pollution when working adjacent to watercourses or in channel, will be implemented. Following the implementation of mitigation measures, the residual effects of the proposed Development will be **Not Significant** at any level.
- 8.5.18 Good practice mitigation including temporary fencing and dust suppression, as detailed in the CoCP Part A and described in Section 7.4. of Chapter 7: Air Quality and detailed in full in Appendix 7-2, will safeguard the CiWS from likely indirect effects due to air quality during construction. Following the implementation of the appropriate mitigation measures, the predicted level of impacts will be Neutral and **Not Significant** at any level.

Long Road Plantation CiWS

- 8.5.19 Long Road Plantation lies adjacent to the Site Boundary, as such no direct effects from loss of habitat are anticipated from the proposed Development.

**Habitat Degradation**

- 8.5.20 Indirect impacts on Long Road Plantation CiWS such as increased dust deposition and emissions from construction vehicles or accidental pollution events are unlikely following the implementation of good practice mitigation measures (including dust suppression, control and treatment of runoff) to manage such impacts. These are detailed in the CoCP Part A and described in Section 18.4 of Chapter 18: Water Resources and Flood Risk and Section 7.4 of Chapter 7: Air Quality. Following the implementation of the appropriate mitigation measures, the residual effects will be Neutral and **Not Significant** at any level.

Triangle North of Long Road CWS

- 8.5.21 The Triangle North of Long Road CWS lies within the Site Boundary. However, no direct impact from habitat loss is anticipated within the CWS as a result of the proposed Development.

**Habitat Degradation**

- 8.5.22 Indirect impacts on Long Road Plantation CiWS such as increased dust deposition and emissions from construction vehicles or accidental pollution events are unlikely following the implementation of good practice mitigation measures (including dust suppression, control and treatment of runoff) to manage such impacts. These are detailed in the CoCP Part A and described in Section 18.4 of Chapter 18: Water Resources and Flood Risk and Section 7.4 of Chapter 7: Air Quality. Following the implementation of the appropriate mitigation measures, the residual effects will be Neutral and **Not Significant** at any level.

Other hydrologically linked sites

- 8.5.23 Although, no direct impacts or indirect impacts due to changes in air quality are anticipated as a result of the proposed Development, the following sites are hydrologically linked to the proposed Development and therefore is potential for impacts through changes in hydrology.
- Bentley Road paddocks CiWS
  - Clare Wood CiWS
  - Coe Fen CWS
  - Grantchester Road Plantations CiWS
  - Lower Vicar's Brook CWS
  - River Cam CWS
  - River Granta CWS

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- Perse Girl's School Reedbed CiWS
- Sheep's Green CWS
- Skaters Meadow Group CiWS
- Meadows and Drain CiWS

8.5.24 Hobson's Brook and/or the River Cam provides a hydrological link between the proposed Development and the sites above. As mentioned in Section 8.4 above, surface water runoff will be managed through control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk. Given these measures and the distances of these designated sites from the proposed Development, the residual effects of the Project on these sites will be Neutral and **Not Significant** at any level.

## Plants and Habitats

8.5.25 The likely effects on habitats associated with the construction phase will be:

- Habitat loss
- Habitat degradation

Habitat loss

8.5.26 The construction phase of the proposed Development will result in habitat losses and gains of both a temporary and permanent nature. Table 8-12 shows all the predicted habitat losses and gains associated with the proposed Development. The losses and gains associated with habitats that are considered to be of Site importance or higher and therefore requiring further assessment, are then further discussed (see paragraphs 8.5.27 to 8.5.39).

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Table 8-12 Habitat losses and gains associated with the proposed Development

Existing Habitat	Importance	Habitat Loss	New semi-natural habitat from landscaping Masterplan	Habitat permanent gain (ha)	Net permanent gain (ha) (gain-loss)
Broad-leaved semi-natural woodland	County	0.26 ha	Proposed broad-leaved woodland & scrub mix	1.61 ha	0.7 ha
Mixed and broad-leaved plantation woodland	Local	0.53 ha			
Dense and scattered scrub	Local	0.12 ha			
Scattered and Parkland trees (not considered veteran)	Local	90 trees	Proposed semi-mature trees and proposed compensation trees	102 trees	12 trees
Semi-improved Neutral grassland	County	2.69 ha	Species rich wildflower grassland	4.23	-0.9 ha
Poor semi-improved neutral grassland	Local	2.47 ha			
Semi-improved calcareous grassland	County	0.33 ha	Semi-improved calcareous grassland reinstated	0.81	0.48 ha
Improved grassland	Site	0	None	0	0
Amenity grassland	Site	0	None	0	0
Marginal vegetation	N/A	N/A	Marginal vegetation	0.71	0.71 ha
Standing water (ponds)	County	0	Balancing pond	0.07 ha	0.07 ha



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Existing Habitat	Importance	Habitat Loss	New semi-natural habitat from landscaping Masterplan	Habitat permanent gain (ha)	Net permanent gain (ha) (gain-loss)
Standing water (ditches)	Local	0.01 ha	N/A	0	0
Running water	County	0	N/A	0	0
Arable	Site	8.20 ha	Reinstated following works	2.96 ha	-5.24 ha
Hedgerow (species-poor)	County	250m	Native hedgerow	330 m	120 m
Wall	Negligible	0	N/A	0	0
Built-up areas	Negligible	0	Biodiverse (brown) roof, rain garden, climbers/green wall, shrub / herbaceous / perennial planting	0.64 ha	N/A
Bare ground	Negligible	0.51 ha	N/A	0.34	0.17 ha
Hardstanding	Negligible	0.74 ha	Railway and associated hardstanding (paths and roads)	2.37 ha	1.63 ha

### Woodland

- 8.5.27 Construction works will result in the temporary loss of 0.26ha of mature broad-leaved semi-natural woodland to the west of the railway to facilitate access to the track. This area will be reinstated following construction. Given the size of the area, this will result in effects that are small-scale temporary medium-term slight adverse. Despite this, it will be expected that newly planted semi-natural woodland will take in excess of 32 years (Ref 8.16) to become sufficiently established and mature to offset the predicted losses. As such, the residual effects of the proposed Development on woodland will be **Significant** at a Local level.
- 8.5.28 Construction works will also result in the loss of 0.45ha of broadleaved plantation woodland, the majority of which is newly planted within Hobsons Park. This area will be reinstated following construction works and given the plantation woodland is currently still young, this will not take long to re-establish. An additional 0.84ha of woodland will also be planted mainly within the park to compensate for this loss. Overall, a minor adverse level of impact on the county-level important woodland resource will persist for the short and medium-term (up to 30 years). This will result in residual effects that will be **Significant** at a Local level. This effect will eventually become slight beneficial in the long-term, with the establishment of the new woodland planting.

### Dense and scattered scrub

- 8.5.29 Construction works will result in the permanent loss of 0.12ha of dense and continuous scrub adjacent to the existing works to facilitate widening works. Although, these specific areas will not be directly reinstated following construction, the NR Biodiversity Action Plans (Ref 8.48) promotes enhancing biodiversity of the railway verge through seeding, planting and selective use of herbicide to promote certain lower maintenance, more ecologically valuable habitat types. As such, the residual effect will be **Significant Beneficial** at the Local level in the long term.

### Scattered and Parkland Trees

- 8.5.30 Several young parkland trees are present within Hobson Park. Where possible, these trees will be avoided. Construction will also result in the loss of two lines of young broadleaved trees adjacent to the new hospital buildings. These will also be reinstated following works. Where possible, planted trees removed will be moved to a storage area and replanted following construction. As the trees in these areas are newly planted and therefore are still relatively young, the impact is considered to be temporary and short-term in nature, as it will only take a short amount of time for the new trees to reach the same maturity. As such, the residual effect will be **Not Significant** at any level.
- 8.5.31 To facilitate access of taller vehicles along the existing access track along Long Road, the removal of several tree branches may be required. The branches will be left to re-establish following construction. The impact will be temporary and short-term in nature. As such, the residual effect will be **Not Significant** at any level.

### Grassland

- 8.5.32 The proposed Development will result in the loss of 2.69ha of semi-improved neutral grassland. The majority of which will be to facilitate the new station within Hobson's park. Track widening at Shepreth Branch Junction will result in the permanent loss of 0.33ha of semi-improved calcareous grassland. To facilitate works, 0.21ha of semi-improved calcareous grassland will also be temporarily lost. In addition to this, 2.47ha of poor semi-improved grassland will also be temporarily lost as a result of construction compounds and temporary works areas, a small area (0.16ha) will be permanently lost.
- 8.5.33 Following construction, 4.1ha of good quality semi-improved neutral grassland will be created and 0.18 ha of semi-improved calcareous grassland will be reinstated. Although overall the habitat creation is less than that lost, the created habitats will be of higher quality. Where possible, the soil seedbank will be preserved and transplanted within new and reinstated areas of grassland creation. Furthermore, the construction compounds will be reinstated to other high value habitats such as ponds, woodland and scrub. It will be expected that newly seeded grassland will take approximately 15 years to establish and offset the predicted losses resulting in a temporary medium-term slight adverse impact. Given this, the residual effects will be **Not Significant** at any level.

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- 8.5.34 No direct loss of any areas of improved grassland is proposed as a result of the proposed Development.
- 8.5.35 No direct loss of any areas of amenity grassland is proposed as a result of the proposed Development.

**Standing Water**

- 8.5.36 There will be no direct loss of any ponds due to the proposed Development. However, 0.01ha of ditch habitat (north ditch) will be permanently lost for the construction of the proposed station area to east of the existing railway. To compensate for this loss, 0.71 ha of marginal vegetation will be planted to enhance the remaining ditch habitat in Hobsons Park. Given the enhancement measures proposed, the residual effects will be **Not Significant** at any level.

**Running Water**

- 8.5.37 An access bridge, proposed across Hobson's Brook, will require some clearance of bankside vegetation to facilitate construction works. Vegetation clearance will be considered small-scale as the bridge will be approximately 5m wide and as mentioned in Section 8.4, working areas will be kept to a minimum. The bridge will be clear span and as such, the bankside vegetation will be allowed to regenerate following installation. In addition to this, enhancements to Hobson's Brook including dense scrub clearance and plug planting to increase species diversity will improve the condition of the conduit in the long term. This will result in a small-scale short-term temporary slight adverse impact to the bankside vegetation. Following mitigation, the residual effects of the proposed Development will be **Not Significant** at any level.

**Arable**

- 8.5.38 Construction works will result in the loss of 8.20ha of arable habitat, of which 1.6ha will be permanent due to proposed track widening and a permanent access track. 2.08ha of exchange land which will be taken permanently from the St John's college arable field to the south west of Addenbrooke's Road (Nine Wells) bridge. This area will form an extension to Hobson's Park comprised of species-rich grassland, scrub, woodland and a pond. 0.75 ha will facilitate an attenuation pond and associated landscape planting. The remaining 3.90 ha will be reinstated to arable land following construction. As arable farmland is considered to have little ecological value, the loss of this habitat is considered to be negligible and will result in effects that are Neutral and **Not Significant** at any level.

**Hedgerow (Species Poor)**

- 8.5.39 The proposed Development will result the loss in 250m of species-poor hedgerows to facilitate the construction compound to the south east of Addenbrooke's road. This will be reinstated with native species-rich hedgerows following construction. In addition to this, an additional 120m of hedgerow will be planted to compensate for this loss. The impact will be temporary and short-term in nature and the habitat will be replaced with one of higher quality, as such residual effect of the proposed Development will be **Not Significant** at any level.

Habitat degradation

- 8.5.40 Temporary indirect impacts associated with dust deposition during the construction phase in dry spells could result in the degradation of retained habitats. As summarised in Section 8.4, this will be avoided by the dust suppression methods set out in the CoCP Part A. No significant short-term or long-term impacts are anticipated resulting in a temporary negligible adverse level of impact. The effects on habitats will therefore be Neutral and **Not Significant** at any level.
- 8.5.41 Construction works within close proximity to ponds, ditches and watercourses could result in degradation through surface water runoff. As summarised in Section 8.4, mitigation measures to control runoff and the discharge of pollutants into waterbodies are set out in the CoCP Part A. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.
- 8.5.42 During the construction of new structure along Hobson's Brook and works to the Hobson's Brook footbridge at Shepreth Branch Junction, there is a higher risk of temporary impacts on surface water quality through the disturbance of the banks of the watercourses and through

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works being undertaken in closer proximity to them. However, measures outlined in the CoCP Part A and Section 18.4 of Chapter 18: Water Resources and Flood Risk for avoiding pollution when working adjacent to watercourses or in channel, will be implemented. Following the implementation of mitigation measures, the residual effects of the proposed Development will be **Not Significant** at any level.

## Invasive Non-native Species

- 8.5.43 The stand of Giant Hogweed is located adjacent to the Site Boundary, current proposals in this area comprise the use of the existing access track only. Although, this could involve the removal of tree branches along the track to facilitate taller vehicles, no impact is anticipated to ground vegetation in this area. Measures set out in the CoCP Part A, including toolbox talks, will be implemented to ensure any Giant Hogweed is avoided during construction and seed is not inadvertently spread. As such, the effects on invasive species will be Neutral and **Not Significant** at any level.

## Great Crested Newt

- 8.5.44 The population of great crested newt recorded within the Study Area were assessed as being of Local importance for biodiversity. The likely effects associated with the construction phase on great crested newt will be:

- Habitat loss
- Direct mortality
- Habitat fragmentation
- Habitat degradation

Habitat Loss

- 8.5.45 Construction works are proposed within close proximity to Ponds P028, P029 and P022 (see Figure 8.3, Appendix 8.1) resulting in the loss of habitats. Given the distance between P028/P029 and P022, the great crested newts associated with these ponds are considered to form part of different populations and as such, have been considered separately below.
- 8.5.46 Table 8-13 and Table 8-14 below provide a summary of habitats in the vicinity of confirmed great crested newt ponds. Each table provides the area of habitat within 50m, 50-250m and 250-500m buffers from the perimeter of the pond, and the total area of habitat within 500m. Where two or more ponds are considered to support great crested newt from the same population, buffers were applied to the perimeter of all ponds and the combined area of habitat was calculated for these ponds.
- 8.5.47 Proposed works within the vicinity of ponds P028 and P029 comprise construction of the new station and platform, track widening and associated working areas and compounds. The majority of the habitat lost is to the west of the existing railway within Hobsons Park or within the intensively managed arable land to the south of Addenbrooke's road. Arable fields are considered sub-optimal for supporting great crested newt. However, the loss of habitat within Hobsons Park, could have a negative effect as a result of a reduction in foraging, commuting, resting and hibernating habitat. Despite this, the majority of the high-quality habitat (semi-improved grassland and plantation woodland) in close proximity to the ponds is retained. The likelihood of encountering great crested newt is greatest within 50m of ponds, with fewer animals encountered at distances greater than 100m and the majority of adult great crested newts likely to stay within approximately 250m of their breeding pond. Although, individuals may travel further where there are areas of high-quality foraging and refuge habitat extending beyond this range (Ref 8.49, Ref 8.50). As such, the loss within 50m is considered to be small-scale in comparison to the total amount of suitable habitat retained.
- 8.5.48 In addition, vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure and the majority of the habitat loss will be reinstated following construction. Most of the habitats affected (grassland) are expected to begin regenerating within a year. Given that the lifespan of a great crested newt is up to 14 years (Ref 8.25), no long-term reduction in habitat availability will occur. Despite this, to compensate for the temporary loss of these habitats, several hibernacula will be created close to these ponds.

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Enhancement works to P029 will also be undertaken to improve the quality this breeding habitat for great crested newts.

Table 8-13 Loss of habitat within 500m of P028 and P029

	Permanent habitat loss (ha)	Temporary habitat loss (ha)	Habitats affected
Habitat within 50m of pond	0.06	0.16	Arable, semi-improved neutral grassland, species-poor semi-improved grassland
Habitat within 50m-250m of pond	0.13	5.18	Arable, species-poor semi-improved grassland, semi-improved neutral grassland, scrub, plantation woodland, hedgerow
Habitat within 250m-500m of pond	0.61	2.53	Arable, semi-improved neutral grassland, plantation woodland, species-poor semi-improved grassland, scrub, ditch
Total Habitat within 500m	0.80	7.87	Arable, semi-improved neutral grassland, species-poor semi-improved grassland, scrub, plantation woodland, ditch, hedgerow

8.5.49 Pond P022N is located adjacent to the Site Boundary. However, minor signalling works is proposed in this location which is not anticipated to require the removal of any suitable great crested newt habitat. Habitat loss, to facilitate track widening and temporary working area, is located within semi-improved grassland entirely within the distant zone (250-500m) of this pond. The loss is located within a habitat of value to great crested newt. However, a housing estate and minor road is situated between the pond and this field. Although, this is not considered to be a complete barrier to the movement of great crested newt, it is considered likely to deter them from dispersing into this area. Given the distance of the works and the possible barrier to movement, great crested newt are considered to be absent from this area.

Table 8-14 Loss of habitat within 500m of P022

	Permanent habitat loss (ha)	Temporary habitat loss (ha)	Habitats affected
Habitat within 50m of pond	0	0	N/A
Habitat within 50m-250m of pond	0	0	N/A
Habitat within 250m-500m of pond	0.14	0.29	Semi-improved calcareous grassland
Total Habitat within 500m	0.14	0.29	Semi-improved calcareous grassland

8.5.50 The habitat loss within 500m of these ponds is considered either small-scale and temporary or not utilised by the newts. The creation of hibernaculum and reinstatement of the majority of lost habitats will sufficiently offset the adverse effects associated with habitat loss on these great crested newt populations such that the conservation status of the population will be maintained. The implementation of mitigation measures (additional landscape planting, hibernacula creation and pond enhancements) will result in an overall minor beneficial level of impact, which will constitute a **Significant Beneficial** effect at the Local level.

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Direct mortality

- 8.5.51 Great crested newt may be encountered within suitable breeding and terrestrial habitats within 500m of a known breeding pond. No breeding ponds will be lost to facilitate current proposals.
- 8.5.52 Due to the distance of construction works to P022N, it is considered unlikely great crested newt will be encountered. It is recommended vegetation clearance within suitable habitat within 500m of the pond is undertaken under A Precautionary Method of Working to safeguard any great crested newt, if found.
- 8.5.53 Works within close proximity to P028 and P029 have the potential to injure and/or kill great crested newt. It is recommended works are undertaken under an appropriate Protected Species mitigation licence with respect to great crested newt. The licence will set out mitigation measures, also described in Section 8.4 (species translocation, phased vegetation clearance, installing exclusion fencing, site supervision and habitat restoration), that will safeguard great crested newt and prevent the incidental injury or mortality of animals. This will result in a 'no change' level of impact on the local-level important great crested newt population as a whole and therefore, the residual effect on great crested newt will be **Not Significant** at any level.

Habitat fragmentation

- 8.5.54 Construction works have potential to temporarily cause barriers to movement between great crested newt breeding ponds and/or terrestrial habitat used for foraging, commuting, resting and hibernating. Connectivity will be retained between P028 and P029 during construction. Construction works do have potential to cause fragmentation between these ponds and other ponds present within Hobson's Park. However, great crested newt were not found to be present within these ponds. The removal of the hedgerow between the great crested newt breeding ponds and Nine Wells LNR to the south could cause a fragmentation effect. Although the LNR is located 220m from the ponds, the LNR does provide optimal habitat for hibernating and foraging. High-quality habitat suitable for foraging will be retained within 50m of the ponds and the hedgerow will be reinstated following construction resulting in a temporary short-term impact. However, to offset this temporary loss of hibernating provision, hibernacula will be created close to ponds P028 and P029 providing additional hibernating and resting places.
- 8.5.55 The nature of the works within 500m of P022 is not considered to cause any fragmentation effects for this population. Although the removal of the hedgerow connecting P028 and P029 to Nine Wells LNR will result in a temporary short-term minor adverse level of impact, it is not considered to have impact on the population at a Local level. As such, the residual effect of habitat fragmentation on great crested newt will be **Not Significant** at any level.

Habitat Degradation

- 8.5.56 Construction works within close proximity to great crested newt ponds could result in degradation through surface water runoff. As summarised in Section 8.4, mitigation measures to control runoff and the discharge of pollutants into waterbodies are set out in the CoCP Part A and Section 18.4 of Chapter 18: Water Resources and Flood Risk. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.

**Reptiles**

- 8.5.57 The population of reptiles recorded within the Study Area were assessed as being of Local importance for biodiversity. The likely effects associated with the construction phase on reptiles will be:
- Habitat loss
  - Direct mortality
  - Habitat fragmentation
  - Habitat degradation

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Habitat loss

- 8.5.58 The proposed Development will result in the loss of habitat considered to support reptiles (common lizard and grass snake), including scrub, woodland, semi-improved grassland, hedgerows and ditch habitat. The amount of habitat lost is outlined in Table 8-12.
- 8.5.59 The amount of habitat lost is considered small-scale in comparison to the available habitat in the wider landscape. In addition to this, vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure and the majority will be reinstated following construction. Additional habitat creation is also proposed to the south of Addenbrooke's road comprising grassland, scrub and woodland as well as attenuation ponds. In addition to this, several hibernacula and refugia will be created, providing additional foraging and hibernation sites. As the planting matures, the newly created landscape planting will also provide areas of additional habitat for reptiles.
- 8.5.60 The inclusion of the mitigation measures as detailed above will offset the predicted habitat losses such that the level of impact on the reptile population which is of Local importance, will be temporary short-term minor impact and result in effects that are considered to be Neutral and **Not Significant** at any level.

Direct Mortality

- 8.5.61 In the absence of mitigation, activities such as vegetation clearance, stockpiling of equipment and material has the potential to harm and kill reptiles. When disturbed, reptiles frequently bury themselves beneath vegetation to evade predation. The latter response to predation makes them particularly vulnerable to being crushed by heavy machinery.
- 8.5.62 Given the small numbers of reptiles within the Study Area, mitigation measures will include undertaking vegetation clearance under A Precautionary Method of Working which will include phased and directional habitat clearance and ecological supervision (refer to the CoCP Part A). Reptile-proof fencing will also be installed to prevent animals re-entering the working areas. Where suitable reptile habitat is present along the rail corridor translocation of animals may not be suitable due to working along the live track and the difficulties of installing fencing. Phased and directional habitat clearance will be undertaken within these areas.
- 8.5.63 The removal of reptiles from the construction footprint and the inclusion of additional mitigation to prevent reptiles re-entering the construction area where necessary, will prevent adverse impacts on the reptile populations, which are of Local importance, and result in effects that are considered to be Neutral and **Not Significant** at any level.

Habitat fragmentation

- 8.5.64 Fragmentation effects could occur when construction works sever connectivity between hibernating, resting and foraging locations. The nature of the construction works, which is largely adjacent to the existing railway, is not considered to sever these commuting routes. As such, the effects of fragmentation on reptiles will be Neutral and **Not Significant** at any level.

Habitat degradation

- 8.5.65 Construction works within close proximity to waterbodies used by foraging reptiles (i.e. grass snake) could result in degradation through surface water runoff. As summarised in Section 8.4, mitigation measures to control runoff and the discharge of pollutants into waterbodies are set out in the CoCP Part A and Section 18.4 of Chapter 18: Water Resources and Flood Risk. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.

**Birds**

- 8.5.66 The assemblage of birds recorded within the Study Area were assessed as being of County importance for biodiversity. The likely effects associated with the construction phase will be:
- Habitat loss
  - Direct mortality
  - Disturbance

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Habitat loss

- 8.5.67 All habitat types within the Study Area have the potential to be used by nesting (both ground-nesting and otherwise), foraging and roosting birds. The full extent of the habitat loss is presented in Table 8-12. The temporary or permanent loss of any habitats will reduce the availability of potential nesting sites and foraging resources for birds throughout the duration of construction (anticipated to be three years). In the short-term, this will result in adverse effects, particularly for species that are associated with grassland habitat e.g. skylark.
- 8.5.68 Species nesting nearby within the Study Area, but beyond the Site Boundary, may adapt their foraging behaviour and continue to breed successfully as prior to commencement of construction. Others, such as skylark, may be displaced from breeding territories and may occur in reduced numbers because suitable retained habitat is already well used by breeding pairs.
- 8.5.69 During construction, the majority of woodland, grassland and arable areas are being retained and will continue to provide opportunities for foraging and nesting birds. Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure. Any areas that will be temporarily lost will also be reinstated following construction, with only a relatively small number of woodland, grassland and arable species potentially displaced in the short-term, with suitable habitat still available within the wider Study Area, and surrounding countryside.
- 8.5.70 Implementation of the design and mitigation measures (habitat creation) as described in Section 8.4 and shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77), including the creation of woodland, hedgerow and scrub, as well as enhancement of ditches and grassland areas, will offset the adverse effects of habitat loss over time as newly created habitats establish and become more suitable for use by birds. The re-creation of species rich grassland will also provide optimal foraging habitat for birds post-construction.
- 8.5.71 To further offset the loss of nesting opportunities for woodland / scrub species while newly created habitats establish, the habitat creation measures will be supplemented by the provision of bird nest boxes within areas of retained woodland and trees.
- 8.5.72 The residual effects of the proposed Development from habitat loss on bird species will be **Not Significant** at any level.

Direct Mortality

- 8.5.73 Nesting birds (the adult birds, nests, eggs and dependent young) are vulnerable to works occurring in close proximity that might damage or destroy a nest site during breeding (March to August inclusive). Implementation of the embedded and good practice mitigation measures (e.g. fencing, timing of vegetation removal and supervision of works) described in Section 8.4 and the CoCP Part A will avoid such impacts and will provide protection for birds and their nests throughout the construction phase. The residual effects will therefore be **Neutral and Not Significant** on nesting birds which are of County importance.
- 8.5.74 Some low-flying bird species (e.g. thrushes and game birds) are especially vulnerable to collision with vehicles, particularly where site-traffic routes are near to features such as woodland edges and hedgerows. Implementation of the embedded and good practice mitigation measures described in Section 8.4 and detailed within the CoCP Part A, including fencing of the construction area and adherence to standard low speed limits for construction vehicles will reduce the risk of mortality of birds through collision. The level of impact will be minor adverse and will result in residual effects that are considered to be Slight Adverse and **Not Significant** on the general bird assemblage, which is of County importance.

Disturbance

- 8.5.75 Nesting birds are also vulnerable to disturbance from changes in noise, lighting and vibration. Construction-related activities will result in an increase in noise levels and construction impact noise that could cause disturbance to foraging and roosting birds in the surrounding area. Visual disturbance will also be likely to affect birds by causing them to avoid areas of habitat that might otherwise be used for foraging and resting. Implementation of the mitigation measures described in Section 8.4 and the CoCP Part A, including construction measures to



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reduce impact noise, the use of acoustic screening to safeguard particularly sensitive areas (e.g. bird reserve in Hobson's Park), noise and vibration measures as detailed in Chapters 5 and 6: Acoustics Assessment, as well as directional lighting will reduce the impact of disturbance.

- 8.5.76 It is likely that kingfisher (Schedule 1 species) were using the Bird Reserve and adjacent Hobson's Brook as a foraging resource. Fencing of the construction works will reduce any disturbance effects to foraging kingfisher. It is also considered that Hobson's Brook within the Site Boundary is sub-optimal for supporting this species and represents only a small part of a kingfisher's territory. Furthermore, the planned works in the vicinity of Hobson's Brook are temporary and short-term in nature.
- 8.5.77 Overall, it is considered that disturbance of foraging and roosting birds will be a minor temporary adverse level of impact that won't affect the conservation status of the bird populations concerned in the longer term. Therefore, the effect on the bird populations of County importance will be **Not Significant** at any level.

## Bats

- 8.5.78 The assemblage of bats recorded within the Study Area were assessed as being of County importance for biodiversity. The likely effects associated with the construction phase will be:

- Habitat loss
- Direct mortality
- Disturbance
- Habitat fragmentation

### Habitat loss

- 8.5.79 the construction of the proposed Development will result in the loss of foraging and commuting habitat for bats. The full extent of the habitat loss is presented in Table 8-12 Habitat losses and gains associated with the proposed Development. The majority of the temporary loss is sub-optimal for foraging including grassland (in Hobson's Park) or arable areas, which will reduce the availability of foraging habitat for the duration of construction (anticipated to be three years).
- 8.5.80 Species foraging and commuting nearby within the Study Area, but beyond the Site Boundary, may adapt their foraging and commuting behaviour and be negligibly impacted.
- 8.5.81 During construction, the vast majority of woodland, especially in the north, will be retained and will continue to provide opportunities for foraging and commuting bats. Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure. Any areas that will be temporarily lost will also be reinstated following construction, with only a relatively small area permanently lost to construction of the new station. A small number of bats will potentially be displaced in the short-term, with suitable habitat still available within the wider Study Area, and surrounding countryside.
- 8.5.82 Implementation of the design and mitigation measures (habitat creation) as described in Section 8.4 and shown on the Indicative Landscape Plans (Figures 158454-ARC-00-ZZ-DRG-EEN-000074, 75, 76 and 77), including the creation of woodland, hedgerow and scrub, as well as enhancement of ditches and grassland areas, will offset the adverse effects of habitat loss over time as newly created habitats establish and become more suitable for use by bats. The re-creation of species rich grassland and newly created areas of woodland / scrub will also provide more optimal foraging habitat for bats post-construction (medium to long-term).
- 8.5.83 In addition to the loss of foraging and commuting habitat, construction works could also result in the loss of habitats with potential roosting provision. All structures, including Long Road Guided Busway Bridge for which the confirmed roost was identified, will be retained on Site. Two trees were also identified as having low potential for supporting roosting bats; one of which will be removed to facilitate works.
- 8.5.84 Overall, impacts of habitat loss on the bat assemblage, which is of County importance, will be sufficiently offset by the proposed mitigation and compensation measures, such that the level of impact will be small-scale temporary and minor. As such, the residual effect of the proposed Development will be **Not Significant** at any level.

Direct mortality

- 8.5.85 Two trees to the east of Shepreth Branch Junction were identified as having low potential to support roosting bats as shown on Figure 8.12 (Appendix 8.1). Current proposals require the removal of Tree 1. It is recommended a pre-construction survey is undertaken to ensure there are no bats roosting within the tree prior to their removal. If bats were to be present, surveys will be required to inform a protected species licence application. The licence will set out embedded mitigation measures that will safeguard roosting bats and prevent their incidental injury or mortality. In addition to this, pre-construction surveys of all trees affected by construction works will be recommended to ensure no new features suitable for roosting bats have developed between baseline data collection and construction. As such, mortality of bats will be avoided and the likely residual effects on the County-level bat assemblage will be Neutral and **Not Significant** at any level.

Disturbance

- 8.5.86 Activities resulting in increased levels of noise, vibration or light can lead to bats abandoning roosts. Although some bat species can become habituated to a degree of disturbance, this is less likely to happen if the disturbance increases or begins when bats are already present. Bats are particularly susceptible to disturbance impacts during the sensitive hibernation and maternity periods. The confirmed roost identified in the Long Road Guided Busway Bridge will be retained. It is likely that bats utilising this feature are already habituated to high levels of noise from the operation of the Busway and the adjacent Long Road. The construction work in the vicinity of the Busway Bridge is limited and of a temporary nature (i.e. minor trimming of branches to allow access for larger vehicles, and vehicle transport to the railway).
- 8.5.87 Working measures to reduce noise and vibration, detailed in the CoCP Part A and Chapter 5 and 6: Acoustic Assessment, will reduce any likely significant disturbance to bats to negligible levels. As outlined in Section 8.4, construction phase lighting will be designed to avoid light spill on any important bat foraging and commuting locations. With this mitigation, possible disturbance impacts on the bat assemblage, which is of County importance, will be negligible adverse and result in residual effects that are Neutral and **Not Significant** at any level.

Habitat fragmentation

- 8.5.88 The main commuting and foraging areas for bats appeared to be the west – east woodland alongside Long Road, and woodland and scrub along the railway running north – south as well as along the busway. The vast majority of the woodland along Long Road will be retained by the proposed Development, with a relatively small strip of woodland temporarily removed during construction adjacent to the railway to facilitate access to the track. Habitat fragmentation impacts will be temporary and short-term in nature and considered negligible adverse, owing to the proposed mitigation and design measures (habitat creation) outlined in Section 8.4. The residual effects on bat assemblages of County importance will therefore be Neutral and **Not Significant** at any level.

Water Vole

- 8.5.89 The population of water vole recorded within the Study Area was assessed as being of Local importance for biodiversity. The likely effects associated with the construction phase will be:
- Habitat loss
  - Direct mortality
  - Disturbance
  - Habitat fragmentation
  - Habitat degradation

Habitat loss

- 8.5.90 The proposed access bridge across Hobson's Brook, for which water vole are known to be present, will likely require some vegetation clearance to facilitate construction works. Vegetation clearance will be considered small-scale as the bridge will be approximately 5m wide and as mentioned in Section 8.4, working areas will be kept to a minimum. The bridge will be clear span and as such, the bankside vegetation will be allowed to regenerate following installation. In addition to this, proposals to enhance Hobson's Brook by clearing dense scrub

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and plug planting to increase species diversity will benefit water vole. Following the implementation of mitigation measures (bankside vegetation enhancements) will result in an overall minor beneficial level of impact, which will constitute a **Significant Beneficial** effect at the Local level.

Direct mortality

- 8.5.91 The proposed clear span bridge across Hobson's Brook has potential to damage water vole burrows and therefore potential to injure or kill water vole. Although, water vole are present along Hobson's Brook, no water vole signs were identified within the section of ditch of the proposed bridge location, although the survey was constrained due to dense vegetation. Once the dense vegetation is cleared, a pre-construction survey will be undertaken to confirm the location of water vole burrows. If water vole are found to be present the bridge will be micro-sited to a section for which water vole are absent or works will be undertaken under an appropriate protected species licence. The licence will set out embedded mitigation measures, (e.g. displacement measures, species translocation, phased vegetation clearance, installing exclusion fencing, site supervision and habitat restoration) which will safeguard water vole and prevent the incidental injury or mortality of animals.
- 8.5.92 All other construction works will be set back from water vole ditches by 10m and areas fenced off with temporary fencing for retained vegetation, as described in Section 8.4.
- 8.5.93 As water vole are mobile animals and will utilise different ditches within the area dependent on water levels, pre-construction surveys will be undertaken of all waterbodies to be impacted by the proposed Development to confirm the status of the water vole population prior to construction. Should pre-construction surveys identify the presence of water vole within ditches to be impacted, an appropriate protected species licence to safeguard water vole will be obtained. This will result in a 'no change' level of impact on the local-level important water vole population as a whole and therefore, the residual effect on water vole will be neutral and **Not Significant** at any level.

Disturbance

- 8.5.94 The potential for disturbance impacts to this species is most likely within Hobson's Brook. Mitigation measures to set back all works by 10m from ditches where the presence of water voles is confirmed or likely present will reduce the magnitude and extent of the potential disturbance impacts on water vole territories. The proposed bridge across Hobson's Brook will be clear span and construction informed by the pre-construction surveys for water vole burrows, which will enable micro-siting as appropriate. The overall level of impact will be negligible adverse being temporary in nature and not sufficient to affect the conservation status of the population. This will result in residual effects that are Neutral and **Not Significant** at any level.

Habitat fragmentation

- 8.5.95 Construction works which sever ditch habitat could result in fragmentation of water vole movement along the network. However, the clear span bridge proposed over Hobson's Brook will maintain connectivity along the waterbody. As such, fragmentation impacts will be negligible, resulting in effects that are Neutral and **Not Significant** at any level.

Habitat degradation

- 8.5.96 Construction works within close proximity waterbodies in which water vole could be present could result in degradation through surface water runoff. As summarised in Section 8.4, mitigation measures to control runoff and the discharge of pollutants into waterbodies are set out in the CoCP Part A. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.

**Badger**

- 8.5.97 The population of badger recorded within the Study Area were assessed as being of negligible importance for biodiversity. However, to ensure legislative compliance, the impacts on badger have been included within this assessment. The likely effects of construction on badger will be:

- Habitat loss

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- Direct mortality
- Disturbance
- Habitat fragmentation

Habitat loss

- 8.5.98 Construction works will not result in the loss or damage of any existing setts within the Study Area. As badgers are a mobile species and use different setts at different times of year, a pre-construction survey to identify any new setts within the site will be undertaken. If a new badger sett were to be identified, an appropriate development licence from Natural England will outline mitigation measures to safeguard badger sett provision.
- 8.5.99 Although, no setts are lost, habitat loss could result in a reduction of foraging opportunities for badger. However, vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure. Also, the amount of habitat lost is considered small-scale in comparison to the available habitat for foraging in the wider landscape. The successful implementation of the landscaping plans will mean the majority of habitat loss will be reinstated following construction. Additional habitat creation is also proposed, which will ensure that badger can continue to utilise the site for commuting and foraging. As such, the level of impact of habitat loss on badger will therefore be small-scale temporary negligible adverse, the effect of habitat loss on the local badger population will be Neutral and **Not Significant** at any level.

Direct mortality

- 8.5.100 In the absence of mitigation, construction activities, especially earthworks have the potential to harm and kill badgers. The covering of excavations overnight to prevent animals becoming trapped will avoid any adverse impacts. With the implementation of these measures, the level of impact will therefore be Neutral and **Not Significant** at any level.

Disturbance

- 8.5.101 Due to the distance of proposed works from the outlier setts (Appendix 8.9), badgers are considered unlikely to be impacted by disturbance whilst occupying an existing sett. As such, the effects of disturbance on badgers will be Neutral and **Not Significant** at any level.

Habitat fragmentation

- 8.5.102 Fragmentation effects could occur when construction works sever connectivity between setts and foraging locations. The nature of the construction works, which is largely adjacent to the existing railway, is not considered to sever these commuting routes. As such, the effects of fragmentation on badgers will be Neutral and **Not Significant** at any level.

## Residual Effects from Operation

- 8.5.103 The likely effects of operation on ecological receptors could include the following:

- Direct mortality – operation of the proposed Development causing direct mortality.
- Disturbance – noise and visual disturbance of species present, including from anthropomorphic influences.
- Fragmentation – preventing animals dispersing and moving within the wider landscape.
- Habitat degradation – causing the habitat to become sub-optimal, for example through changes in air quality, specifically nitrogen deposition, and pollution events.

## Statutory and Non-statutory Sites

- 8.5.104 No direct impacts are anticipated on any statutory and non-statutory designated sites during the operation of the proposed Development. In the absence of mitigation, effects from habitat degradation and disturbance could occur.

Disturbance of species

- 8.5.105 Increased recreational usage of the Hobson's Park reserve has the potential to impact on any sensitive species using the park. However, it is considered Daubenton's bats associated with

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Byron's Pool LNR will not be using the park, given few recordings of this species on Site and the distance of the LNR. As such, the predicted level of impacts will be negligible, resulting in likely effects that are therefore Neutral and **Not Significant** at any level. The conservation status of these species and the integrity of these sites will therefore be maintained as a result of the proposed Development.

#### Habitat Degradation through Changes in Air Quality

8.5.106 The following sites are located within 200m of the affected road network (Addenbrooke's road, A1309 Hauxton Road/ High Street, A1134 Long Road, A1307 Babraham Road and Francis Crick Avenue) and therefore changes in traffic could result in a change to air quality:

- Long Road Plantation CiWS
- Triangle North of Long Road CWS
- Hobson's Brook CiWS
- Trumpington Road Woodland CiWS

8.5.107 Although, Chapter 7: Air Quality does not consider non-statutory designated sites during the operational phase, the changes of air quality within 200m of the affected road network, including nitrogen deposition, are considered to be negligible (see Appendix 7.5) and therefore, the effect of air quality changes on these sites will be Neutral and **Not Significant** at any level.

#### Habitat Degradation through changes in water quality

8.5.108 Hobson's Brook and/or the River Cam provides a hydrological link between the proposed Development and the following sites.

- Bryon's Pool LNR
- Sheep's Green and Coe Fen LNR
- Paradise LNR
- Hobson Brook CiWS
- Bentley Road paddocks CiWS
- Clare Wood CiWS
- Coe Fen CWS
- Grantchester Road Plantations CiWS
- Lower Vicar's Brook CWS
- River Cam CWS
- River Granta CWS
- Perse Girl's School Reedbed CiWS
- Sheep's Green CWS
- Skaters Meadow Group CiWS
- Meadows and Drain CiWS

8.5.109 As mentioned in Section 8.4, any typical small-scale accidental spills from parking/storage areas will be managed through control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk. Following the implementation of mitigation measures, the residual effect of the proposed Development on these sites will be **Not Significant** at any level.

### Plants and Habitats

8.5.110 The likely significant effects of operation of the proposed Development on plants and habitats will be disturbance and habitat degradation.

#### Disturbance

8.5.111 Increased recreational usage of the Hobson's Park reserve has the potential to impact on any sensitive habitats, namely grassland, within the Park. It is anticipated that, on a daily basis, an additional 774 pedestrians and 751 cyclists will be using the footpath within the northern

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section of the park to travel between the new station and the residential areas to the west. However, the park is already subject to recreational use from the adjacent residential area and it is anticipated the disturbance is likely to be restricted to areas immediately adjacent to the path. The impact will therefore be small-scale and minor, resulting in a residual effect which is **Not Significant** at any level.

Habitat degradation

8.5.112 Small-scale accidental spills from parking/storage areas could result in habitat degradation to waterbodies and watercourses within or close to the proposed Development. As mentioned in Section 8.4, control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk will be implemented to safeguard against this. Following the implementation of mitigation measures, the residual effect of the proposed Development will be **Not Significant** at any level.

**Biodiversity Net Gain Assessment**

8.5.113 Following the creation and reinstatement of area-based habitats on site (Table 8-12), the on-site post development biodiversity units total 232.23, representing a decrease of 12.80 biodiversity units from the baseline 244.28 units. This is a 4.93% decrease in area-based habitat. Full details of the Biodiversity Net Gain Assessment are contained in Appendix 8.10.

8.5.114 A total of 5.36 hedgerow units will be delivered post-development from a baseline of 4.83 hedgerow units resulting in an increase of 0.53 units. This is a 10.91% increase.

8.5.115 A total of 6.69 river units will be delivered post-development from a baseline of 6.07 river units resulting in an increase of 0.61 units. This is a 10.11% increase.

8.5.116 Although, a net loss for area-based habitats have been calculated, the Project has committed to achieving a 10% net gain. As such, an additional 36.46 units are required. This will be secured through a combination of the following options:

- The purchasing of additional land to provide space to build new habitat;
- Purchase biodiversity units from 3rd party organisations; or
- Work with 3rd parties such as local authorities, trusts, etc to deliver biodiversity units on their land.

8.5.117 NR are committed to achieving 10% net gain and as such, the effect will be **Significant Beneficial** at the local level.

**Great Crested Newt**

8.5.118 The likely significant effects of operation of the proposed Development on great crested newt will be:

- habitat fragmentation
- habitat degradation.

Habitat fragmentation

8.5.119 The existing railway is currently within close proximity to the ponds and is not considered to a significant barrier to movement. As such, the widening of these sections is also not considered to result in any habitat fragmentation during the operational phase. The effects will therefore be Neutral and **Not Significant** at any level.

Habitat degradation

8.5.120 Small-scale accidental spills from parking/storage areas and rainfall run-off could result in habitat degradation to waterbodies within which great crested newts are known to be present. As mentioned in Section 8.4, control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk will be implemented to safeguard against this. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.

**Reptiles**

8.5.121 The likely significant effects of operation of the proposed Development on reptiles will be:



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- habitat fragmentation
- habitat degradation.

Habitat fragmentation

8.5.122 The existing railway is currently within close proximity to the ponds and is not considered to a significant barrier to movement. As such, the widening of these sections is also not considered to result in any habitat fragmentation during the operational phase. The effects will therefore be Neutral and **Not Significant** at any level.

Habitat degradation

8.5.123 Small-scale accidental spills from parking/storage areas and rainfall run-off could result in habitat degradation to waterbodies and watercourses utilised by reptiles such as grass snake. As mentioned in Section 8.4, control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk will be implemented to safeguard against this. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.

**Birds**

8.5.124 The likely significant effects of operation of the proposed Development on birds will be:

- Direct mortality
- Disturbance

Direct mortality

8.5.125 Certain low-flying species such as thrushes and game birds are at greater risk of collision with increased rail traffic during the operation of the proposed Development. Collision risk is greatest where hedgerows and woodland habitat directly adjoins the railway. The majority of the arable land available to sustain the population of grey partridge is located to the east of the railway. It is not considered that the western arable field is the main habitat resource for grey partridge, therefore regular crossing of the railway by this species is less likely. Although the impact cannot be avoided entirely, any residual impact on the general bird assemblage, which is of County importance, hence the overall residual effect will be **Not Significant** at any level.

Disturbance

8.5.126 It is feasible that the increased noise, visual and lighting from operation of the new station and increased rail traffic, as well as increased footfall in Hobson's Park, could cause disturbance to birds. This could result in changes in bird behaviour and a reduction in the local distribution of some bird species such as skylark. To mitigate for this, measures outlined in Section 8.4 will be incorporated into the detailed design and will include careful siting of footpaths, sensitive use of directional lighting and measures to reduce operational noise and vibration (Chapters 5 and 6: Acoustics Assessment). Planting schemes will be designed so that the new station is screened from the park. These measures will reduce the residual impacts on the general bird assemblage to a minor adverse level. It is unlikely that will be sufficient to affect the conservation status of the bird populations, which are of County importance, hence the overall residual effect will be **Not Significant** at any level.

**Bats**

8.5.127 The likely significant effects of operation of the proposed Development on bats will be:

- Direct mortality
- Disturbance

Direct mortality

8.5.128 The survey results indicate the main commuting routes for bats is along rather than over the railway. The development of the station is not anticipated to impact on commuting bats post-construction. As such the impact on the bat assemblage of County importance will be Neutral and **Not Significant** at any level.

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Disturbance

8.5.129 It is feasible that increased light, noise and visual disturbance of foraging and commuting bats could occur. Measures outlined in Section 8.4 will be incorporated into the detailed design and will include sensitive use of directional lighting and measures to reduce operational noise and vibration (Chapters 5 and 6: Acoustic Assessment). Planting schemes will be designed so that the new station is screened from the park. These measures will reduce the residual impacts on the general bat assemblage to a minor adverse level. It is unlikely that will be sufficient to affect the conservation status of the bat populations, which are of County importance, hence the overall residual effect will be **Not Significant** at any level.

**Water Vole**

8.5.130 The likely significant effects of operation of the proposed Development on water vole is considered to be limited to habitat degradation.

Habitat degradation

8.5.131 Small-scale accidental spills from parking/storage areas could result in habitat degradation to waterbodies and watercourses for which water vole are known or assumed to be present. As mentioned in Section 8.4, control measures documented in the CoCP Part A and the embedded design measures outlined in Section 18.4 of Chapter 18: Water Resources and Flood Risk will be implemented to safeguard against this. The inclusion of these measures will result in a residual effect that will be **Not Significant** at any level.

**Badger**

8.5.132 No impacts on badgers associated with the operational phase of the proposed Development are considered likely. The effects will therefore be Neutral and **Not Significant** at any level.

**Cumulative Effects**

8.5.133 This sub-section considers the cumulative effects of the proposed Development with other schemes in the Cambridge vicinity with regard to biodiversity. The cumulative effects of the proposed Development have been assessed with reference to those listed in Appendix 2.3.

8.5.134 Where other schemes had overlapping Zol of any of the receptors identified as part of the proposed Development (Table 8-4), cumulative effects were assessed to determine if any additional mitigation will be required and any residual effects.

8.5.135 The following developments were considered to have potential residual cumulative effects. The cumulative effects on the other developments were considered to be Neutral.

**Cambridge South East Transport**

8.5.136 The Cambridge South East Transport (CSET) scheme (ID Number 37 in Appendix 2.3) comprises a proposed new public transport route link between the Cambridge Biomedical Campus via Great Shelford, Stapleford and Sawston to a new travel hub near the A11/A1307 with connections to Babraham, the Babraham Research Campus and Granta Park. The route travels to the east of the railway to the south of Addenbrookes Road adjacent to the Site Boundary before passing through the southeast compound near Nine Wells LNR. The construction programme for CSET is not anticipated to overlap with that of the proposed Development.

8.5.137 From review of proposals, there will be potential for cumulative residual effects on great crested newt, birds, bats and water vole. CSET is anticipated to require the removal of pond P029 and cause permanent isolation to the great crested newt present within pond P028. This is of considerably greater significance for great crested newt compared to the small-scale short-term temporary habitat loss and fragmentation effects predicted for the proposed Development.

8.5.138 There is potential for combined residual effects on the water vole population along Hobson's Brook due to loss in habitat. However, habitat loss for both schemes is considered small scale and/or temporary for this species. As such, no additional mitigation is anticipated.

8.5.139 Despite the potential for cumulative effects, mitigation proposals for both developments should be sufficient to offset any adverse effects. As such, no additional mitigation is anticipated, and



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the cumulative effects will range from Slight Adverse to Slight Beneficial (dependent on impacted species) but in any event will be **Not Significant**.

## Cambridge Biomedical Campus

- 8.5.140 The Cambridge Biomedical Campus Scheme (ID Numbers 1, 2, 3, 8, 32, 45 and 46 in Appendix 2.3) is a multiplot development adjacent and within the Site Boundary. The development comprises a number of research and development and clinical buildings as well as multiple car parks, open space and landscaping and all other associated supporting infrastructure. Construction works at some of the plots are either already complete or are currently ongoing. There is potential for construction programmes to coincide with the proposed Development for those plots currently in construction or those proposed for development in the future.
- 8.5.141 From review of the application forms, the sites were predominately arable farmland or amenity grassland of little value for biodiversity. However, due to the proximity of one of the areas proposed for future development to south ditch there is potential for cumulative effects on designated sites and habitats due to habitat degradation. Both schemes have proposed appropriate pollution control measures that will control runoff to surface water and the risk of pollution of local watercourses.
- 8.5.142 There could also be potential for cumulative residual effects on great crested newt due to the close proximity to Ponds P028 and P029, especially if construction works are undertaken at the same time. However, appropriate mitigation measures under appropriate licencing will be undertaken to safeguard any great crested newts. In addition to this, both schemes are anticipated a minor beneficial effect in the long term for amphibians due to the enhancement of ponds, creation of hibernacula and additional landscape planting.
- 8.5.143 Despite the potential for cumulative effects, mitigation proposals for both developments should be sufficient to offset any adverse effects. As such, no additional mitigation is anticipated, and the cumulative effects will be Slight Adverse to Slight Beneficial and **Not Significant**.

## Clay Farm Development

- 8.5.144 The Clay Farm development (ID Numbers 5 and 39 in Appendix 2.3) comprises residential development of up to 2,300 dwellings with associated services including the provision of sports and recreation facilities, landscaped open space (including public open space in a green corridor), retail, food and drink, financial and professional services, non-residential institutions, a nursery, alternative health treatments, education facilities and related infrastructure (including road and busway), attenuation ponds, cycleways, footways and crossing of Hobson's Brook.
- 8.5.145 From a review of the application documents, the majority of the site comprises large arable field units of relatively low value for wildlife (site value), with three small woodland blocks, a number of hedgerows and standing and flowing water within ditches and Hobson's Brook, which crossed the centre of the site. The overall predicted outcome of the development with regard to ecology is significant positive at the local level. However, a significant negative impact for breeding farmland birds was predicted due to the loss of a large area of farmland habitat. There is therefore potential for cumulative effects for breeding farmland birds.
- 8.5.146 The Clay Farm development incorporated a 5ha wetland habitat creation area (Bird Reserve) to directly mitigate for the loss of arable farmland by providing a smaller area of higher quality habitat, mainly for wintering birds. Sensitive timing of works where possible (i.e. outside of the nesting bird period) as well as phasing of the development over a 10 year period to allow birds to continue to breed on site by leaving some nesting habitat undisturbed at any one time was recommended to help lessen the impact on breeding birds.
- 8.5.147 The majority of the Clay Farm Development is now complete. Despite the potential for cumulative effects, the loss of habitat for farmland birds within the proposed Development is relatively small, the nature of the works is largely temporary and measures such as the use of acoustic fencing and other visual, noise and vibration reduction measures, sensitive timing of vegetation clearance will be implemented to safeguard birds. However, if construction works coincide, then an appropriate phased approach to construction works will be implemented. Given these measures, the overall cumulative effect will be considered to be Slight Adverse and **Not Significant**.

## Land north-east of Mores Meadow

- 8.5.148 Land north-east of Mores Meadow (ID Number 16 in Appendix 2.3) comprises the erection of 21 dwellings (almshouses) the relocation of existing allotments and public open space provision together with associated landscaping and infrastructure. The development is still awaiting decision.
- 8.5.149 The development is approximately 3.4ha in area and located 50m east from the Site Boundary near Shepreth Branch Junction. There is potential for cumulative effects on designated sites, great crested newts, birds, bats and water voles. From review of the application forms, the site was predominately arable farmland, of little value for biodiversity, and allotments considered suitable to support some ecological receptors. However, this development does not predict any direct impacts on designated sites, great crested newts or bats and therefore no cumulative effects with the proposed Development are anticipated.
- 8.5.150 Although, no direct impacts were predicted to Hobson Brook, due to the close proximity of this development to this watercourse, there is potential for cumulative effects on designated sites, habitats and water voles downstream due to habitat degradation. However, both schemes have proposed appropriate pollution control measures that will control runoff to surface water and the risk of pollution of local watercourses.
- 8.5.151 No breeding bird surveys have been undertaken on this site, hence the impact on breeding birds has not been fully assessed within the application but is likely to include scrub and garden species associated with the hedgerow, scrub and trees on site. A barn owl box was also present (Box A, on wintering and breeding bird survey Figures 8.5 – 8.10, Appendix 8.1) and grassland suitable for skylark. It was recommended that avoidance of disturbance to the barn owl box and sensitive timing of vegetation clearance (outside the breeding bird period) was undertaken. Landscaping plans incorporating creation of a traditional orchard, and enhancement of grassland areas and green roof's proposed within the development will also lessen the longer-term impact on breeding birds.
- 8.5.152 A small number of skylark could be displaced during construction which could lead to a cumulative impact. However, given the relatively small amount of habitat to be impacted by the proposed Development within proximity to this site, the overall cumulative effect for skylark will be Slight Adverse and **Not Significant**.
- 8.5.153 The barn owl box was surveyed in 2020 and no barn owl were found to be nesting within the box. A preconstruction check of the barn owl box as recommended within the proposed Development and appropriate measures taken to avoid disturbance to the box should it be in use will negate any cumulative impact on barn owl.

## 8.6 Assessment Summary

- 8.6.1 The assessment of effects on terrestrial biodiversity considered the construction and operational phase impacts of the proposed Development and the likely changes these will cause to biodiversity resources. Biodiversity resources that were assessed included designated sites, habitats and species.
- 8.6.2 The biodiversity net gain assessment has achieved a decrease in area-based habitat units by 4.93%. Hedgerow and river units are however showing a net gain of 10.91% and 10.14%, respectively. Options to achieve 10% net loss will be secured. For full details of the Biodiversity Net Gain Assessment refer to Appendix 8.10.
- 8.6.3 Although, a net loss for area-based habitats have been calculated, the Project has committed to achieving 10% net gain. This will be secured through a combination of the following options:
- Purchasing additional land to provide space to build new habitat;
  - Purchasing biodiversity units from 3rd party organisations; or
  - Working with 3rd parties such as local authorities, trusts, etc to deliver biodiversity units on their land.
- 8.6.4 NR are committed to achieving 10% net gain and as such, the effect will be **Significant Beneficial** at the local level.

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8.6.5 Table 8-15 provides an assessment summary with respect to biodiversity and how they have been addressed.

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Table 8-15 Assessment Summary

Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Byron's Pool LNR	Disturbance of species	C & O	None required	Not significant at any level
	Habitat degradation due to changes in hydrology	C & O	Water pollution control measures	Not significant at any level
Sheep's Green and Coe Fen LNR	Habitat degradation due to changes in hydrology	C & O	Water pollution control measures	Not significant at any level
Paradise LNR	Habitat degradation due to changes in hydrology	C & O	Water pollution control measures	Not significant at any level
Hobson's Brook CiWS	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure	Not significant at any level
	Habitat degradation due to changes in hydrology	C	Water pollution control measures	Not significant at any level
	Habitat degradation due to changes in air quality	C	Air quality control measures	Not significant at any level
	Habitat degradation due to changes in air quality	O	None required	Not significant at any level
Long Road Plantation	Habitat degradation due to changes in hydrology	C	Pollution control measures	Not significant at any level
	Habitat degradation due to changes in air quality	C	Air quality control measures	Not significant at any level

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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
	Habitat degradation due to changes in air quality	O	None required	Not significant at any level
Triangle North of Long Road	Habitat degradation due to changes in hydrology	C	Pollution control measures	Not significant at any level
	Habitat degradation due to changes in air quality	C	Air quality control measures	Not significant at any level
	Habitat degradation due to changes in air quality	O	None required	Not significant at any level
Trumpington Road Woodland CiWS	Habitat degradation due to changes in air quality	O	None required	Not significant at any level
Other hydrological linked non-statutory designated sites (Bentley Road paddocks CiWS, Clare Wood CiWS, Coe Fen CWS, Grantchester Road Plantations CiWS, Lower Vicar's Brook CWS, River Cam CWS, River Granta CWS, Perse Girl's School Reedbed CiWS, Sheep's Green CWS, Skaters Meadow Group CiWS and Meadows and Drain CiWS)	Habitat degradation due to changes in hydrology	C & O	Water pollution control measures	Not significant at any level
Plants and habitats	Habitat loss of woodland	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Reinstatement of habitats following construction, additional habitat creation	Significant at a Local level

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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
	Habitat loss of dense and scattered scrub, scattered trees, grassland, standing water (ditches), species-poor hedgerows, running water	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure  Reinstatement of habitats following construction, additional habitat creation  NR Biodiversity Action Plans (Ref 8.48) promotes enhancing biodiversity of the railway verge through seeding, planting and selective use of herbicide to promote certain lower maintenance, more ecologically valuable habitat types.	Not significant at any level  <b>Beneficial significant at the local level along railway verge</b>
	Habitat loss of standing water (ponds), arable, amenity grassland, improved grassland	C	None required	Not significant at any level
	Habitat degradation due to changes in air quality	C	Air quality control measures	Not significant at any level
	Habitat degradation due to changes in hydrology	C & O	Water pollution control measures	Not significant at any level
	Disturbance	O	None required	Not significant at any level
Invasive non-native	Spread of INNS	C	INNS Control measure	Not significant at any level

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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Great crested newt	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Reinstatement of habitats following construction Provision of hibernacula and pond enhancement	<b>Significant beneficial</b> effect at the Local level
	Direct mortality	C	Protected species mitigation licence Species translocation, phased vegetation clearance, exclusion fencing, site supervision and habitat restoration	Not significant at any level
	Habitat fragmentation	C	Reinstatement of hedgerow between ponds and Nine Wells LNR Provision of hibernacula	Not significant at any level
		O	None required	Not significant at any level
	Habitat degradation	C & O	Water pollution control measures	Not significant at any level
Reptiles	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Reinstatement of habitats following construction, additional habitat creation, provision of hibernacula	Not significant at any level

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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Birds	Direct mortality	C	Vegetation clearance under a Precautionary Method of Working, phased and directional habitat clearance and ecological supervision. Installation of reptile-proof fencing	Not significant at any level
	Habitat fragmentation	C & O	None required	Not significant at any level
	Habitat degradation	C & O	Water pollution control measures	Not significant at any level
	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Artificial nest box provision Reinstatement and creation of new habitat post construction Potential habitat enhancement measures	Not significant at any level
	Direct Mortality	C	Timing of vegetation clearance &/or nesting bird checks prior to vegetation clearance CoCP measures (fencing / vehicle speed)	Not significant at any level
		O	None required	Not significant at any level



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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
	Disturbance	C	Acoustic screening of sensitive areas Noise and vibration control measures Use of sensitive/directional lighting	Not significant at any level
		O	Siting of footpaths, sensitive use of directional lighting and measures to reduce operational noise and vibration. Landscaping to screen new station	Not significant at any level
Bats	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Reinstatement and creation of new habitat post construction	Not significant at any level
	Direct mortality	C	Pre-construction surveys, protected species licence, if bat roost identified	Not significant at any level
		O	None required	Not significant at any level
	Disturbance	C	Consideration phase lighting design to minimise light spill, measures to reduce noise and vibration	Not significant at any level
		O	Sensitive use of directional lighting and measures to reduce operational noise and vibration. Landscaping to screen new station	Not significant at any level
	Habitat fragmentation	C	Reinstatement habitat post construction along railway	Not significant at any level

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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Water vole	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Enhancements to bankside vegetation	<b>Significant beneficial</b> effect at the Local level
	Direct mortality	C	Pre-construction surveys and micro-siting of clear span bridge to avoid water vole burrows. Protected species licence, if burrows cannot be avoided.	Not significant at any level
	Disturbance	C	Micro-siting of clear span bridge Protected species licence, if burrows cannot be avoided.	Not significant at any level
	Habitat fragmentation	C	Provision of clear span bridge over watercourses	Not significant at any level
	Habitat degradation due to hydrological changes	C & O	Water pollution control measures	Not significant at any level
Badger	Habitat loss	C	Vegetation clearance will be kept to a minimum in compounds, working areas and associated infrastructure Reinstatement of habitats following construction and additional habitat creation	Not significant at any level
	Direct mortality	C	Covering of excavation and pits to prevent animals getting trapped	Not significant at any level

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Receptor	Potential Significance Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
	Disturbance	C	None required	Not significant at any level
	Habitat fragmentation	C	None required	Not significant at any level

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Environmental Statement – Volume 2:  
Chapter 9 – Climate Part 1 – Climate Change Adaptation



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 9 – Climate Part 1 - Climate Change Adaptation**

JUNE 2021



The Network Rail (Cambridge South Infrastructure Enhancements) Order

Environmental Statement – Volume 2:  
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## 9 Climate Part 1 – Climate Change Adaptation

### 9.1 Introduction

- 9.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impacts of climate change, on the proposed Development and relevant receptors during the construction and operational phases. The assessment incorporates relevant design and other mitigation measures that would be employed during construction and operation of the proposed Development. Please note Chapter 10 (GHG Emissions) of the ES reports the environmental impact of construction and operation of the proposed Development with respect to GHG emissions.

#### Relevant Aspects of the Proposed Development

- 9.1.2 A description of the proposed Development is provided in Chapter 4. The specific aspect of the proposed Development that is being assessed in relation to climate change is its capacity to be resilient to the effects of climate change through the application of adaptation measures within the design.
- 9.1.3 The assessment considers impacts associated with the following climate change themes:
- Climate change adaptation – presents the vulnerability of the proposed Development to climate change and how climate change will potentially manifest itself in the future. It evaluates the effectiveness and feasibility of adaptation measures integrated into the proposed Development to increase the resilience of the proposed Development to climate change impacts.
  - In-combination climate change impact (ICCI) - evaluates the combined effect of the proposed Development and potential climate change impacts on the receiving environment during the construction and operation of the proposed Development.

### 9.2 Assessment Methodology

#### Legislation, Policy and Guidance

##### Legislation

- 9.2.1 The main European and national legislation impacting on climate change in the UK (relevant to England) include:
- Paris Agreement, 2015 (Ref 9.1) - adopted in 2015 and entered into force in November 2016, the Paris Agreement is an international climate agreement aiming to limit global temperature increase this century to less than 2 degrees Celsius above pre-industrial levels. It additionally establishes a goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change.
  - EIA Directive 2014/52/EU (Ref 9.2) - requires EIAs to identify, describe and assess the direct and indirect significant effects of climate change relevant to the proposed Development.
  - Infrastructure Planning (Environmental Impact Assessment) Regulations 2017/572 (EIA Regulations) (Ref 9.3) - these regulations transposed the requirements of the EIA Directive 2014/52/EU into UK law. This introduced climate as a topic for environmental assessment, including a description of the likely significant effects resulting from the climate change impact on the proposed Development.
  - The Climate Change Act 2008 (2050 target amendment) 2019 (the 2008 Act) (Ref 9.4) – created a new approach to managing and responding to climate change in the UK, by:
    - Setting ambitious, legally binding reduction targets.
    - Taking powers to help meet those targets.
    - Strengthening the institutional framework.
    - Enhancing the UK's ability to adapt to the impacts of climate change.

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- Establishing clear and regular accountability to the UK Parliament and to the developed legislatures.
- Key provisions of the 2008 Act in respect of climate change adaptation include a requirement for Government to report, at least every five years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. The 2008 Act also introduces powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks. The Adaptation Sub-Committee of the Committee on Climate Change will provide advice to, and scrutiny of, the Government's adaptation work.

## Policy

9.2.2 The main national and regional policy impacting on climate change in the UK (relevant to England) include:

- National Planning Policy Framework (NPPF) (2019) (Ref 9.5) - the NPPF sets out government planning policy for England and describes ways in which the challenge of climate change can be met. Chapter 14 of the NPPF highlights that planning plays a key role in meeting the challenge of climate change. Paragraph 149 of the NPPF also includes the requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change in line with the provisions and objectives of the 2008 Act and co-operate to deliver strategic priorities which include climate change.
- Greater Cambridge Sustainable Design and Construction Supplementary Planning Document 2020 (Ref 9.6) - this supplementary planning document sets out the standards required to meet the visions, objectives and policies of the Cambridge and South Cambridgeshire Local Plans. The plan outlines the need to meet sustainable transport objectives, as transport is a large contributor to UK and Cambridgeshire emissions.
- Network Rail Environmental Policy 2017 (Ref 9.7) – this policy states that Network Rail will make the network resilient to weather impacts and future changes in the climate.
- Network Rail Environment and Social Performance policy (document ref NR/L1/ENV/100) 2017 (Ref 9.8) - this policy mandates requirements to improve Network Rail's environment and social performance through the mitigation of risks and improved delivery of environment and social management. Network Rail shall identify and manage its significant environmental impacts. Network Rail's developing Decarbonisation Programme is included in this policy.

## Guidance

9.2.3 Guidance produced by Network Rail include:

- Sustainable Development Strategy 2013-2024 (document ref SBPT204) (Ref 9.9) - this strategy outlines the need to use low carbon energy to minimise carbon footprint, and to make the rail network resilient to future changes in the climate.
- Network Rail Environmental Sustainability Strategy 2020-2050 (Ref 9.10) – Network Rail sets out a vision to provide clean, green mass transport that supports local communities. To achieve this vision, Network Rail's core priority relevant to climate change is to prepare the railway infrastructure to minimise the impacts of climate change by 2050.
- Network Rail Weather Resilience and Climate Change Adaptation Strategy 2017 (Ref 9.11) – This was developed to provide long-term strategic focus to the activities relating to Climate Change adverse effects. These include heatwaves, wind, storms, droughts and flooding events.
- Weather Resilience and Climate Change Impact Assessment Guidance Note 2021 (Ref 9.12) - this document provides guidance on how to effectively carry out a weather and climate change risk assessment.

9.2.4 Guidance documents regarding the assessment of climate within the scope of this ES include:

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- The National Adaptation Programme (NAP) and the Third Strategy for Climate Adaptation Reporting: Making the country Resilient to a changing Climate 2018 (Ref 9.13).
- The UK Climate Change Risk Assessment (CCRA) 2017 (Ref 9.14).
- Institute of Environmental Management and Assessment (IEMA) (2015) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (Ref 9.15).
- IEMA EIA Guide to: Climate Change Resilience and Adaptation 2020 (Ref 9.16).

## Consultation and Scoping

### Consultation

9.2.5 Table 9-1 provides a summary of Consultee issues raised with respect to climate change adaptation during informal scoping and how they have been addressed.

Table 9-1 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Emma Davies and Jo Dicks, Greater Cambridge Shared Planning (GCSP), 19/06/2020	Climate scope discussed at local authority (LA) meeting as per issued CSIE Scheme - EIA Scoping Note. Cambridge South Station meeting notes.  Methodology was going to follow Design Manual for Roads and Bridges (DMRB) LA114 standard. However, in 2020 the IEMA EIA Guide to: Climate Change Resilience and Adaptation was published.	This climate change adaptation assessment covers risk associated projected GHG emissions, both during construction and operation and ensures all relevant receptors from other topics are assessed. The proposed Development has been assessed only against IEMA guidance instead of DMRB LA114, since the IEMA EIA Guide to: Climate Change Resilience and Adaptation was published in 2020
Julie Lunt, Natural England, 26/06/2020	The National Planning Policy Framework (NPPF) requires that the planning system should contribute to the enhancement of the natural environment “by establishing coherent ecological networks that are more resilient to current and future pressures” (NPPF Paras 170 and 174), which should be demonstrated through the EIA.	The impact of climate change on biodiversity has been considered within Chapter 8: Biodiversity of this ES. Principles set out within the England Biodiversity Strategy have been reflected to identify how the proposed Development’s effects on the natural environment have been influenced by climate change, and how ecological networks have been maintained.

### Scoping

9.2.6

9.2.7 Table 9-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to climate change, and the corresponding location in the ES where they are addressed.

Table 9-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Network Rail	Referencing of NR Environment and Sustainability Strategy	Reference have been added in Legislation, Policy and Guidance section, further consultation of the policy will be made during design stage.

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Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Environment Agency	Detailed assessment of the effects of climate change to be undertaken in relation to flood risk	Reference have been added in Residual Effects from Operation in this Chapter of the ES at Table 9-9 under building and SuDS.  A Flood Risk Assessment has been undertaken and is detailed in Chapter 18: Water Resources and Flood Risk of this ES.
Greater Cambridge Shared Planning	Explicit reference to impacts of heatwaves on the rail network	Reference have been added in Residual Effects from Operation in this Chapter of the ES at Table 9-9 under concourses and rail surfaces.
Natural England	The ES should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained	Planting design will be determined in detailed design. Reference have been added in Residual Effects from Operation in this Chapter of the ES, with further detailed outlined paragraph 9.4.9 and at Table 9-9 under Landscape and Ecology.
Department for Transport	Impacts such as the sagging and buckling of the track, due to heatwaves, should be considered	Heat-resistant materials will be determined in detailed design. Reference have been added in Residual Effects from Operation in this Chapter of the ES, with further detailed outlined paragraph 9.4.8 and at Table 9-9 under concourses and rail surfaces.

## The Study Area

- 9.2.8 The study area for assessing the vulnerability of the proposed Development to climate change adaptation during the construction and operational phases and the ICCI assessment has been the site boundary (see Figure 4.1 in Appendix 4.1), which captures all assets, environmental mitigation areas and physical infrastructure associated with the proposed Development (e.g. earthworks, structures, pavement, temporary land take and compounds).

## Methodology for Establishing Baseline Conditions

- 9.2.9 To establish the baseline for climate change adaptation of the proposed Development, a review of published current and historical regional weather data in the location of the proposed Development has been completed (Table 9-7), including Met Office historic climate data and historical flood data.
- 9.2.10 Met Office historic climate data (Ref 9.17), from the period 1981–2010, was obtained from the Cambridge Niab climate station (Location UTM: 52.245, 0.102, National Grid X:543607, Y:262839), with available data closest to the proposed Development.
- 9.2.11 A desk-based review of water data sources has been undertaken in Chapter 18.3: Water Resources and Flood Risk of this ES to determine baseline conditions across the proposed Development study area and to inform models of flooding.

## Forecasting the Future Baseline

- 9.2.12 Future baseline conditions for climate change adaptation have been established through desk-top research utilising UK Climate Projections 2018 (UKCP18) (Ref 9.18). This is a climate analysis tool, released in 2019, that provides probabilistic projections for the whole of the UK, at regional and local level. To identify the future changes to the climate baseline, the following factors have been identified and used in the assessment:

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- The 120 year lifespan of the proposed Development (including timescales for construction and operational life cycle stages); and
- Climate trends associated with the UKCP18 Representative Concentration Pathway (RCP) 8.5 (RCP8.5) scenario (50% probability) projection. RCP8.5 is the closest scenario to the high emissions scenario and therefore the reasonable worse-case scenario for assessing impacts of Climate Change on the proposed Development.

9.2.13 UKCP18 probabilistic projections for RCP8.5 have been analysed for the relevant 25km<sup>2</sup> grid square in which the proposed Development would be located. These figures have been expressed as temperature and precipitation anomalies in relation to the 1981–2010 baseline. The 50% probability level has been presented for the 60 years appraisal period (in line with IEMA 2020 guidance, Ref 9.16), the assumed 120 years operational life cycle stage plus the timescales for construction stage.

9.2.14 The future baseline has included a range of different climate variables from UKCP18 (e.g. UK mean daily temperature for summer and winter, mean daily maximum temperatures for summer and mean daily minimum temperatures for winter).

### Defining the Likelihood Category

9.2.15 The climate change adaptation assessment has been carried out in line with the IEMA EIA Guide to: Climate Change Resilience and Adaptation (Ref 9.16). The assessments have considered the strategic aims and objectives encompassed within government, Network Rail and local planning strategy and policy. These policies have the overarching aim of minimising the adverse impacts of climate change, while requiring the proposed Development to take climate change considerations into account within the design.

9.2.16 The following key terms and definitions relating to the climate change adaptation assessment have been used:

- Climate hazard – a weather or climate related event which has potential to do harm to environmental or community receptors or assets, for example increased winter precipitation.
- Likelihood – probability and frequency of occurrence of the climate hazard.
- Climate change impact – an impact from a climate hazard which affects the ability of the receptor or asset to maintain its function or purpose.
- Consequence of impact – any effect on the receptor or asset as a result of the climate hazard having an impact.

9.2.17 Figure 9-1 summarises the methodology and stages for the climate change adaptation assessment.

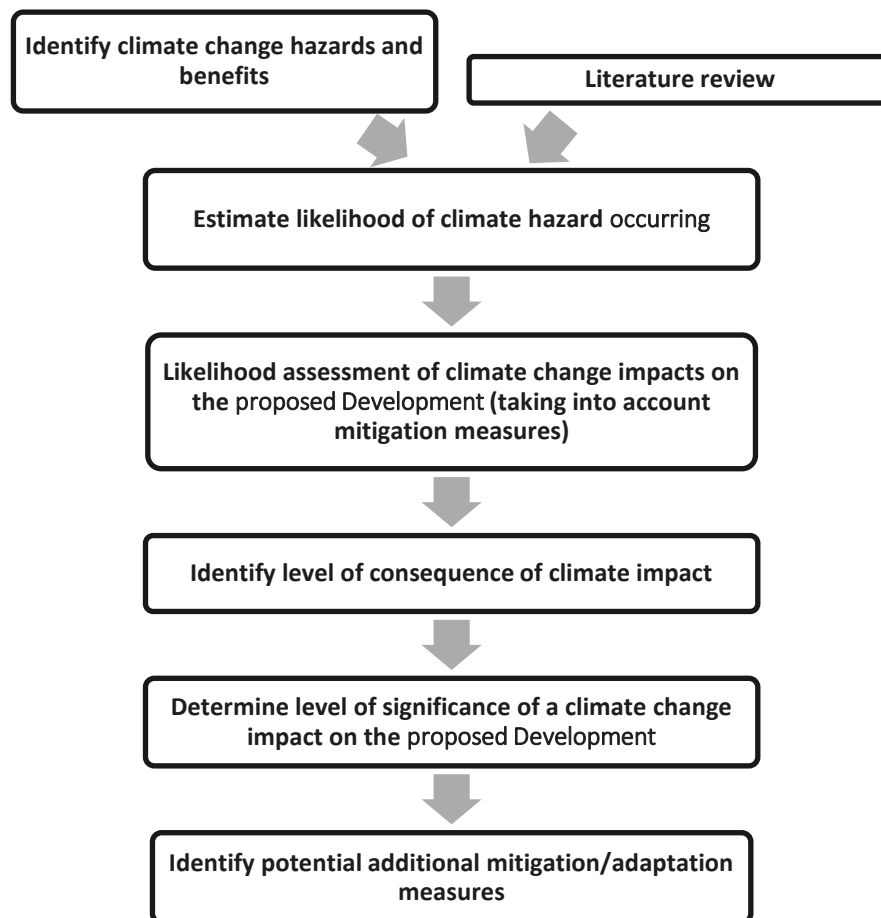


Figure 9-1 Stages of the climate change adaptation assessment

- 9.2.18 The UK CCRA (Ref 9.14) and UKCP18 (Ref 9.18) data outputs for the Cambridge area were used to identify potential climate hazards that may affect the specific geographical location. The assessment has considered vulnerability against both gradual climate change and the risks associated with an increased frequency of severe weather events as per the UKCP18 climate change projections (Ref 9.18).
- 9.2.19 A review of the potential climate change impacts has been followed by an assessment of their potential consequence and likelihood of occurrence, taking into account the measures incorporated into the design of the proposed Development.
- 9.2.20 The assessment has included infrastructure and assets associated with the proposed Development and has identified the local receptors within the study area which are vulnerable to future climate change scenarios developed as follows:
- The construction phase receptors
  - The assets and their operation, maintenance, and refurbishment
  - End-users
- 9.2.21 The 60-year appraisal period includes the operational phase from the opening of the proposed Development. The assessment has also accounted for the construction phase in addition to the 60-year operational appraisal period. As the construction phase would be much shorter in duration than the operational phase and is expected to be undertaken between 2023 and 2025 inclusive, future climate change is less relevant to the assessment of construction impacts and effects.



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9.2.22 The assessment of likelihood has been undertaken using the framework provided in the IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020) (Ref 9.16) and presented in Table 9-3.

Table 9-3 Categories of likelihood of the climate impact occurring

Likelihood Category	Definition
Very high	The event occurs multiple times during the lifetime of the proposed Development (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the proposed Development (60 years) e.g. approximately once every 5 years, typically 12 events
Medium	The event occurs limited times during the lifetime of the proposed Development (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the proposed Development (60 years) e.g. once in 60 years.
Very low	The event unlikely to occur during the lifetime of the proposed Development (60 years).

## Methodology for Assessing Impacts

### Impact Characterisation

9.2.23 The assessment of consequences of the potential impacts has been undertaken using the framework provided in the IEMA Guidance (Ref 9.16) and presented in Table 9-4.

Table 9-4 Measure of consequence

Measure of Consequence	Definition
Very large adverse	<ul style="list-style-type: none"> <li>On-going annual impact with the potential for extreme events to cause operational or structural damage, with delays and disruption to services. For example, higher temperatures causing a major failure in structures or buildings with the potential for injury;</li> <li>Permanent damage and complete loss of service with a disruption lasting more than one week;</li> <li>Severe health effects or fatalities; and</li> <li>Very significant loss to the environment requiring replacement and/ or restoration.</li> </ul>
Large adverse	<ul style="list-style-type: none"> <li>Seasonal impact with the potential for climatic events to cause operational or structural damage. For example, increased summer maximum temperatures could affect structures through the movement of materials, foundations etc. Long term or significant damage and severe loss of service with a disruption lasting more than three days;</li> <li>Serious health effects; and</li> <li>Significant loss to the environment requiring replacement and/ or restoration.</li> </ul>
Moderate adverse	<ul style="list-style-type: none"> <li>Seasonal impact with the potential for minor operational loss. For example, higher summer temperatures could cause overheating which could lead to a loss in operational hours;</li> </ul>

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Measure of Consequence	Definition
	<ul style="list-style-type: none"> <li>• Medium term or moderate damage and moderate loss of service with a disruption lasting more than one day (less than three days);</li> <li>• Moderate health effects; and</li> <li>• Moderate loss to the environment requiring restoration.</li> </ul>
Minor adverse	<ul style="list-style-type: none"> <li>• Minimal impact, either positive or negative and likely to be mitigated through resilience measures included through regulatory or best practice. Short term or minimal damage and short-term loss of service with a disruption lasting less than one day;</li> <li>• Minimal health effects; and</li> <li>• Minimal loss to the environment.</li> </ul>
Negligible	<ul style="list-style-type: none"> <li>• No impact, either positive or negative and likely to be mitigated through resilience measures included through regulatory or best practice.</li> </ul>

## Assessing Significance

9.2.24 For both the construction and operational phases of the proposed Development, a risk assessment of the likelihood (probability and frequency of occurrence) and measure of consequence of a climate change impact occurring to a receptor (where relevant) have been used to determine the significance (Ref 9.16), as shown in Table 9-5, over the selected future time frame for operation (60 years).

Table 9-5 Significance criteria matrix for climate change adaptation

Measure of consequence	Measure of Likelihood				
	Very low	Low	Medium	High	Very High
Negligible	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Minor adverse	Not Significant	Not Significant	Not Significant	Significant	Significant
Moderate adverse	Not Significant	Not Significant	Significant	Significant	Significant
Large adverse	Not Significant	Significant	Significant	Significant	Significant
Very large adverse	Not Significant	Significant	Significant	Significant	Significant

## Limitations and Assumptions

### Limitations

9.2.25 Climate change, by its very nature, is associated with a range of assumptions and limitations. To overcome these issues, current climate change data and science have been incorporated into the assessment, and proven, effective approaches undertaken for similar project types were replicated. Limitations associated with the approach taken for the vulnerability of the proposed Development to climate change assessment relate to uncertainties inherent within UKCP18 data. The UKCP18 project currently provides the leading climate change projections for the UK.

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- 9.2.26 Furthermore, UKCP18 data are provided in 30-year time slices, with periods up to and including 2099 (2070-2099). The projections do not cover the whole design life of the project but go to the extent of data available at the time of assessment.

## Assumptions

- 9.2.27 The design life of the proposed Development is 120 years. Climate Change effects over the 120 years period are highly uncertain, and the design should be kept flexible for any later adaptations to be incorporated into it.
- 9.2.28 The ES has been developed on the basis of a 2026 opening year. This assumes that the Transport and Works Act Order is made by the Secretary of State for Transport and work commences in 2023 ahead of the 2026 opening year.

## 9.3 Baseline

### Existing Baseline

- 9.3.1 The Central England Temperature dataset shows that the most recent decade (2009-2018) was around 1°C warmer than the period it defines as 'pre-industrial' (1850-1900). This trend has also been observed globally, with 2016 being the warmest year on record (Ref 9.19). Globally, the 21 warmest years on record (since 1880) have all occurred within the 23 years since 1995 (Ref 9.19). Across England as a whole, land temperature in the decade 2005 - 2014 was 1°C warmer than 1961 - 1990. There has been a significant human influence on the observed warming in annual Central England Temperature since 1950. Statistical results from extreme weather value analysis suggest that the UK daily maximum and minimum temperature extremes have increased by just over 1°C since the 1950s, and that heavy seasonal and annual rainfall events have also increased (Ref 9.19).
- 9.3.2 Historic climate data has been extracted from the Met Office (Ref 9.17), from the period 1981–2010, for the Cambridge Niab Climate station which is closest to the proposed Development. Table 9-6 presents the historic precipitation and temperature data for the period 1981-2010. This period is the default baseline period used for UKCP18.

Table 9-6 Historic seasonal averages for temperature and precipitation at Cambridge Niab for the period 1981-2010

Parameter		Historic Average (1981 -2010)			
		Winter	Spring	Summer	Autumn
Precipitation	Rainfall (mm)	42.5	41.8	49.9	55.1
Temperature	Maximum air temperature (°C)	7.5	13.6	21.8	14.8
	Minimum air temperature (°C)	1.6	4.8	11.7	7.4

- 9.3.3 It is predicted that climate change will increase the frequency and severity of some types of extreme weather events in England. UKCP18 data (Ref 9.18) generally shows that warmer, drier summers are more likely along with warmer, wetter winters. By the end of the 21st century, central estimates are that mean summer temperatures in the East of England will increase by 1.3 – 4.7°C in a low emission scenario, and 2.5 – 7.5°C under a high emission scenario, and that precipitation will increase by 16 – 26% in the winter and decrease by 14 – 27% in the summer. Upper and lower end estimates are more extreme but are equally likely to occur as the central estimates.
- 9.3.4 A recent report by the International Panel for Climate Change (Ref 9.21) concluded that if we take no action to reduce greenhouse gas emissions, average global temperatures are likely to increase by between 2.6°C and 4.8°C by the end of the 21st Century (2081-2100) compared to 1986-2005.

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**Future Baseline**

- 9.3.5 The UKCP18 for the 25km<sup>2</sup> grid square, within which the proposed Development site is located, suggests an increase in mean summer and winter air temperatures, while precipitation rates are expected to become more seasonal, with increased precipitation expected in winter and decreased precipitation in summer.
- 9.3.6 Table 9-7 sets out the projections for pre-determined 10-year time periods presented for each season for mean, minimum and maximum temperature and precipitation, from a 1981-2010 baseline period. Each period is provided over a 30-year average for the decade. UKCP18 data provides projections up to the period of 2070-2099 (2080s). This is to maintain consistency across UKCP18 products where due to computational constraints, the high-resolution projections will only be available for certain periods (a baseline of 1981-2010 and future periods of 2010-2039 and 2020-2049 etc.). This shows that precipitation is likely to increase in winter by 20% by the end of the century and decrease in summer by 32%. Summer temperatures are projected to be 4-5.5°C warmer and winter temperatures around 3°C warmer.

*Table 9-7 Projected Changes in Temperature Variables (°C) and Precipitation (%) for the Proposed Development*

Parameter	Season	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069	2070-2079	2080-2089
Precipitation rate anomaly (%)	Winter	4.58	5.38	7.59	9.43	13.28	16.61	20.09
	Spring	-1.82	-2.20	-3.25	-3.43	-3.17	-3.81	-4.77
	Summer	-5.88	-9.75	-14.58	-20.31	-24.79	-27.46	-32.60
	Autumn	3.28	3.63	1.99	0.39	1.28	3.49	6.14
Mean air temperature anomaly at 1.5m (°C)	Winter	0.68	0.92	1.34	1.70	2.14	2.59	3.12
	Spring	0.54	0.76	1.08	1.47	1.82	2.26	2.69
	Summer	1.00	1.41	1.86	2.46	3.16	3.88	4.81
	Autumn	0.79	1.12	1.50	2.03	2.59	3.24	3.86
Maximum air temperature anomaly at 1.5m (°C)	Winter	0.69	0.94	1.33	1.66	2.09	2.53	3.02
	Spring	0.73	0.99	1.31	1.69	2.09	2.61	3.12
	Summer	1.12	1.53	2.13	2.83	3.65	4.46	5.53
	Autumn	0.93	1.29	1.72	2.27	2.83	3.48	4.12
Minimum air temperature anomaly at 1.5m (°C)	Winter	0.64	0.90	1.33	1.72	2.17	2.60	3.14
	Spring	0.58	0.81	1.11	1.47	1.84	2.33	2.82
	Summer	0.89	1.20	1.67	2.25	2.87	3.56	4.38
	Autumn	0.71	1.03	1.44	1.97	2.55	3.21	3.87

## 9.4 Design and Mitigation

9.4.1 Mitigation measures relevant to the construction and operational phases of the proposed Development are outlined in this section.

### Climate Change Resilience During Construction

9.4.2 The outline Code of Construction Practice (CoCP) Part A (see Appendix 2.4), submitted as part of this application submission, sets out the principles for environmental mitigation. There are two parts to this CoCP – Part A is the outline document and Part B will be produced by the contractor and issued to GCSP for approval. This would help to ensure that mitigation measures are implemented and, as appropriate, additional measures are identified to ensure resilience of the proposed mitigation of impacts during extreme weather events. The following measures would be in place during construction, and are incorporated into the outline CoCP submitted separately with the TWAO application:

- The appointed contractor would register the proposed Development with the EA Flood Warning Service, with this service providing alerts to warn of the risk of an impending flood event. In the case of a warning or severe warning alert, plans would be put into action to ensure that construction worksites and access routes are made safe and are evacuated of construction personnel.
- Use of short to medium range weather forecasting services to inform programme management and environmental control.
- A high-level risk assessment of severe weather impacts on the construction programme would be produced by the appointed contractor to inform mitigation measures. Any receptors and/or construction-related operations and activities potentially sensitive to severe weather events would be considered in the assessment.
- As far as reasonably practicable use of construction materials with superior properties that offer increased tolerance to fluctuating temperatures, heavy precipitation and other extreme weather events such as storms.
- Training of personnel in the risks, mitigation and prevention of climate change risk during the construction.
- During the construction phase, extended dry spells may cause increased dust production. This consequence would be minimised as far as reasonably practicable, through the measures incorporated into the CoCP (e.g., reduce dust emissions through the effective transportation and storage of materials), including the proposed Dust Management Plan regime as noted in Construction Approach and Mitigation of Construction Effects within the Chapter 7: Air Quality of this ES.

### Climate Change Resilience During Operation

- 9.4.3 Following identification of the future climate projections, the proposed Development receptors which are vulnerable to climate change have been identified as the concourses and rail surfaces, buildings, drainage, signs, rail signals and lighting, landscape (including Biodiversity), workforce & passengers, plant and equipment and user facilities.
- 9.4.4 Mitigation and adaptation measures for drainage and landscape to address climate change have been considered and embedded within the design, the Flood Risk Assessment (Appendix 18.2) and the outline Drainage Strategy (contained within Appendix 18.5).
- 9.4.5 The proposed Development would utilise sustainable drainage systems (SuDS) to manage surface water drainage and mitigate flood risk. Further information is provided in the Flood Risk Assessment and outline Drainage Strategy, where it assesses the flood risk of the proposed Development to be Not Significant.
- 9.4.6 An outline Drainage Strategy has been prepared for the site, including a 40% allowance for climate change. The Drainage Strategy considers surface water flows during 1 in 100 years storm event and better water efficiencies (measures are included in water resource and flood risk - Chapter 18).

- 9.4.7 Residual risk of flooding will be managed through the appropriate design of onsite levels at detailed design stage and corridors to manage overland flows sustainability, and through management of the SuDS features. Adequate space has been designed into the development proposals to allow for sustainable management of any increase of surface water runoff as a result of the development.
- 9.4.8 The resilience of other receptors (materials, concourses, signs, lighting etc.) would be addressed at detailed design stage, with materials selected that would be resistant to increased frequency and severity of extreme weather events, such as storms and heatwaves. Specific consideration of the impact of extreme weather events such as heat waves on sagging and buckling of rail, which has been experienced in recent years, will be considered through ongoing reviews of appropriate Stress Free Temperature ranges and incorporated into design as per stipulations within Network Rail design standards.
- 9.4.9 Allowances for climate change would be identified and incorporated into the detailed design. As an example, climate change will have an effect on planting, with longer vegetation growing seasons leading to a reduction in soil moisture and/or increased tree leaf coverage. Other examples include increased magnitude and frequency of storm events could result in tree fall and increased maintenance and management requirements.

## 9.5 Assessment of Residual and Cumulative Effects

- 9.5.1 The following sections outline the residual effects once the mitigation measures described in Section 9.4 have been implemented.

### Residual Effects from Construction

- 9.5.2 The proposed Development has the potential to be vulnerable to a range of climate changes, including an increased frequency and severity of prolonged and/or heavy precipitation events, prolonged droughts and heatwaves, a greater frequency of very hot days, and an increased risk of storms. Projections suggest there will be a decreasing in falling and lying snow, nevertheless frequency and severity of storms and other severe weather events, which can include snow and gales, may increase and retaining the ability to respond to these events would remain important. For the period 2061-2080, under a high emissions scenario, the Regional (12km) and Local (2.2km) projections show a decrease in both falling and lying snow across the UK relative to the 1981-2000 baseline with low-lying regions in southern England seeing greater decline (Ref 9.22).
- 9.5.3 The effects of climate change will become more prevalent in the future. During the construction phase, which is in the relatively near future (2023-2025), these effects are likely to be not significant, given the mitigation of construction effects as set out in Section 9.4. However, they have still been considered as a precaution. Table 9-8 identifies the proposed Development's receptors, related aspects and the climate change effects they are likely to experience, taking into account the mitigation measures outlined in Section 9.4. The likelihood and consequence of these effects are also set out which determine the resulting significance of effect.

Table 9-8 Vulnerability of the Proposed Development to Climate Change During the Construction Phase

Receptor	Aspect	Potential adverse climate impacts on the proposed Development	Likelihood Category	Consequence	Effect Significance
Buildings	Wind actions (loads)	An increase in wind speed has the potential to increase risk of disruption to construction work (unable to operate in high winds). This may delay the construction programme.	Low	Minor Adverse	<b>Not Significant</b>

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Receptor	Aspect	Potential adverse climate impacts on the proposed Development	Likelihood Category	Consequence	Effect Significance
	Increased thermal range giving rise to increased earth pressures for buildings	An increase in mean and extreme temperatures has the potential to lead to the requirement of stronger fill material and therefore increasing the quantities of excavated material becoming waste.	Very Low	Negligible	<b>Not Significant</b>
	Earth pressures used in design affected by change in ground water level	An increase in winter precipitation and a decrease in summer precipitation has the potential to change ground water levels.	Very Low	Negligible	<b>Not Significant</b>
	Foundation settlement affected by change in ground water level	Increased winter precipitation and decreased summer precipitation has the potential to change the ground water level. This could potentially lead to the requirement of more robust foundations due to potential increased settlement.	Very Low	Negligible	<b>Not Significant</b>
	Design of construction drainage	An increase in extreme precipitation has the potential to lead to the requirement for additional construction drainage, larger components and more extensive works.	Low	Negligible	<b>Not Significant</b>
Drainage	Surface water drainage systems, attenuation outfalls and drainage ditches	An increase in winter precipitation and a decrease in summer precipitation has the potential to change ground water levels. This could potentially lead to larger ground movement and heave. In addition, this could mean that additional drainage and stronger materials would be required.	Low	Negligible	<b>Not Significant</b>
Geotechnical conditions	Stability of earthworks	Increased precipitation could increase risk to the earthworks stability resulting in the requirement of fill materials that are less	Very Low	Negligible	<b>Not Significant</b>



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Receptor	Aspect	Potential adverse climate impacts on the proposed Development	Likelihood Category	Consequence	Effect Significance
		susceptible to moisture such as Pulverised Fuel Ash and aggregate and/or increased stabilisation techniques (such as lime stabilisation).			
	Earthworks compaction	An increase in extreme temperature and a decrease in summer precipitation has the potential to lead to reduction in soil moisture requiring greater compaction.	Very Low	Negligible	<b>Not Significant</b>
Signs, traffic signals, lighting	Stability	An increase in extreme precipitation and wind speed has the potential to create wind loading risks for the signs, rail signals and lighting.	Low	Negligible	<b>Not Significant</b>
Landscape	Planting	An increase in mean temperature and a decrease in summer precipitation has the potential to lead to longer growing season and a reduction in soil moisture.	Very Low	Negligible	<b>Not Significant</b>
User facilities	Workforce	An increase in projected mean daily rainfall, especially in winter months could result increase safety risk of slips, trips and falls to construction workers.	Low	Moderate Adverse	<b>Not Significant</b>
	Construction site	An increase in projected mean daily rainfall, especially in winter months could potentially result in the construction site flooding, excavations flooding during construction phase. Site roads may also become impassable through flooding.	Low	Negligible	<b>Not Significant</b>
	Construction activities	Under extreme temperatures, certain construction activities may be required to be reprogrammed to keep	Low	Negligible	<b>Not Significant</b>



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Receptor	Aspect	Potential adverse climate impacts on the proposed Development	Likelihood Category	Consequence	Effect Significance
		proposed Development build to schedule.			
	Plant and equipment	Extreme weather (storms) may impact critical equipment, including power distribution sites, leading to electronic equipment failures, general disruption and programme delay.	Very Low	Negligible	<b>Not Significant</b>

9.5.4 With the mitigation detailed in Section 9.4 incorporated into the scheme design, and given the relatively short time span of construction, the residual effects for construction are expected to be **Not Significant**.

### Residual Effects from Operation

9.5.5 The likely operational lifespan of the proposed Development will be at least 120 years from 2026 onwards, during which the effects of climate change are likely to be prevalent. Table 9-9 **Error! Reference source not found.** identifies the proposed Development receptors, related aspects and the climate change effects they are likely to experience. The likelihood and consequence of these effects are also set out which determine the resulting significance of effect. This takes account of the design mitigation for the proposed Development as set out in Section 0.

Table 9-9 Vulnerability of the Proposed Development to Climate During the 120 year Operational Phase

Receptor	Aspect	Potential impacts to proposed Development	Likelihood Category	Consequence of Impact	Effect Significance
Concourses and rail surfaces	Rail	Substantial changes in temperature brought about by increased average temperature and increased severe weather events have the potential to generate thermal contraction and expansion in rail surfaces, resulting in sagging and buckling of rail.	High	Negligible	<b>Not Significant</b>
		For concrete concourses, thermal gradients have the potential to create uneven internal stresses which could then give rise to curling or warping, sometimes called hogging, or the slabs. These could be compounded by loading from passing traffic.	Low	Minor Adverse	<b>Not Significant</b>
	Concourse Surface	Large changes in temperature have the potential to generate thermal contraction and expansion of the concourse surfaces which, if not taken	Low	Minor Adverse	<b>Not Significant</b>

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Receptor	Aspect	Potential impacts to proposed Development	Likelihood Category	Consequence of Impact	Effect Significance
		into consideration at the design stage, could generate unacceptably large longitudinal internal stresses and excessive movements at joints.			
Buildings	Station	Increases in temperature have the potential risk of thermal actions (loads) applied to buildings (e.g. leading to joint and bearing failure). Some buildings have the potential to fail to operate within original design parameters. This could induce failures meaning additional works would then be required to strengthen them.	Low	Moderate Adverse	<b>Not Significant</b>
		Increases in precipitation rates could lead to premature deterioration rates for joints, bearings, surfaces and external fabric of buildings.	Low	Negligible	<b>Not Significant</b>
		An increase in the frequency and intensity of storms have the potential to cause increased loads on building structures and lead to collapse.	Very Low	Large Adverse	<b>Not Significant</b>
		An increase in mean temperatures and increased humidity levels has the potential to lead an increased need for maintenances for the building fabric and discomfort for the workforce and passengers (overheating and reduced ventilation).	Low	Negligible	<b>Not Significant</b>
		Increased precipitation has the potential to lead to isolated flooding (flood damage, damp, mould). However, the proposed Development will include suitable resilient drainage incorporating +40% allowance for climate change.	Low	Negligible	<b>Not Significant</b>
		Increased drought could lead to the subsidence in the buildings.	Very Low	Moderate Adverse	<b>Not Significant</b>

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Receptor	Aspect	Potential impacts to proposed Development	Likelihood Category	Consequence of Impact	Effect Significance
	Foundations	Increased winter precipitation and decreased summer precipitation has the potential to change the ground water level. This could potentially lead to the requirement of more robust foundations due to potential increased settlement.	Low	Negligible	<b>Not Significant</b>
	Particulates	An increase in the frequency and intensity of rainfall and storm events could lead to an increase in particulates (i.e. leaves) entering the drainage system. This may lead to localised flooding events, increase maintenance and increased land take for additional drainage assets. However, the proposed Development will include suitable resilient drainage incorporating +40% allowance for climate change.	Low	Negligible	<b>Not Significant</b>
	SuDS	The increased prevalence of drought conditions may decrease the permeability of the ground that forms part of SuDS and if followed by heavy rainfall events may result in surface water flooding.	Low	Negligible	<b>Not Significant</b>
Signage and, signals	Signs and signals	An increase in the frequency and intensity of storm events could reduce the design life of a number of key assets such as signage, lighting, rail surface and rail markings. This could increase maintenance costs over the lifespan of the road.	Low	Negligible	<b>Not Significant</b>
	Signs	An increase in wind speed and in frequency of extreme wind events has the potential to affect the stability of the signs, which have a design life of 25 years.	Low	Negligible	<b>Not Significant</b>
Landscape	Landscape Design	Changes in climatic conditions may favour particular plant species over others with associated impacts on the aesthetic value of the landscape design. This may also be	Medium	Negligible	<b>Not Significant</b>

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Receptor	Aspect	Potential impacts to proposed Development	Likelihood Category	Consequence of Impact	Effect Significance
		linked to a change in the landscape character of the area.			
		An increase in temperature may lead to longer growing seasons and consequently increased leaf coverage and decreased soil moisture content.	Low	Negligible	<b>Not Significant</b>
		Increased frequency of severe weather events could result in tree fall and increased maintenance and management requirement. This could also lead to the loss of valued landscape features and mature trees potentially opening up new views of the proposed Development that were previously shielded.	Low	Negligible	<b>Not Significant</b>
		The increased prevalence of drought may result in the implementation of emergency drought measures such as hose pipe bans with associated impacts of the watering of private and public gardens.	Medium	Negligible	<b>Not Significant</b>
Water	Continuity of water supplies	Increased risk of station water supply interruptions during droughts and from burst pipes in cold weather.	Medium	Negligible	<b>Not Significant</b>
Air Quality	Pollutants	Hotter and drier / drought conditions could increase concentrations and mobility of certain air pollutants such as ozone and PM2.5/10.	Low	Minor Adverse	<b>Not Significant</b>
		Pollutants such as nitrogen oxides would disperse at faster rates in higher ambient air temperatures resulting in an improvement in local air quality.	Low	Minor Adverse	<b>Not Significant</b>
Ecology	Habitat and wildlife	An increase in mean temperatures may exceed thresholds for certain habitats and species identified for relocation and enhancement as part of the environmental masterplan.	Low	Negligible	<b>Not Significant</b>

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Receptor	Aspect	Potential impacts to proposed Development	Likelihood Category	Consequence of Impact	Effect Significance
	Wildlife	Higher average temperatures and more frequent and intense heatwaves may increase in the risk of wildfires (frequency and intensity).	Low	Moderate Adverse	<b>Not Significant</b>
People	Health	Higher average temperatures and more frequent and intense heatwaves may increase incidences of serious illness, particularly for at-risk age groups who may be using the station to get to the hospital.	Low	Moderate Adverse	<b>Not Significant</b>
		Change in climate conditions could include the occurrence of severe weather events including cold spells, this has a potential to cause mortality and morbidity, particularly for at-risk age groups who may be using the station to get to the hospital.	Low	Moderate Adverse	<b>Not Significant</b>
Finance	Disruption to local economy	Extreme and changing weather would impact upon business activities, from disruption of supply chain and the transportation of goods to potential interruption to power supply.  Increased temperatures may also reduce business productivity.	Low	Minor Adverse	<b>Not Significant</b>
	Safety	The increased intensity and frequency of storm and flood events poses risks to human safety.	Medium	Minor Adverse	<b>Not Significant</b>
	Insurance	Increased flood risk in the future could result in an increase in insurance premiums with associated socio-economic implications. However, the proposed Development will include suitable resilient drainage incorporating +40% allowance for climate change.	Medium	Minor Adverse	<b>Not Significant</b>

9.5.6 Taking into account the proposed mitigation measures in Section 0 of this chapter and other relevant chapters, **no significant adverse effects** have been identified that may impact the proposed Development during the operation phase.

## In-Combination Climate Impacts

- 9.5.7 The ICCI assessment evaluates the combined effect of the proposed Development and potential climate change impacts on the receiving environment during the construction and operation of the proposed Development.
- 9.5.8 The assessment of potential in-combination impacts considers the requirement for additional mitigation measures and inclusion of allowance for future mitigation measures and monitoring.

Table 9-10: Potential In-combination climate impacts

Receptor	Potential in-combination impact	Likelihood	Consequence	Significance
Soils	Land use change in combination with changes in groundwater levels as a result of an increase in precipitation rates due to climate change could lead to ground movements and soil settlement.	Very Low	Moderate Adverse	<b>Not Significant</b>
	Changes in temperature and increased severe weather events have the potential to generate thermal contraction and expansion in station's rail surfaces, impacting the underlying ground conditions.	Very Low	Moderate Adverse	<b>Not Significant</b>
Water supply	Increased demand for water due to station operations, and climate variability creating droughts, can lead to water supply issues.	Low	Negligible	<b>Not Significant</b>
Drainage Systems	Increases in SuDS due to construction of the station can impact drainage, which is already exacerbated by impacts from climate change.	Low	Minor	<b>Not Significant</b>
Atmosphere	Increased dust as a result of construction may be exacerbated by drought or high-pressure systems, leading to increased pollution and poorer air quality.	Low	Minor Adverse	<b>Not Significant</b>
People & Communities	People using the station instead of vehicles for the journeys could be exposed to uncomfortable, hot environments, for example on an exposed concourse as they wait for a train. This could be exacerbated by increasing prevalence of heatwaves, especially impacting at-risk groups.	Low	Moderate Adverse	<b>Not Significant</b>
Habitats and Wildlife Species	Changes in climatic conditions may favour particular plant species over others, which may lead to changes	Medium	Negligible	<b>Not Significant</b>

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Receptor	Potential in-combination impact	Likelihood	Consequence	Significance
	in aesthetic value of the landscape design.			
Flood risk and land drainage	Extreme rainfall events in combination with the introduction of more impermeable surfaces could lead to localised flooding of transport infrastructure.	Low	Negligible	<b>Not Significant</b>
Landscape character and visual receptors	Vegetation being added to screen the station infrastructure from local receptors in combination with changing an increased growth rate of vegetation due to warmer weather can change the projected impact on Landscape character	Low	Negligible	<b>Not Significant</b>
Business and community organisations	Increase in frequency of extreme weather events in combination with direct and indirect job creation from the station during operation may lead to increased stress on local infrastructure.	Low	Minor Adverse	<b>Not Significant</b>

9.5.9 No further mitigation was required due to adequate mitigation measures already in place, and the effects are deemed **Not Significant**.

## Inter-project Cumulative Effects

9.5.10 With respect to climate change adaptation, this is largely a scheme specific consideration, namely the resilience of the project in question to climate change and the extent to which projected climate change could alter the predicted impact judgements. As such, there are no inter-project cumulative effects identified for Climate Change Adaptation.

## 9.6 Monitoring

9.6.1 No likely significant adverse residual effects have been identified, and no specific monitoring is required for climate receptors.

## 9.7 Assessment Summary

- 9.7.1 The assessment of climate change adaptation considered the vulnerability of the proposed Development to climate change during the construction and operational phases. Assessments were undertaken in accordance with IEMA Guidance (Ref 9.16). The climate of the study area is projected to change in the future. The assessment has considered the vulnerability of the proposed Development to these changes.
- 9.7.2 The potential impacts resulting from climate change were assessed on their likelihood and potential consequence of their occurrence taking into account the measures incorporated into the design of the proposed Development.
- 9.7.3 The assessment included infrastructure and assets associated with the proposed Development and identified receptors within the study area which were vulnerable to climate change. Significance of an impact was designated based on IEMA Guidance (Ref 9.16).
- 9.7.4 Taking into account the proposed mitigation measures in Section 9.4 of this chapter and other relevant chapters, **no significant impacts** have been identified for the proposed Development in either the construction phase or operational phase.

## 9.8 References

Reference	Title
Ref 9.1	The Paris Agreement, United Nations, 2015 Available online: <a href="https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf">https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf</a>
Ref 9.2	EU Directive on Environmental Impact Assessment (EIA) (Directive 2014/52/EU), 2017 (as amended) Available online: <a href="https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052">https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052</a>
Ref 9.3	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017/572 (EIA Regulations) Available online: <a href="https://www.legislation.gov.uk/uksi/2017/572/contents/made">https://www.legislation.gov.uk/uksi/2017/572/contents/made</a>
Ref 9.4	Climate Change Act 2008 (as amended), Committee on Climate Change, 2019. Available online: <a href="https://www.legislation.gov.uk/ukpga/2008/27/contents">https://www.legislation.gov.uk/ukpga/2008/27/contents</a>
Ref 9.5	HMSO, National Planning Policy Framework (2019) Available online: <a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf</a>
Ref 9.6	Greater Cambridge Shared Planning (2020) Greater Cambridge Sustainable Design and Construction Supplementary Planning Guidance Available online: <a href="https://www.cambridge.gov.uk/media/8157/greater-cambridge-sustainable-design-and-construction-spd.pdf">https://www.cambridge.gov.uk/media/8157/greater-cambridge-sustainable-design-and-construction-spd.pdf</a>
Ref 9.7	Network Rail Environmental Policy, 2017 Available online: <a href="https://www.networkrail.co.uk/wp-content/uploads/2016/11/Network-Rail-Environment-Policy.pdf">https://www.networkrail.co.uk/wp-content/uploads/2016/11/Network-Rail-Environment-Policy.pdf</a>
Ref 9.8	Network Rail Environment and Social Performance policy, 2017, Document Ref: NR/L1/ENV/100 Available online: <a href="https://safety.networkrail.co.uk/wp-content/uploads/2016/03/Environment-Policy-2015-Signed.pdf">https://safety.networkrail.co.uk/wp-content/uploads/2016/03/Environment-Policy-2015-Signed.pdf</a>
Ref 9.9	Network Rail Sustainable Development Strategy Our vision and strategy: A railway fit for the future 2013 – 2024, Document Ref: SBPT204 Available online: <a href="http://www.ukraildev.net/wp-content/uploads/2016/11/sustainable-development-strategy.pdf">http://www.ukraildev.net/wp-content/uploads/2016/11/sustainable-development-strategy.pdf</a>
Ref 9.10	Network Rail Environmental Sustainability Strategy 2020-2050 Available Online: <a href="https://www.networkrail.co.uk/wp-content/uploads/2020/09/NR-Environmental-Strategy-FINAL-web.pdf">https://www.networkrail.co.uk/wp-content/uploads/2020/09/NR-Environmental-Strategy-FINAL-web.pdf</a>
Ref 9.11	Network Rail Weather Resilience and Climate Change Adaptation Strategy, 2017 Available online: <a href="https://safety.networkrail.co.uk/wp-content/uploads/2017/02/NR-WRCCA-Strategy-2017-2019.pdf">https://safety.networkrail.co.uk/wp-content/uploads/2017/02/NR-WRCCA-Strategy-2017-2019.pdf</a>



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Reference	Title
Ref 9.12	<p>Weather Resilience and Climate Change Impact Assessment Guidance Note, Network Rail, Document Ref: NR/GN/ESD11 Issue 3.</p> <p>Available Online: <a href="https://safety.networkrail.co.uk/wp-content/uploads/2020/12/Weather-resilience-and-climate-change-impact-assessment-guidance.pdf">https://safety.networkrail.co.uk/wp-content/uploads/2020/12/Weather-resilience-and-climate-change-impact-assessment-guidance.pdf</a></p>
Ref 9.13	<p>The National Adaptation Programme (NAP) and the Third Strategy for Climate Adaptation Reporting: Making the country Resilient to a changing Climate, 2018</p> <p>Available online: <a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf</a></p>
Ref 9.14	<p>The UK Climate Change Risk Assessment, 2017</p> <p>Available online: <a href="https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf">https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf</a></p> <p><a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf</a></p>
Ref 9.15	Institute of Environmental Management and Assessment (IEMA) (2015) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation
Ref 9.16	IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020)
Ref 9.17	<p>Met Office, UK Climate Averages, Station: Cambridge, NIAB, 1981-2010</p> <p>Available online: <a href="https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u1214qgj0">https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u1214qgj0</a></p>
Ref 9.18	<p>UK Climate Projections 2018 (UKCP18) 2018</p> <p>Available online: <a href="https://www.metoffice.gov.uk/research/collaboration/ukcp/download-data">https://www.metoffice.gov.uk/research/collaboration/ukcp/download-data</a></p>
Ref 9.19	<p>Climate at a Glance: Global Time Series, NOAA National Centres for Environmental information, 2020</p> <p>Available online: <a href="https://www.ncdc.noaa.gov/cag/global/time-series/globe/land_ocean/ann/8/1880-2020">https://www.ncdc.noaa.gov/cag/global/time-series/globe/land_ocean/ann/8/1880-2020</a></p>
Ref 9.22	<p>UKCP18 Factsheet: Snow, Met Office, 2019</p> <p><a href="https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-factsheet-snow.pdf">https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-factsheet-snow.pdf</a></p>

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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 10 – Climate Part 2 – Greenhouse Gas Emissions**

JUNE 2021

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# APPENDICES

Appendix 10.1 Rail Carbon Tool

## 10 Climate Part 2 - Greenhouse Gas Emissions

### 10.1 Introduction

- 10.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to greenhouse gas (GHG) emissions. The assessment incorporates relevant design and other mitigation measures that would be employed and reports the residual effects.

### Relevant Aspects of the Proposed Development

- 10.1.2 A description of the proposed Development is provided in Chapter 4. The specific aspects of the proposed Development that relate to GHG emissions are the emissions arising during the construction and operational phases of the proposed Development.

### 10.2 Assessment Methodology

#### Legislation, Policy and Guidance

##### Legislation

- 10.2.1 The main European and national legislation and policy impacting on GHG emissions in the UK (relevant to England) include:

- Paris Agreement, 2015 (Ref 10.1) - adopted in 2015 and entered into force in November 2016, the Paris Agreement is an international climate agreement aiming to limit global temperature increase this century to well below 2, preferably to 1.5, degrees Celsius above pre-industrial levels. It additionally establishes a goal of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. In December 2020, the government announced a new target to reduce the UK's emissions by at least 68% by 2030, compared to 1990 levels. This target will act as a Nationally Determined Contribution (NDC) to the Paris Agreement, which determines the required domestic action each country must take to help deliver on the global agreement.
- EIA Directive 2014/52/EU (Ref 10.2) - states that EIAs shall identify, describe and assess the direct and indirect significant effects of climate change relevant to the proposed Development.
- The Climate Change Act 2008 (2050 target amendment) 2019 (Ref 10.3) - in June 2019, the Government amended the Climate Change Act 2008 to revise the 2050 GHG target of an 80% reduction of GHG emissions compared to 1990 levels to a 100% reduction carbon target. Section 16 of the Act required annual statements of UK; these statements set out the steps taken to calculate the net UK carbon account. The Act required that the pathway to achieving the 2050 carbon target should be set out in five-year carbon budgets. The net UK carbon account is compared against the carbon budgets to determine whether they are met, and must not exceed the level of the carbon budget at the end of each budgetary period. The most recent carbon budget is the fifth which sets a cap on carbon emission levels between 2028 and 2032. However, the Committee on Climate Change (CCC) (Ref 10.4) has stated:

'The path to achieving net-zero emissions by 2050 will necessarily entail a steeper reduction in emissions over the intervening three decades ... As the existing carbon budgets were set on a cost-effective path to achieving an 80% reduction in UK greenhouse gas emissions by 2050, a more ambitious long-term target is likely to require outperformance of the carbon budgets legislated to date. The Committee will revise its assessment of the appropriate path for emissions over the period to 2050 as part of its advice next year on the sixth carbon budget (covering 2033-2037).'

'In December, the Committee will publish its recommendation on the level of the sixth carbon budget, the limit on UK emissions for 2033-37. This will present a full pathway to

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net-zero greenhouse gas emissions by 2050. Government is required to respond to that advice and legislate the new carbon budget by June 2021.'

## Policy

10.2.2 The main national and regional policy impacting on GHG emissions in the UK (relevant to England) include:

- National Planning Policy Framework (NPPF) (2019) (Ref 10.5) - the NPPF sets out government planning policy for England and describes ways in which the challenge of climate change can be met. Chapter 14 of the NPPF highlights that planning plays a key role in meeting the challenge of climate change. The Policy also includes the requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change in line with the provisions and objectives of the Climate Change Act 2008 and co-operate with other authorities to deliver strategic priorities which include climate change.
- Greater Cambridge Sustainable Design and Construction Supplementary Planning Document 2020 (Ref 10.6) - this supplementary planning document sets out the standards required to meet the visions, objectives and policies of the Cambridge and South Cambridgeshire Local Plans. The plan outlines the need to meet sustainable transport objectives, as transport is a large contributor to UK and Cambridgeshire GHG emissions.
- South Cambridgeshire Zero Carbon Strategy May 2020 (Ref 10.7) - the strategy adopts the district target of a 50% reduction in carbon emissions by 2030 and to be zero carbon by 2050. This target includes cutting carbon footprint from transport, which accounts for 50% of emissions (679,000 tCO<sub>2</sub> per year) in the district. Approximately 98% of transport emissions are from road traffic running through South Cambridgeshire.

## Guidance

10.2.3 Relevant policy and guidance produced by Network Rail (NR) has been considered and where relevant applied through this assessment. This includes the following:

- Sustainable Development Strategy 2013-2024 (document ref SBPT204) (Ref 10.8) - this strategy outlines the need to use low carbon energy to minimise carbon footprint, and to make the rail network resilient to future changes in the climate.
- Network Rail Environmental Sustainability Strategy 2020-2050 (Ref 10.9) – Network Rail sets out a vision to provide clean, green mass transport that supports local communities. To achieve this vision, four core priorities are set:
  - A low emission railway – aim to achieve net zero emissions by 2050 and deliver continual improvements to air quality.
  - A reliable railway service that is resilient to climate change – prepare the railway infrastructure to minimise the impacts of climate change by 2050.
  - Improved biodiversity of plants and wildlife – Protect nature, maintain and enhance biodiversity across the railway.
  - Minimal waste and sustainable use of materials – Reuse, repurpose or redeploy all surplus resources, minimise use of resources, design out waste and embed waste life-cycle / circular economy thinking into the rail industry by 2035.
- Network Rail Traction Decarbonisation Network Strategy 2020 (Ref 10.10) - this strategy sets out the importance of decarbonising rail traction and considers overhead electrification, battery and hydrogen fuel cells as means to achieve it. At the request of the Department for Transport, the rail industry should explore whether it would be possible to remove all diesel-only trains from the network by 2040 in England and Wales. Decarbonisation across the network would help towards the Network Rail science-based target of 27.5% reduction for traction by 2029.
- Capital Carbon Guidance Note (Ref 10.11) - this document outlines how to manage Capital Carbon while working on Design, Construction and Maintenance activities. Capital

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carbon covers GHG emissions arising from the creation, refurbishment, and end of life treatment of assets such as buildings and infrastructure. The Rail Safety and Standards Board (RSSB) Rail Carbon Tool (RCT) is to be used to undertake capital carbon assessment on Network Rail projects (Ref 10.12). Carbon assessment would account for:

- The embodied carbon emissions associated with the creation and manufacture of materials and products (construction raw materials).
- Carbon emissions associated with travel, transport, and logistics. Transport carbon shall be calculated from final supplier's gate to Network Rail site based on travel distance, mode of transport, number of movements, etc. Transport of waste from site will be calculated in the same way, from the site to the designated Materials Recycling Facility.
- Carbon emissions from site utilities consumption and fuel used by mobile plant and equipment.
- Operational Carbon Guidance Note (Ref 10.13) - this document provides guidance which is applied to the proposed Development on how to design for goods, materials and assets to reduce operational carbon emissions for those working in Design, Construction and Maintenance activities. Guidance includes the following topics:
  - Asset energy metering – NR requirements and industry standards for energy metering in buildings and the benefits of metering
  - Lighting – NR requirements for the design, specification installation and maintenance of lighting to achieve energy efficiency, reduce operational costs and carbon footprint
  - Optimising building design – designing for energy efficiency to reduce energy consumption, costs and carbon emissions, as well as the consideration of renewable energy in the design
  - Heating –designing to prevent heat loss including the consideration within the Building Management Systems, construction and commissioning design process and delivery
  - Cooling and ventilation –designing to optimising comfort for those in operations of the building whilst also reducing energy consumption where possible.

10.2.4 Guidance documents regarding the assessment of climate considered and applied by this EIA include:

- Publicly Available Specification (PAS) 2080:2016 Carbon Management in Infrastructure 2016 (Ref 10.14).
- GHG Protocol (World Resources Institute (WRI) and World Business Council on Sustainable Development) (Ref 10.15).
- Inventory of Carbon and Energy (ICE) Database v.2 and v.3 (Ref 10.16).
- RSSB Rail Carbon Tool (Ref 10.12).
- Department for Business, Energy and Industrial Strategy (BEIS), Government emissions conversion factors for GHG company reporting, 2020 (Ref 10.17).
- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2017 (Ref 10.18).
- Department for Transport's Appraisal and Modelling Strategy: A route map for updating Transport Analysis Guidance (TAG) during uncertain times, 2020 (Ref 10.19).
- Network Rail Capital Carbon Guidance (Ref 10.11).



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## Consultation and Scoping

### Consultation

10.2.5 Table 10-1 provides a summary of Consultee issues raised with respect to climate change and how they have been addressed.

Table 10-1 Summary of Scoping Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Greater Cambridgeshire Shared Planning (GCSP), 19/06/2020	<p>Climate scope discussed at local authority (LA) meeting as per issued Cambridge South Infrastructure Enhancements (CSIE) Scheme- EIA Scoping Note. Cambridge South Station meeting notes:</p> <p>The intention was not to scope out anything. However, due to the design life of the proposed Development, decommissioning has been scoped out.</p>	<p>This GHG emissions assessment covers GHG emissions during both construction and operation. GHG assessment has covered embodied carbon, use of water, land use change, any construction activities and plant and equipment, following Network Rail (NR) Capital Carbon Guidance. The GHG emissions assessment will also cover transport of material resources, waste and workers travelling to and/or from the construction site.</p>
Cambridge County Council (email via Network Rail), 04/12/2020	<p>Lack of evidence on how the new development will contribute to the net zero carbon emissions target for Cambridgeshire.</p> <p>Request for a carbon assessment which forecast Scope 1, 2 and 3 carbon emissions for Cambridge South Station, and a plan that shows how the carbon emissions for the development for scope 1, 2 and 3 emissions (GHG protocol) will reduce towards net zero.</p> <p>No reference to how the provision of clean electricity and low carbon heat for the station buildings will be key to the station's carbon reduction trajectory</p> <p>Request to quantify the strategic carbon benefits, such as how many diesel/petrol vehicle miles will be reduced as a result of the station being built and what this translates into in terms of a potential carbon saving for the wider area.</p>	<p>This Chapter takes cognisance of the South Cambridgeshire Zero Carbon Strategy May 2020 and its targets, and these are referenced in Policy section 10.2.2.</p> <p>Data for a scope 1, 2 and 3 calculation is not available, however certain scope 3 emissions would be included e.g. embodied carbon emissions of building material resources.</p> <p>The carbon reduction trajectory for the station building will be determined by parties operating the station. The mitigation measures in Table 10-8 gives examples of how to minimise operational GHG emissions at the design stage.</p> <p>A projection of total car/miles removed as a result of the station and the associated carbon emissions reduction, will be provided in Section 10.5 'Residual Effects from Operation'</p>

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## Scoping

10.2.6 Table 10-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to climate change, and the corresponding location in the ES where they are addressed.

*Table 10-2 Summary of Scoping Opinion*

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Department for Transport	ES consideration needs to be given to the most recent carbon budget	Recommendations from the sixth carbon budget have been outlined in 10.2.14 'Defining the Importance /Sensitivity of the Resource', and a timeline regarding the government's response referenced in Legislation, Policy and Guidance' Section 10.2.1
Greater Cambridge Shared Planning	Recommends specific reference to sixth carbon budget recommendations	Recommendations from the sixth carbon budget have been outlined in 10.2.14 'Defining the Importance /Sensitivity of the Resource', and a timeline regarding the government's response referenced in Legislation, Policy and Guidance' Section 10.2.1

## The Study Area

### Construction Phase

10.2.7 The study area for GHG emissions assessment for the construction phase covers GHG emissions associated with the proposed Development's construction activities and materials usage within the site boundary (see Figure 4.1 in Chapter 4), as well as the emissions associated with their transport from outside of the site boundary. GHG emissions from transportation of key construction material resource and construction waste have been derived from their estimated distance of travel from site boundary, using the RCT. This study area is appropriate as it captures the emissions from the proposed Development's construction activities and materials usage as well as emissions from staff travel and movements associated with material assets and waste.

### Operational Phase

10.2.8 The study area for GHG emissions impact assessment for the operational phase is the area covered by the traffic model for the proposed Development. This study area is appropriate as it captures the user emissions from the proposed Development, those arising from the outlying transport network, and vehicle movements that have been indirectly influenced by the proposed Development.

10.2.9 Utilities (electricity, heating and water) required to calculate the associated operational emissions is not currently available so has not been assessed at this stage of the development. The outline station area schedule suggests minimal energy provision would be required. This energy usage may cover retail, ticket office, toilets, lifts and lighting. Therefore, the impact of the exclusion of GHG emission data is unlikely to change the overall residual effect.

## Methodology for Establishing Baseline Conditions

10.2.10 Baseline conditions for GHG emissions have been established through desk-top research, including the interrogation of key datasets such as the Department for Business and the Energy and Industrial Strategy UK GHG Emissions (Ref 10.20).

10.2.11 In addition, the existing baseline for the GHG emissions assessment has been a 'Do Minimum' scenario, which presents the GHG emissions of the existing transport network without the proposed Development. The 'Do minimum' scenario has been based on information obtained from the proposed Development's traffic model.

## Forecasting the Future Baseline

10.2.12 The construction phase GHG emissions future baseline for the 'Do Minimum' scenario is whereby the proposed Development does not go ahead and provides the basis for comparison against which net changes in GHG emissions can be established. The future baseline conditions for the 'Do Minimum' scenario for the operational phase have been identified based on volumes of traffic currently on the existing network for the fully operational year 2031. The assessment of the operational phase was undertaken for fully operational year (2031) instead of opening year (2026) as this is the year when the projected passenger numbers using the station will be reached, and so associated GHG emissions from traffic models for 2031 would be more representative for operational emissions. These are considered the reasonable worst-case scenarios for GHG emissions from the operational phase. This has established the baseline against which the proposed Development has been subsequently compared, to identify any variation in GHG emissions over time.

## Defining the Importance/Sensitivity of resource

10.2.13 The global climate has been identified as the receptor for the purposes of the GHG emissions impact assessment. However, to enable significance evaluation of the estimated GHG emissions arising from the proposed Development, the UK GHG inventory and specifically the five-year UK national carbon budgets (Ref 10.21) have been used as a proxy for the global climate. There is no standard definition for receptor sensitivity to GHG emissions set out in the IEMA guidance (Ref 10.18). The sensitivity of the receptor, the UK carbon budget (as a proxy for the global climate), has been defined as high. The rationale for this evaluation is that any additional GHG impacts could compromise the UK's ability to reduce its GHG emissions and therefore meet the future carbon budgets presented within The sixth carbon budget will cover the emission reductions for the period 2033 to 2037. The Committee on Climate Change published their recommendation to the government in December 2020 (Ref 10.4). The CCC recommend that the Sixth Carbon Budget for 2033-2037 is set at 965 million tCO<sub>2</sub>e, implying a reduction in emissions to 2035 of 78% from 1990 levels or 63% from 2019.

10.2.14 Table 10-3.

10.2.15 The sixth carbon budget will cover the emission reductions for the period 2033 to 2037. The Committee on Climate Change published their recommendation to the government in December 2020 (Ref 10.4). The CCC recommend that the Sixth Carbon Budget for 2033-2037 is set at 965 million tCO<sub>2</sub>e, implying a reduction in emissions to 2035 of 78% from 1990 levels or 63% from 2019.

*Table 10-3 UK Carbon Reduction Targets set out within the Carbon Budget*

Carbon Budget	Carbon Budget Level	Reduction below 1990 Levels
3rd carbon budget (2018 -2022)	2,544 million tCO <sub>2</sub> e	37% by 2020
4th carbon budget (2023 – 2027)	1,950 million tCO <sub>2</sub> e	51% by 2025

5th carbon budget (2028 – 2032)	1,725 million tCO <sub>2</sub> e	57% by 2030
6th carbon budget (2033 – 2037)	965 million tCO <sub>2</sub> e	78% by 2035

## Methodology for Assessing Impacts

### Impact Characterisation

10.2.16 The GHG emissions assessment has taken a project lifecycle approach to identify GHG emissions hot spots (i.e. emissions sources likely to generate the largest amount of GHG emissions), and correspondingly enables the identification of priority areas for mitigation. This approach is consistent with the principles set out in IEMA guidance (Ref 10.18).

10.2.17 The GHG emissions assessment has also considered the significance of the proposed Development's contribution to UK GHG emissions and the Government's ability to achieve its carbon reduction targets to meet the relevant carbon budgets set pursuant to the Climate Change Act 2008 (as amended) (Ref 10.3).

10.2.18 The budgets relevant to the GHG emissions assessment (for the construction and operational phases), expressed in the form of tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e), are detailed in The sixth carbon budget will cover the emission reductions for the period 2033 to 2037. The Committee on Climate Change published their recommendation to the government in December 2020 (Ref 10.4). The CCC recommend that the Sixth Carbon Budget for 2033-2037 is set at 965 million tCO<sub>2</sub>e, implying a reduction in emissions to 2035 of 78% from 1990 levels or 63% from 2019.

10.2.19 Table 10-3. In addition, the GHG emissions assessment takes an approach consistent with the principles set out in PAS 2080:2016 (Ref 10.16). CO<sub>2</sub>e is a metric measure used to compare the emissions from various GHGs on the basis of their global-warming potential (GWP). This allows the emissions of the 7 key GHGs: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (NO<sub>2</sub>), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>); to be expressed in terms of their equivalent global warming potential in mass of CO<sub>2</sub>e. GHG Emissions from transport movements have been calculated using available transport information and TAG (Ref 10.19).

10.2.20 To determine the significance of the proposed Development's contribution to the UK GHG emissions, the assessment compares two scenarios: the 'Do Minimum' scenario (baseline and future baseline); and the 'Do Something' scenario, as set out in Table 10-4, against the carbon budgets as set out in The sixth carbon budget will cover the emission reductions for the period 2033 to 2037. The Committee on Climate Change published their recommendation to the government in December 2020 (Ref 10.4). The CCC recommend that the Sixth Carbon Budget for 2033-2037 is set at 965 million tCO<sub>2</sub>e, implying a reduction in emissions to 2035 of 78% from 1990 levels or 63% from 2019.

10.2.21 Table 10-3. Using these scenarios, an estimation of the net emissions resulting from the proposed Development has been determined.

Table 10-4 GHG Emissions Assessment Scenarios

Scenario	Description
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Do Minimum	Baseline without the proposed Development  Future baseline without the proposed Development (Fully Operational Year (2031))	Two do minimum scenarios are presented as follows: <ul style="list-style-type: none"> <li>Baseline conditions in a business-as-usual scenario. An estimation of the GHG emissions from the traffic model's baseline year.</li> <li>The future baseline considers the full operational year (2031). The future baseline also includes any increase in traffic and associated congestion due to committed developments within the study area from 2023 to 2031 (e.g. Cambridge Biomedical Campus).</li> </ul>
Do Something	Proposed Development goes ahead	The proposed Development with the design measures.

10.2.22 The assessment of GHG emissions associated with the proposed Development has been considered through the following stages:

- Construction of the proposed Development, including material supply, transport, manufacturing and construction process.
  - The GHG emitted through the materials used to construct the proposed Development, and the significance of the effects of this.
  - The GHG emitted through the construction activities associated with the proposed Development, calculated in line with Network Rail Capital Carbon Guidance (Ref 10.4), including transportation of materials to site.
- Operation of the proposed Development, including:
  - The GHG emissions from utilities.
  - The GHG emissions from Rail users' carbon.
  - Emissions associated with maintenance and refurbishment, including fuels of plant, equipment and transportation.
  - The GHG emissions through Land use change associated with the proposed Development's planting proposals and ongoing sequestration of GHG.

10.2.23 The rail users' carbon has been assessed through the traffic analysis. The proposed Development is not expected to significantly change rail GHG emissions; it is projected that there will be no change in frequency or volume of diesel locomotives (both passenger and freight) associated with the operation of the proposed Development as compared to the future baseline. The data to undertake an energy model and assessment – which is needed to calculate GHG emission projections – has not been developed. However the station area schedule, which contains information on building activities, suggests that minimal energy demand would be required for the operation of the station. Therefore GHG emissions from the operation of the station are highly unlikely to have a material impact on the outcome of this significance assessment.

10.2.24 Estimated GHG emissions have been and aligned with the GHG Protocol principles and assessed the equation below (Ref 10.15):

- Relevance: ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.
- Completeness: account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions

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- Consistency: use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.
- Transparency: address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used
- Accuracy: Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.
- Activity data x GHG emissions factor = GHG emissions value.

10.2.25 GHG emission factors from the ICE database v3 and v2 (Ref 10.16) and from BEIS GHG conversion factors (Ref 10.17), as used by the RCT (Appendix 10.1), have been utilised.

10.2.26 GHG emissions have an effect on the atmosphere rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. There are no clear, agreed thresholds or methods for evaluating the significance of GHG effects in EIA, with the guidance suggesting that several possible approaches could be taken. Therefore, for this assessment, the two scenarios ('do minimum' and 'do something' with the proposed Development going ahead) have been compared against the UK Carbon Budgets set out in Table 10-3 in order to evaluate the net change in GHG impacts.

### Assessing Significance

10.2.27 GHG emissions from the proposed Development have been quantified and expressed as tCO<sub>2</sub>e per annum for the 'Do Minimum' and 'Do Something' scenarios. The difference between the two scenarios has been calculated to provide evidence of the carbon impact of the proposed Development during its construction and operational phases.

10.2.28 It is unlikely that a single development will impact the ability of the UK to meet its carbon budget. However, in the absence of any significance criteria or a defined threshold, all GHG emissions are considered significant. The proposed Development would therefore address their occurrence by taking mitigating action.

### Limitations and Assumptions

10.2.29 While considered sufficient to inform the assessment, quantifications of materials required and waste arisings forecast from the proposed Development have been derived from the emerging design and the application of professional judgement. Additionally, there is inherent uncertainty in projecting GHG emissions over 120 years into the future. Therefore, the GHG emissions presented in Section 10.5 are an estimation, calculated using the most representative, accurate and plausible data available.

10.2.30 The emissions presented in this chapter are best estimates, incorporating construction and operational emissions as a result of the proposed Development. However, due to inadequate data available at this stage of development it has not been possible to account for all emissions, for example the operational GHG emissions associated with the energy used such as for heating and lighting of the station. Additionally, GHG emissions associated with decommissioning of the proposed Development have been scoped out.

10.2.31 The GHG emissions linked to shifting traffic patterns have been calculated using TAG GHG emissions workbook, which uses Defra's Emission Factor Toolkit version 10.1 to forecast the mix of vehicles (petrol/diesel/electric) in the fleet and engine fuel efficiency up to 2031. As such, both the proportion of the vehicle fleet that will be electric in the future and the fuel efficiency of petrol/diesel vehicles that are calculated after this date can be considered



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conservative estimates. Therefore, the (TAG) workbook is expected to overestimate GHG emissions, providing a reasonable worst-case scenario.

10.2.32 Where possible, emission factors were researched for the exact material/product specified for the proposed Development. Primary sources of emission factors are ICE Database V3.0 (Ref 10.16). Where an exact match could not be identified, assumptions were made to select a representative material or product from these databases.

10.2.33 Data collection for GHG calculations was based on the set of standard data quality principles detailed in the GHG Protocol guidelines and summarised in Table 10-5. Applying these principles allowed the results from the GHG assessment to be as representative as possible.

Table 10-5 GHG Protocol Principles

Data quality principle	Application to Project
Age	The GHG assessment is based on activity data and GHG emissions factors applicable to the study period. The construction peak year (2023) for the GHG assessment incorporates GHG emissions from fuel use for construction activities along with embodied carbon within material assets used for the construction phase. The assessment has been based on an estimation of the types and quantities of key materials required for the construction and operation of the proposed Development.
Geography	The activity data is specific to the proposed Development and emission factors used are representative of the UK construction industry and UK transport sector.
Technology	The activity data and emission factors used are representative of the UK construction and transport sectors.
Methodology	The activity data is specific to the proposed Development and has been provided by the Project's engineering and design teams.
Competency	The activity data is specific to the proposed Development and has been provided by the Project's engineering and design teams. The emission factors used are from published sources. Data gaps have been filled using best available data, for example extrapolating existing data or using industry guidance documents.

10.2.34 The design and ground investigation for the proposed Development will continue to evolve; however, conservative assumptions were used in estimating material quantities to inform the proposed Development's GHG emissions to cover a reasonable worst case. Therefore, changes that may occur as a result of emerging data are not expected to materially alter the conclusions of this assessment.

10.2.35 It is recognised that many parameters of the 'Do Something' scenario cannot be fully defined at the preliminary design stage and would be the subject of further evaluation during the development of the detailed design. However, for the purposes of quantifying the proposed Development's GHG emissions, a number of design assumptions were built into the proposed Development's GHG emissions calculations to apply the principles of avoiding/preventing, reducing and remediating GHG emissions in line with the IEMA guidance (Ref 10.18). These design assumptions have been based on professional judgment and industry standards.

10.2.36 Although all assumptions in this section are considered reasonable to determine the GHG emissions at the preliminary design stage, on a reasonable worst-case basis, the assumptions may change during the detailed design. Section 10.4 provides details of the committed mitigation related to the proposed Development GHG emissions and it would be for the contractors then to determine the best means to reduce GHG emissions in line with these commitments. As conservative assumptions were used to inform the proposed Development's GHG emissions, the assessment covers a reasonable worst case. Therefore, changes that

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may occur as a result of emerging data during detailed design would not alter the overall conclusions of this assessment.

## **10.3 Baseline**

### **Existing Baseline**

10.3.1 The UK total GHG emissions for 2019 was 454,766,073 tonnes of carbon dioxide equivalent (CO<sub>2</sub>e) of which transport was the largest emitting sector (27%) (Ref 10.20). In South Cambridge, carbon footprint from transport accounts for 50% of emissions (679,000 tCO<sub>2</sub> per year) in the district (Ref 10.7).

The total provisional GHG emissions from transport in the UK (Ref 10.20) are presented in



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10.3.2 Table 10-6. These figures are by source; they include direct emissions and not emissions resulting from the production of the fuels used.

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Table 10-6 GHG Emissions from Transport in the UK

Year	Tonnes of CO <sub>2</sub> e
2013	119,990,990
2014	121,346,471
2015	123,510,935
2016	125,921,390
2017	126,110,478
2018	124,353,601
2019	122,212,128

- 10.3.3 When reviewing carbon emissions alone, transport was responsible for 33% of emissions in the UK in 2019. In Cambridgeshire, transport contributed 44% of emissions in 2018 (2019 data not yet published) with 97% of transport emissions from road traffic, the majority of which (57%) from traffic on A-roads (Ref 10.22). Transport accounts for a larger proportion of per capita carbon emissions in Cambridgeshire (33.8%) than in England (31%) as a whole (Ref 10.23).
- 10.3.4 In addition, the existing baseline presents the GHG emissions estimated from traffic for the baseline year of 2019, - as calculated using the full modelled road network provided through TAG – which is defined as the base year for the proposed Development's validated traffic model. GHG emissions calculated through the traffic model estimated approximately 12,573 tCO<sub>2</sub>e were emitted from transport within the study area.
- 10.3.5 Within the proposed Development site boundary, current land use is predominantly park land. The resulting GHG impact from necessary changes to the land use as a result of the proposed Development have been assessed within the EIA.

## Future Baseline

- 10.3.6 The future baseline conditions for the 'without proposed Development' ('Do Minimum') scenario have been identified based on the modelling volumes of traffic currently on the study area for 2031 (fully operational year). This established the baseline against which the proposed Development has been subsequently compared, to identify any variation in GHG emissions over time. The modelled volumes of traffic and associated GHG emissions were calculated using the TAG.
- 10.3.7 Under this scenario, GHG emissions for the use (including transport required for maintenance) of the transport network ('Do Minimum' scenario) were estimated to be approximately 12,281 tCO<sub>2</sub>e for the 2031 fully operational year.
- 10.3.8 The estimations for the future baseline years expect to demonstrate a reduction in the GHG emissions associated with transport when compared to the existing emissions taken from the base year of the traffic model, which can be attributed to lowering of the GHG emissions factors for vehicles as a result of electrification of the fleet and improved efficiency standards. Comparisons between the baseline year (2019) and the fully operational year (2031) indicates a reduction of 291 tCO<sub>2</sub>e compared to the baseline year, in the 'Do Minimum' scenario in each case.

## 10.4 Design and Mitigation

- 10.4.1 Environmental considerations have influenced the proposed Development throughout the design development process, from options assessment through to refinement of the proposed Development's design. An iterative process has facilitated design updates and improvements, informed by environmental assessment and input from the proposed Development design teams and consultation.
- 10.4.2 Through the application of the IEMA Guidance (Ref 10.18), the proposed Development is committed to reducing GHG emissions from the activities by implementing the following hierarchy for GHG emissions:
- Avoid and/or prevent – measures that maximise potential for reusing and/or refurbishing existing assets.
  - Reduce – measures that apply low carbon solutions, including technologies, materials and products, to minimise resource consumption.
  - Remediate – measures to further reduce carbon through on or offsite offsetting or sequestration.
- 10.4.3 This hierarchy is being applied throughout the design process and associated mitigation measures and has informed the assumptions used to develop the 'Do Something' scenario. These are presented within Section 10.2: Limitations and Assumptions. Further measures to reduce the carbon emissions of the proposed Development are described below.

## Construction Approach and Mitigation of Construction Effects

- 10.4.4 The design features of the proposed Development and mitigation measures that would seek to reduce GHG emissions are set out in this section. A number of features have been embedded in the design and best practice construction methodologies would form part of the outline Code of Construction Practice (CoCP) Part A (see Appendix 2.4), which will be submitted as part of the application. This would describe the outline procedures for the management of environmental effects during construction, including the implementation of good site housekeeping practices. As described in Chapter 4, a CoCP Part B, which would be secured via deemed planning condition, would be produced by the appointed contractor and would need to set out detailed procedures for managing environmental effects.

*Mitigation measures that would be used to reduce GHG emissions during the construction phase have been presented in*

- 10.4.5 Table 10-7.

Table 10-7 GHG emissions mitigation measures during the construction phase

Stages and Sub-stages of Lifecycle		Mitigation Measures
Product stage	Materials resources	<p>Appointed contractor(s) attention to material resources quantities requirements to avoid over-ordering and generation of waste through reuse where possible.</p> <p>Where feasible, design for offsite manufacture of design elements to reduce waste and energy resource required onsite.</p> <p>Consideration to alternative low carbon materials when possible (e.g. recycled aggregates, replacement of ordinary Portland cement with Ground Granulated Blast furnace Slag (GGBS), etc.). to be considered in design and procurement, as this will impact the embodied carbon and could reduce GHG emissions associated with material resources.</p>

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Stages and Sub-stages of Lifecycle		Mitigation Measures
	Waste	<p>Prioritise reducing the import of fill through the retention and reuse of excavated materials suitable for use as engineered fill and landscaping.</p> <p>Deliver designing out waste and carbon workshops to identify opportunities to reduce waste and material resources and to identify opportunities to achieve a cut/fill balance during the construction phase.</p> <p>Appointed contractor(s) will adopt good practice in sustainable procurement and construction waste management to reduce waste. For example, agreements with material resources suppliers to reduce the amount of packaging or to participate in a packaging take-back schemes.</p>
Construction activities	Transport of material resources	Material resources transportation will be reduced and/or avoided by minimising the quantity of material resources. Additionally, where possible detailed design and procurement measures will be specified to minimise the requirement to source material resources from long distances.
	Transport of waste	Reduction of waste generation will be carried out in accordance with the principles of the Waste Hierarchy and the mitigation measures outlined in Chapter 14: Materials and Waste.
	Transport (commuting)	Local contractors will be used where possible, reducing the distance driven by employees.
	Plant and equipment use	<p>Construction plant and equipment GHG emissions will be minimised by designing for efficient construction processes as part of the proposed Development design development. The plant and equipment GHG emissions will be managed via the CoCP Part B, which would specify plant and equipment operator efficiency requirements.</p> <p>The proposed Development will utilise energy efficiency equipment during the construction phase resulting in a reduction of GHG emissions. An example of energy efficiency products would be LED lighting for temporary accommodation and security routes, which is considered best practise on construction site in the UK.</p> <p>The proposed Development will cover the consumption from the construction compound using suppliers that procure renewable electricity, if feasible.</p> <p>A Carbon Efficiency Plan will be developed and implemented by the appointed contractor(s) as part of the CoCP Part B to manage and reduce GHG emissions and promote good practice including:</p> <ul style="list-style-type: none"> <li>• Monitoring of fuel use.</li> <li>• Driver/plant use training.</li> <li>• Mandate grid connection for utilities</li> <li>• Where generators are necessary, avoidance of oversizing of generators for plant and temporary buildings.</li> <li>• Nominate individuals with responsibility for site energy management.</li> <li>• Use of hybrid or electric plant.</li> <li>•</li> </ul>
	Water use	Construction phase water consumption would be minimised through use of water efficient sanitaryware and initiatives such as rainwater harvesting.

## Scheme Design and Mitigation of Operational Effects

10.4.6 Mitigation measures that would be implemented to reduce GHG emissions arising from the operational phase of the proposed Development are presented in Table 10-8. Though certain emissions have been excluded from GHG calculations, for example emissions from energy used to operate the station, mitigation measures for these have been included in this section.

Table 10-8 GHG emissions mitigation measures during the operational phase

Stages and Sub-stages of Lifecycle		Mitigation Measures
Product stage	Materials resources	Reduction of material resources in accordance with the mitigation measures outlined in Chapter 14: Materials and Waste.  Where feasible, design for end of component reuse and durability, so minimise energy resource required for maintenance and recycled/reprocessing materials
Use of infrastructure	Operation of the station	Reducing GHG emissions by encouraging and facilitating public transport use and increasing the awareness of additional cycling and walking options. Approximately 1,000 cycling parking spaces will be provided.
	Operational energy use	Operational energy use would be minimised by designing for use of low energy lighting and traffic management systems, specification of controls that minimise on-time, and use of low carbon energy sources, where practicable. This will include adopting a 'fabric first' approach to building design to maximise the performance of the components and materials. Additionally, a low carbon and renewable energy provision for electricity and/or heating and cooling can be designed for the proposed Development, which would help to minimise its GHG emissions.
	Transport	The proposed Development supports the medium to long term direction for a shift away from private car use to public transport. Employees would be encouraged to travel by bus, rail, cycling and walking.  Provision for cycling infrastructure/storage that will promote zero-emission journeys to and from the station.
	Production of operational waste	Measures that would be incorporated into the design to reduce waste include the design of adequate waste segregation provision for internal and external waste storage.

## 10.5 Assessment of Residual and Cumulative Effects

### Introduction

10.5.1 This section presents the assessment of residual effects on climate resulting from GHG emissions arising from the construction and operational phases of the proposed Development. The assessment has been based on a comparison between the future baseline scenario (do minimum) with the 'do something' with embedded mitigation measures scenario.

### Residual Effects from Construction

#### Materials Resources

*Within the sub-stages of life cycle presented in*

10.5.2 Table 10-7, the embodied carbon associated with the use of material resources is the biggest contributor to the GHG emissions arising from the construction phase of the proposed Development. Material resources such as steel and concrete can have high embodied carbon

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contents (depending on the specifications and energy used in their production). The assessment has reviewed the materials proposed to be used (refer to Chapter 14: Materials and Waste) and calculated the associated embodied carbon emissions from their production, as well as their transport to site.

- 10.5.3 An estimated list of key material resources is presented in Chapter 14: Materials and Waste. This has been used in the RCT to calculate embodied carbon presented in Table 10-9. All key material resources have been categorised according to the types and subtypes specified in the ICE Database (Ref 10.18). Where in-depth information was not available, assumptions based on industry standards and professional judgement were made regarding the materials in order to obtain a carbon emission factor.

Table 10-9 Estimated construction material resources quantities and associated GHG emissions values

Key Material Resources		Estimated Quantities of Key Material Resources (tonnes)	Carbon Emission Factor (kg CO <sub>2</sub> e/kg)	Estimated GHG Emissions (tCO <sub>2</sub> e)
Bricks		779	0.213	166
Concrete		131,432	0.159	20,898
Inert		61,551	0.024	1477
Insulation materials (non-hazardous)		30	1.97	59
Metals		6,756	1.99	13,445
Plasterboard / Gypsum		578	0.39	226
Plastic (excluding packaging waste)		1,438	3.31	4,760
Timber		7,042	0.493	3,472
Bituminous mixtures (non-hazardous e.g. asphalt)		7,506	0.49	3,678
Packaging	Plastic	137.366	3.31	455
	Tin	137.366	14.47	1,988
	Timber	137.366	0.493	68
	Paper	137.366	1.37	188
<b>Total</b>				<b>50,878</b>

- 10.5.4 Material resources used for the proposed Development are estimated to contribute approximately 50,878 tonnes of CO<sub>2</sub>e.

### Transport of Material Resources

- 10.5.5 The means of transportation has not been identified at this stage of the development. Based on professional judgement and previous EIAs, it has been assumed that required key material resources for the construction of the proposed Development would be imported by road and

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that the following option ‘articulated HGV (3.3-33 tonne capacity)’ would be most applicable for use within the RCT (Appendix 10.1). Additionally, at the current stage of the proposed Development the source of all material resources is not known. It has therefore been assumed that, where feasible, materials would be sourced from suppliers within a worst-case maximum distance of 200 km per trip (one way) from the site boundary.

## 10.5.6

10.5.7 Table 10-10 shows key material resources quantities and associated carbon emissions associated with the transportation of the key material resources used for the construction of the proposed Development. The estimated carbon emissions from the transport of material resources has been calculated using the RCT to be approximately 4,808 tCO<sub>2</sub>e.

Table 10-10 Estimated GHG emissions from transport of material resources

Key Transport of Material Resources	Estimated Quantities of Key Material Resources (tonnes)	Carbon Emission Factor		Estimated GHG Emissions (tCO <sub>2</sub> e)
		Load level 100% (kg CO <sub>2</sub> e / tonne km)	Load level 0% (kg CO <sub>2</sub> e / vehicle km)	
Bricks	779	0.07723	0.64923	17
Concrete	131,432	0.07723	0.64923	2,908
Inert	61,551	0.07723	0.64923	1,374
Insulation materials (non-hazardous)	30	0.07723	0.64923	5
Metals	6,756	0.07723	0.64923	151
Plasterboard / Gypsum	578	0.07723	0.64923	13
Plastic (excluding packaging waste)	1,438	0.07723	0.64923	30
Timber	7,042	0.07723	0.64923	145
Bituminous mixtures (non-hazardous e.g. asphalt)	7,506	0.07723	0.64923	155
Packaging	549	0.07723	0.64923	11
<b>Total</b>				<b>4,808</b>

**Waste**

10.5.8 The disposal and associated transportation of waste from the construction site also has the potential to contribute to the total GHG emissions from the construction phase due to the combustion of hydrocarbons in transport and energy production.

10.5.9 Table 10-11 details the GHG emissions arising from resource waste.

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10.5.10 The portion of waste arising sent to landfill or diverted for recycling or recovery differs between waste type, in line with estimates made in Chapter 14: Material and Waste as outlined in Chapter 14: Materials and Waste. Emission factors are embedded within the RCT (Appendix 10.1).

Table 10-11 Estimated construction waste quantities and associated GHG emissions values

Key Waste Streams	Estimated Quantities of Waste (tonnes)	Carbon Emission Factor (kg CO <sub>2</sub> e/tonne)		Estimated GHG Emissions (tCO <sub>2</sub> e)
		Landfill	Diversion from landfill	
Bricks	156	0	1.019	0.159
Concrete	5,257	0	1.019	5.358
Inert	15,755	0	1.019	16.058
Insulation materials (non hazardous)	4.524	0	1.019	0.004
Metals	203	0	1.019	0.207
Packaging materials	137	0	1.370	0.188
Plasterboard / Gypsum	130	0	21.384	2.783
Plastic (excluding packaging waste)	144	0	21.384	3.075
Timber	704	0	21.384	15.059
Canteen/Office/Adhoc waste	101	586.53	0	59.230
Bituminous mixtures (non hazardous e.g. asphalt)	376	0	1.019	0.382
Other waste	509	0	1.370	0.698
Mixed construction and/or demolition waste	2337	0	1.370	3.202
<b>Total</b>				<b>106.403</b>

10.5.11 Total waste arising from the proposed Development is projected to account for approximately 106.4 tonnes of CO<sub>2</sub>e.

### Transport of Waste



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10.5.12 It is intended that waste arisings from the construction of the proposed Development would be removed from site by articulated HGV's (3.3-33 tonne capacity). At the current stage of the proposed Development the destination of all estimated waste quantities has not been determined. It has therefore been assumed that, where feasible, waste would be delivered to waste management facilities within a worst-case maximum distance of 100 km per trip (one way) from the construction Site boundary. Table 10-12 details emissions from the transport of waste.

Table 10-12 Estimated GHG emissions from transport of waste

Key Transport of Waste Resources	Estimated Quantities of Key Material Resources (tonnes)	Carbon Emission Factor		Estimated GHG Emissions (tCO <sub>2</sub> e)
		Load level 100% (kg CO <sub>2</sub> e / tonne km)	Load level 0% (kg CO <sub>2</sub> e / vehicle km)	
Bricks	155.893	0.07723	0.64923	1.594
Concrete	5257.266	0.07723	0.64923	53.716
Inert	15,755.128	0.07723	0.64923	148.750
Insulation materials (non hazardous)	4.524	0.07723	0.64923	2.697
Metals	202.684	0.07723	0.64923	2.669
Packaging materials	137.366	0.07723	0.64923	2.489
Plasterboard / Gypsum	130.122	0.07723	0.64923	2.563
Plastic (excluding packaging waste)	143.803	0.07723	0.64923	2.084
Timber	704.217	0.07723	0.64923	13.684
Canteen/Office/Adhoc waste	100.984	0.07723	0.64923	1.364
Bituminous mixtures (non-hazardous e.g. asphalt)	375.278	0.07723	0.64923	4.846
Other waste	509.410	0.07723	0.64923	6.596
Mixed construction and/or demolition waste	2,337.100	0.07723	0.64923	26.489
<b>Total</b>				<b>269.542</b>

**Plant & Equipment**

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- 10.5.13 Construction activities would also contribute to GHG emissions due to the associated plant and equipment use, which requires electricity and fuel consumption. Onsite plant and equipment that would likely be utilised during the construction phase may include scrapers, dozers, 360° excavators, backhoe loaders, dumpers, dump trucks, rollers and compressors.
- 10.5.14 Floodlight and security lighting associated with temporary car parking areas for workers, secure compounds and any perimeter fencing/hoarding and lighting required for operational purposes associated with construction when working during the late afternoon in the winter period (including light from headlamps of vehicles) would also be required. Concrete crushers / sorters / ridders would be needed to crush the concrete and sort / grade materials from demolition and excavation. Other heavy equipment may also be required during the construction of buildings including lifting plant, cranes and forklift trucks.
- 10.5.15 As the precise details of the nature and quantity of plant and machinery for the construction of the proposed Development are unknown at this stage the industry benchmark for onsite energy use, published by Construction Industry Training Board (CITB) (Ref 10.24), has been used to calculate the onsite GHG emissions based on typical energy usage quantity per project value. CITB have provided KPIs for the Construction Process Performance for Energy Use since 2003, with the most recent year (2018) stating the median energy use is 370kgCO<sub>2</sub>/£100,000 project value. Once the project value was applied and data transposed from kgCO<sub>2</sub> to tCO<sub>2</sub>e, the GHG emissions from the energy use required to operate plant and equipment have been estimated to be 892.19 tCO<sub>2</sub>e.

**Water use**

- 10.5.16 Water will also be required during construction phase and would have associated GHG emissions due to the indirect impact of using mains water, or the direct impact of the road transport of water. The construction site would be located within close proximity to water utilities and potable water needs would be met through a mains water connection. Therefore, it is assumed that no water would be transported by road or abstracted.
- 10.5.17 The volume of water that may be required for the construction of the proposed Development is currently unknown, therefore the industry benchmark for fresh water, published by CITB (Ref 10.24) has been used to make an estimate of the GHG emissions arising from the use of water onsite, based on typical water usage quantity per project value. CITB have provided KPIs for the Construction Process Performance for Mains Water Use since 2003, with the most recent year (2018) stating the median water use is 5.8m<sup>3</sup>/£100,000 project value. Once the project value was applied, it has been estimated that approximately 11,310 m<sup>3</sup> of water would be utilised, which represents an equivalent of 3.89 tCO<sub>2</sub>e.

**Transport (commuting)**

- 10.5.18 The GHG emissions associated the site workers travelling to site (commuting) has been estimated using Environment Agency's Embodied Carbon calculator (Ref 10.25). The proposed Development is categorised as a 'Very Large' construction project within the calculator, and consequently a GHG emission factor of 1.9 tCO<sub>2</sub>e/week is applied to provide estimated total GHG emissions of 293.12 tCO<sub>2</sub>e.

**Summary**

- 10.5.19 Table 10-13 contains the breakdown and comparison of emissions from each assessed activity during the construction phase of the proposed Development.

*Table 10-13 Estimated GHG emissions breakdown by sub-stage of lifecycle of the construction phase*

Sub-stages of lifecycle	Estimated emissions (tCO <sub>2</sub> e)	Construction phase emissions (%)
Material resources	50,878.209	88.9%

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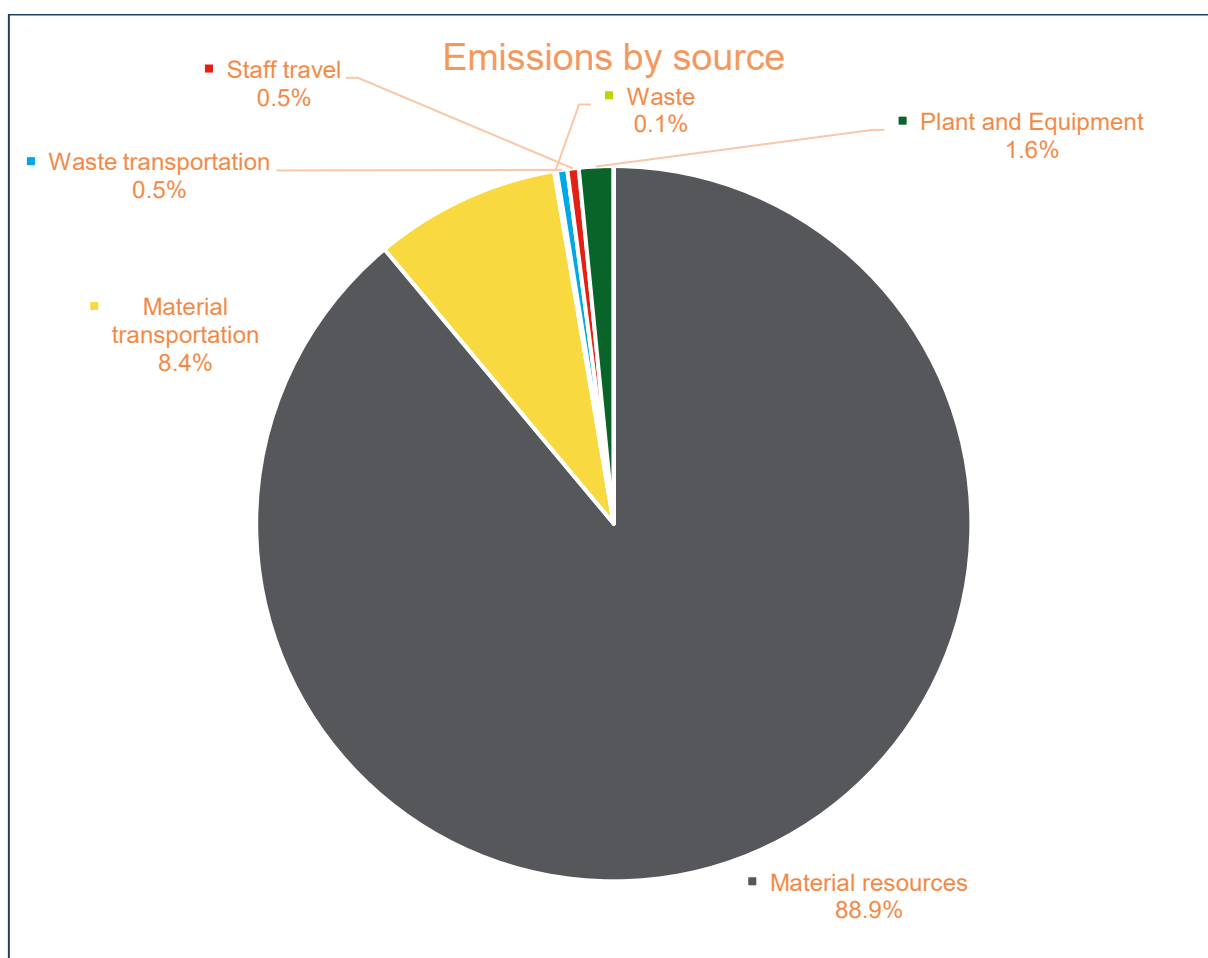
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Sub-stages of lifecycle	Estimated emissions (tCO <sub>2</sub> e)	Construction phase emissions (%)
Transport of material resources	4,808.495	8.4%
Disposal of waste	106.403	0.1%
Transport of waste	269.542	0.5%
Transport (commuting)	293.12	0.5%
Plant and equipment	892.19	1.6%
Water demand	3.89	0.01%
<b>Total</b>	<b>57,2521.85</b>	<b>100%</b>

10.5.20 Material resources are expected to contribute the majority of GHG emissions throughout construction of the proposed Development, at approximately 89%.

10.5.21 Figure 10-1 presents a breakdown of GHG emissions from the construction phase of the proposed Development.

Figure 10-1 GHG Emissions expected to be produced in the construction phase by source



## Residual Effects from Operation

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The GHG emissions associated with Land use change in the proposed Development were estimated using data from Defra report for Land Use, Land Use Change and Forestry (LULUCF) (Ref 10.26). The report presents a summary of the net emissions and removals of greenhouse gases by the Land Use, Land Use Change and Forestry sector of the UNFCCC National Inventory for England, and this data was extrapolated to assess GHG emissions from land use change for the proposed Development. Land use change is expected to produce negative carbon emissions of -0.23 tCO<sub>2</sub>e per year for the operational phase of the proposed Development. Woodland and grassland are expected to be removed and replaced or reinstated after completion of the works. Site clearance, for example the removal of vegetation for replacement with another land use, would result in losses of carbon sinks, i.e. removal of a natural environment that has the ability to absorb GHG emissions. With landscape planting in place, the loss of carbon sinks associated with site clearance is estimated to be balanced out by the carbon sink gain from such landscape planting and the existing natural environment.

10.5.22 Projected GHG emissions from a shifting in traffic patterns have been produced under a Do Minimum scenario compared to a scenario where the development goes ahead (Do Something). GHG emissions have been calculated using TAG GHG emissions workbook (ref 10.27), which uses Defra's Emission Factor Toolkit version 10.1 to forecast the mix of vehicles (petrol/diesel/electric) in the fleet and engine fuel efficiency for 2031 compared to 2019 base year. These emissions have been assessed in the Fully Operational Year (2031) when passenger numbers are anticipated to be at higher levels (due to the anticipated full build out of the CBC and housing growth).

*Table 10-14 Operational carbon tCO<sub>2</sub>e expected to be produced from the TAG workbook*

Reporting Category	Baseline Year (2019)	Fully Operational Year (2031)
Do Minimum	12,572.57	12,281.25
Do Something	12,572.57	12,132.63
Variation ('Do Something' – 'Do Minimum')	-	-148.62

10.5.23 The future baseline conditions for the 'Without proposed Development' ('Do Minimum') scenario have been identified based on the modelling volumes of traffic currently on the study area for 2031 (fully operational year).

10.5.24 GHG emissions associated with the use (including transport required for maintenance) of the transport network ('Do Minimum' scenario) were estimated to be 12,281.25 tCO<sub>2</sub>e for the 2031 fully operational year.

10.5.25 The future baseline years predict a reduction in the GHG emissions associated with transport when compared to the existing emissions taken from the base year of the traffic model. Comparisons between the baseline year (2019) the fully operational year 2031 indicates a reduction of 291.32tCO<sub>2</sub>e in the 'Do Minimum' scenario compared to the baseline year.

10.5.26 While emissions are anticipated to reduce from the baseline year to the fully operational year in a 'Do Minimum' scenario (reduction of 291.32 tCO<sub>2</sub>e), emission reductions are expected to be greater with the proposed Development going ahead (reduction of 439.94 tCO<sub>2</sub>e). The reduction in both scenarios can be attributed to a reduction in GHG emissions factors for vehicles over the years as a result of electrification of the fleet and improved efficiency standards. The lower GHG emissions in the 'Do Something' scenario can be attributed to lower number of vehicles on the roads as a result of utilisation of the proposed Development.

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10.5.27 In addition to the local traffic pattern mode, we have undertaken a high-level assessment of the impact from GHG emissions from the reduced car mileage as a result of the new station being used for travel instead. This considers the traffic generated by the station (inclusive of taxi and passenger drop-off trips) and the predicted reduction of vehicle trips due to the station providing an alternative means to travelling via car. The GHG emissions are calculated using the Defra emission factors for an average car, taking into account conservative projections of emissions factors to ensure GHG emission reduction is a reasonable worst-case scenario. The reduced GHG emissions from the reduction of car trips and mileage from the use of the station was estimated to be 906.82 tCO<sub>2</sub>e for Fully Operational Year (2031). This was not included in the main analysis due to overlapping model content and risk of double counting.

Table 10-15 Estimated GHG emissions breakdown by sub-stage of lifecycle of the operational phase

Sub-stages of lifecycle	Estimated emissions (tCO <sub>2</sub> e/year)	Operational phase emissions (%)
Rail user (traffic model)	-439.94	0.05%
Land use change	-0.23	99.95%
Total	-440.17	100%

10.5.28 The GHG emissions estimated from the operational phase of the station show a net reduction in GHG emissions each year. Estimations do not include GHG emissions from utilities, maintenance and refurbishment activities during the operation of the station as outlined in the 'Methodology for Assessing Impacts' section of this chapter. Such calculations will be undertaken at detailed design stage once robust data is available. Nevertheless, it should be noted that these activities would require minimal energy and as such the associated GHG emissions would not change the 'Not Significant' conclusion of the Residual Effect of the proposed Development.

## Comparison against relevant UK carbon budget

10.5.29 The peak construction phase of the proposed Development is expected to take place between 2023 – 2025, incorporating the 4<sup>th</sup> Carbon Budget (2023 to 2027), so GHG emissions from construction phase has been compared against the 4<sup>th</sup> Carbon Budget. Annual operational phase of the proposed Development has been calculated for the years against each carbon budget – including the proposed 6<sup>th</sup> carbon budget – therefore GHG emissions from the operational phase was calculated against the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Carbon Budget.

Table 10-16 Comparison against the UK Carbon Budgets.

Carbon Budget	Carbon Budget Emissions tCO <sub>2</sub> e	Construction phase - Proposed Development GHG emissions over carbon budget tCO <sub>2</sub> e	Percentage of carbon budget	Operational phase - Proposed Development GHG emissions over carbon budget CO <sub>2</sub> e	Percentage of carbon budget
4th carbon budget (2023 – 2027)	1,950,000,000	57,251.85	0.0000293%	-880	-0.000045%

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5th carbon budget (2028 - 2032)	1,725,000,000	-	-	-2,200	-0.000128%
6th carbon budget (2033 - 2037)	965,000,000	-	-	-2,201	-0.000228%

10.5.30 The construction phase of the proposed Development is expected to produce 0.00003% of the GHG emissions permitted within the 4<sup>th</sup> carbon budget, whilst the operational phase is expected to produce -0.000045%, -0.000128% and -0.000228% of GHG emissions permitted within the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> carbon budgets respectively. Consequently, the proposed Development would not have a material impact on the ability of Government to meet its carbon reduction targets. The overall residual effect is therefore **Not Significant**.

## Cumulative Effects

10.5.31 Cumulative effects of the proposed Development can occur as a result of interrelationships between different environmental topics, which are referred to as 'intra-project effects'. For climate, interrelationships are identified with Chapter 8: Biodiversity, Chapter 14: Materials and Waste and Chapter 17: Transport. However, these interrelationships do not result in a cumulative effect for the GHG emissions impact assessment as the effects of all GHG emissions presented within this assessment are essentially cumulative. In addition to intra-project effects, the inter-project cumulative impacts can also occur due to the proposed Development in combination with other existing and/or approved projects. The effects of all GHG emissions from all areas of the UK are essentially cumulative. Emissions from human activities across the UK contribute to the overall effect on climate in the UK, and therefore local emissions form only a minor proportion. For this reason, the impact of the proposed Development has been considered in the context of overall GHG emissions from the UK, rather than in combination with other local projects, by comparing the estimated proposed Development's GHG emissions with UK carbon budgets. Indeed, the GHG emissions from other local schemes in operation are likely to generate similarly minor emissions in comparison to UK carbon budgets.

## 10.6 Assessment Summary

- 10.6.1 The assessment of GHG emission during construction and operation of the proposed Development have been undertaken in accordance with IEMA Guidance. The GHG emissions impacts assessment considered the potential for effects of the proposed Development on climate by quantifying likely emissions of GHG to the earth's atmosphere, during the construction and operation phases.
- 10.6.2 Throughout the proposed Development's construction and operation, there is commitment to reduce emissions wherever practicable to support the UK Government in meeting its carbon reduction targets.
- 10.6.3 Emissions arising as a result of the proposed Development represent less than 0.00003% of total emissions in any five-year carbon budget during which they arise. In this context, it is concluded that the GHG impact of the proposed Development would not have a material impact on carbon reduction targets as set by the UK Government, and the overall residual effect is therefore **Not Significant**.

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## 10.7 References

Reference	Title
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Ref 10.2	EU Directive on Environmental Impact Assessment (EIA) (Directive 2014/52/EU), 2017 (as amended)
Ref 10.3	Climate Change Act 2008, Committee on Climate Change, 2008 Available online: <a href="https://www.legislation.gov.uk/ukpga/2008/27/contents">https://www.legislation.gov.uk/ukpga/2008/27/contents</a>
Ref 10.4	Committee on Climate Change (CCC) Sixth Carbon Budget, 2020 Available online: <a href="https://www.theccc.org.uk/publication/sixth-carbon-budget/">https://www.theccc.org.uk/publication/sixth-carbon-budget/</a>
Ref 10.5	HMSO, National Planning Policy Framework, 2019 Available online: <a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf</a>
Ref 10.6	Greater Cambridge Shared Planning, Greater Cambridge Sustainable Design and Construction Supplementary Planning Guidance, 2020
Ref 10.7	South Cambridgeshire Zero Carbon Strategy, May 2020
Ref 10.8	Network Rail Sustainable Development Strategy Our vision and strategy: A railway fit for the future 2013 – 2024, Document Ref: SBPT204
Ref 10.9	Network Rail Environmental Sustainability Strategy 2020-2050
Ref 10.10	Network Rail Traction Decarbonisation Network Strategy, 2020
Ref 10.11	Capital Carbon Guidance Note, 2018. Document Ref: NR/GN/ESD07
Ref 10.12	Rail Safety and Standards Board (RSSB) Rail Carbon Tool (RCT), 2021 Available online: <a href="https://www.rssb.co.uk/en/sustainability/rail-carbon-tool">https://www.rssb.co.uk/en/sustainability/rail-carbon-tool</a>
Ref 10.13	Operational Carbon Guidance Note, Document Ref: NR/GN/ESD08
Ref 10.14	Publicly Available Specification (PAS) 2080:2016 Carbon Management in Infrastructure, 2016
Ref 10.15	GHG Protocol, World Resources Institute (WRI) and World Business Council on Sustainable Development, 2004
Ref 10.16	Inventory of Carbon and Energy (ICE) Database v.2, 2011 Inventory of Carbon and Energy (ICE) Database v.3, 2019 Available to download: <a href="https://circularecology.com/embodied-carbon-footprint-database.html">https://circularecology.com/embodied-carbon-footprint-database.html</a>
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Reference	Title
Ref 10.18	Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance, 2017
Ref 10.19	Department for Transport's Appraisal and Modelling Strategy: A route map for updating TAG during uncertain times, 2020  Available online: <a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/951075/tag-route-map-2020.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/951075/tag-route-map-2020.pdf</a>
Ref 10.20	Department for Business and the Energy and Industrial Strategy (BEIS) Final UK greenhouse gas emissions national statistics, 2021  Available online: <a href="https://data.gov.uk/dataset/9568363e-57e5-4c33-9e00-31dc528fcc5a/final-uk-greenhouse-gas-emissions-national-statistics">https://data.gov.uk/dataset/9568363e-57e5-4c33-9e00-31dc528fcc5a/final-uk-greenhouse-gas-emissions-national-statistics</a>
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Ref 10.22	National Statistics, UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018, 2020  Available online: <a href="https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2018">https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2018</a>
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Ref 10.27	Emissions Factors Toolkit (defra.gov.uk)  Available online: Emissions Factors Toolkit (defra.gov.uk)





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Environmental Statement – Volume 2: Chapter 11 – Cultural Heritage



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 11 – Cultural Heritage**

JUNE 2021



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## 11 Cultural Heritage

### 11.1 Introduction

- 11.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to Cultural Heritage. This encompasses both below ground and above ground heritage assets such as archaeological deposits and historic buildings respectively. This also includes the settings of heritage assets which are the surroundings in which a heritage asset is experienced.
- 11.1.2 The assessment incorporates relevant design and other mitigation measures that would be employed during construction of the proposed Development.

### Relevant Aspects of the Proposed Development

- 11.1.3 A description of the proposed Development is provided in Chapter 4 of the ES. Specific aspects of the proposed Development that relate to Cultural Heritage are detailed in the subsequent sections in this Chapter. There are several heritage assets that will be affected by the proposed Development, predominantly below ground archaeological assets dating from the Bronze Age to the Roman period which will be physically impacted, and nearby Listed Buildings which will experience some minor changes within their settings.

#### Construction Phase

- 11.1.4 Construction activities which have the potential to impact heritage assets may include:
- Ground intrusive works which have the potential to truncate or remove known or unknown below ground archaeological deposits; and
  - Above ground construction works which cause detrimental changes within the setting of above or below ground heritage assets.
- 11.1.5 The impacts of the construction phase to historic landscape, including conservation areas, will also be considered and assessed.

#### Operational Phase

- 11.1.6 Operational activities which have the potential to impact heritage assets may include:
- Visual impact of the proposed Development causing change within the setting of nearby heritage assets and historic landscapes.

## 11.2 Assessment Methodology

### Legislation, Policy and Guidance

- 11.2.1 This assessment has been carried out in accordance with the rules and guidance for Transport and Works Act 1992 as amended, and the policies listed below are appropriate for the assessment of Cultural Heritage.

#### Legislation

- 11.2.2 The following legislation is of relevance to the assessment:
- Town and Country Planning Act 1990 (Ref: 11.1);
  - Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref. 11.1) applies special protection to buildings and areas of special aesthetic or historic value;
    - Section 66 (1) of the act states that “In considering whether to grant planning permission for development which affects a Listed Building or its setting, the local planning authority or, as the case may be, the Secretary of State shall have special regard to the desirability of preserving the building or its setting or any features of special aesthetic or historic value which it possesses”.

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- Ancient Monuments and Archaeological Areas Act 1979 (Ref. 11.2) gives statutory protection to any structure, building or work which is considered to be of particular historic or archaeological value and regulates any activities which may affect such areas.

## Policy

## 11.2.1 The following policies are of relevance to the assessment:

- National Planning Policy Framework 2019 (Ref. 11.3);
- Cambridge (City Council) Local Plan (adopted October 2018) (Ref. 11.4);
  - The Cambridge Local Plan is the statutory development strategy for the Cambridge area to 2031. Chapter seven of the plan relates to the Protection and Enhancement of the Character of Cambridge. In particular, Policy 61 contains advice regarding the 'Conservation and enhancement of Cambridge's historic environment'
- South Cambridgeshire Local Plan (adopted September 2018) (11.5);
  - The Local Plan's policies and proposals cover the period 2011 to 2031. Chapter six entitled Protecting and Enhancing the Natural and Historic Environment contains Policy NH/14 "Heritage Assets."
- Cambridge Southern Fringe Area Action Plan; Development Plan Document (DPD) (adopted February 2008) (Ref. 11.6); and
  - Cambridge Southern Fringe Area Action Plan forms part of the Development Plan for South Cambridgeshire. Chapter D Trumpington West contains subsection D8 on Archaeology and Heritage. This section lays out the following objectives:
    - D8/a To develop an appropriate archaeological strategy which mitigates any adverse effects of the development on the archaeological resource.
- Emerging Greater Cambridge Local Plan (Ref 11.7)
  - Cambridge City Council and South Cambridgeshire District Council are preparing a joint Local Plan for their combined districts (Greater Cambridge) as set out in the adopted Greater Cambridge Local Development Scheme. A full draft of the Local Plan has yet to be published.

## Guidance

## 11.2.2 The assessment would be undertaken with regard to all relevant industry guidance, including the following:

- The National Planning Practice Guidance (NPPG), Department for Communities and Local Government (DCLG 2019) offered by the Government to support the NPPF (Ref. 11.X)
- International Council on Monuments and Sites (ICOMOS) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011) (Ref. 11.8);
- Chartered Institute for Archaeologists (CIfA) 'Code of conduct' (2019) (Ref. 11.9), 'Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment' (2014) (Ref. 11.10); and 'Standard and guidance for historic environment desk-based assessment' (2017) (Ref. 11.11)
- Historic England's 'Managing Significance in Decision-Taking in the Historic Environment, Historic Environment Good Practice Advice in Planning Note 2' (henceforth referred to as 'GPA2'): (2015) (Ref. 11.12);
- Historic England's 'The Setting of Heritage Assets, Historic Environment Good Practice Advice in Planning Note 3' (henceforth, 'GPA3') (2017) (Ref. 11.13). This document sets out guidance on managing change within the settings of heritage assets, including archaeological remains, historic buildings, sites, areas and landscapes;
- Historic England's 'Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment' which sets out guidance on assessing and articulating the significance of heritage assets' (2008) (Ref. 11.14); and

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- Network Rail's standard on Heritage Care and Development (Ref. 11.17)

11.2.3 In November 2017, Historic England proposed changes to Conservation Principles (2017 consultation draft) (Ref. 11.15), the consultation for which concluded in 2018. A timetable for the publishing of the updated guidance has not yet been announced. These changes predominantly relate to the terminology used when assessing the interest and value of heritage assets and would not affect the conclusions and recommendations made in this Chapter.

## Consultation and Scoping

### Consultation

11.2.4 **Error! Reference source not found.** Table 11-1 provides a summary of Consultee issues raised with respect to Cultural Heritage and how they have been addressed.

Table 11-1 Summary of Consultation

Consultee/Contact/Date		Summary of Consultee Issue	How Addressed?
Historic England (HE) and Cambridge County Council (CCoC) Historic Environment Team (HET)	March 2019	Need for notification of works that may impact upon nationally designated archaeological assets. Email Request from Network Rail for a meeting with HE	Meeting arranged for 15 <sup>th</sup> May 2019.
HE, CCoC HET, at HE office.	15 <sup>th</sup> May 2019	First meeting with HE/ HET to discuss further archaeological works including with regard to the Scheduled Monument at White Hill Farm (SM4). HE/HET highlighted importance of being kept appraised of progress of assessment works.	Agreed to keep HE/HET appraised of developments of the archaeological assessment and agreed to the recommendation of HE/HET that further archaeological investigation was required in order to make an accurate assessment.
HE and CCoC HET	6 <sup>th</sup> June 2019	Requirement from HE/HET to be kept informed; illustrative work limits site boundary and minutes of meeting on 15 <sup>th</sup> May sent. Request to HET for a brief for archaeological work with respect to scope of Desk Based Assessment (DBA).	DBA carried out in accordance with brief supplied from HET.
CCoC HET	1 <sup>st</sup> July 2020	Following response from HET on 1 <sup>st</sup> July 2020- Meeting is proposed to discuss further steps required with regard to more information needed on archaeological deposits in southern part of the proposed Development site.	Meeting arranged to be held on 4 <sup>th</sup> August 2020 to discuss these issues.
CCoC HET	4 <sup>th</sup> August 2020	More information needed on archaeological deposits in southern part of the proposed Development site.	Agreed that an intrusive archaeological investigation is required south of Addenbrooke's Road; Project team to obtain a brief from CCoC HET. Agreed with CCoC HET that no further pre-determination archaeological investigations are required north

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
		of Addenbrooke's Road due to extensive previous investigation.
HE and HET CCoC	8 <sup>th</sup> July 2020  Requirement from HE/HET to be kept informed of works progress; Historic England to respond any comments if any regarding the geophysics survey of the Scheduled Monument and advice regarding proposals for the archaeological potential of the proposed eastern and western compound. Same request for comment has been issued to CCoC HET.	HE responded on 20 <sup>th</sup> July 2020 to state that the findings were broadly accepted and note the archaeological potential of the areas immediately adjacent to the railway remains unknown. Advice from HE acknowledged and further investigative works to determine the archaeological potential of the site are planned.
HE	15 <sup>th</sup> January 2021  Meeting with HE to discuss scope of investigations within the Scheduled Monument and the application for Scheduled Monument consent.	Project team to provide additional plans of test pit areas corresponding to results from the geophysical survey.

## Scoping

11.2.5 Table 11-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to Cultural Heritage, and the corresponding location in the ES where they are addressed.

Table 11-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Historic England (HE)	HE support the current baseline data and are satisfied that the Scoping Report gives a sound basis for an EIA. HE welcome continued engagement on the scope of test pit evaluation within the scheduled monument. HE advise mitigation option which minimise impacts on the significance of remains. HE advise consideration of advice from local authority Conservation Officers and Archaeological Advisors. HE referred to comments made on the DBA relating to the any potential impacts on organic, waterlogged or geoarchaeological deposits. HE would support an approach which provides narrative discussion alongside the matrix-based approach.	Engagement with HE and the local authority has been part of the mitigation strategy in section 11.4.5  Potential impacts on organic and waterlogged deposits are addressed in section 11.4.8.  Ensuring a narrative discussion of the archaeological sequence is addressed in section 11.4.7.

## The Study Area

11.2.6 The study area for designated assets is illustrated in Figure 11.1 of Appendix 11.1 and is 1km from the proposed Development boundary. This is to ensure that potential setting impacts on designated heritage assets are adequately assessed. The designated study area has been expanded in places to incorporate sensitive or relevant features for which an assessment of the impact of the proposed Development would be relevant. This study area comprises an area of approximately 1500ha.



- 11.2.7 The study area for non-designated assets is illustrated in Figure 11.2 of Appendix 11.1 and is 500m from the proposed Development boundary. This is to ensure an adequate context for the proposed Development so that the archaeological potential can be adequately assessed. This study area comprises an area of approximately 700ha.
- 11.2.8 The size of these study areas has been selected using professional judgement, in order to provide a sufficient baseline information from which to assess the potential impacts of the proposed Development on the historic environment.

## Methodology for Establishing Baseline Conditions

- 11.2.9 A variety of sources were consulted during the preparation of this Chapter (see Section 11.7 for full list of sources, references, and dates of access) and the DBA (Appendix 11.2) which informed this Chapter.
- The Cambridge Historic Environment Record (CHER), was consulted for data on non-designated archaeological assets and archaeological events;
  - The National Heritage List for England (NHLE) and Historic England's (HE) datasets were consulted for information on designated assets within the study area;
  - The Pastscape website, provided by HE, was also consulted for additional information on assets within the study area and the wider area;
  - The British Geological Survey website (BGS Map Viewer), for information on the prevailing geological conditions within the vicinity of the proposed Development;
  - The British Geological Survey website (BGS Map Viewer and Geoindex) for information on boreholes progressed in the study area. There was little useful data available on for the study area – information on the Addenbrooke's Access Road boreholes (including two progressed at Nine Wells Nature Reserve) and for the various Addenbrooke's Sites are restricted access;
  - The CCoC website was consulted for updated information on planning policy;
  - A variety of archaeological reports, monographs and unpublished archaeological reports were consulted for information on existing archaeological conditions within the wider area; and
  - Historic cartographic sources including historic OS maps.
- 11.2.10 Full aerial photographic and LiDAR analysis has not been carried out for this assessment but has been requested by consultees. This is because it is considered to have limited usefulness due to the fragmentary nature of the study area, and the high levels of modern and archaeological disturbance. However, a review of previous aerial photographic assessments for large parts of the study area has been undertaken. The extent of previous intrusive archaeological investigations has provided more detailed information than any future aerial photographic assessment would be capable of. The areas of the site which have had no intrusive archaeological investigations, the area south of Addenbrooke's Road, have been subject to a geophysical survey in 2020. This survey has confirmed that this is an area of high archaeological potential. This was further confirmed by a trial trench evaluation in April 2021, which was designed following consultation with HE and CCoC HET. The trial trenching was carried out under supervision of the consultees and the approved Written Scheme of Investigation. This dedicated and detailed investigation has provided far more detailed and useful information for the purposes of determining the extent of the archaeological resource and recommending appropriate mitigation than LiDAR analysis alone would provide.
- 11.2.11 An initial site visit was undertaken on the 5<sup>th</sup> February 2019 as part of the baseline assessment. A full walkover survey was conducted on the 19<sup>th</sup> and 20<sup>th</sup> August 2019 using data provided from the Cambridge HER and HE, along with historic maps and OS mapping. The area of the proposed Development boundary and study area was assessed using public footpaths, public highways and publicly permissive footpaths.

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11.2.12 The purpose of the site visit and walkover survey was to assess the setting of historic assets, views to and from historic assets, and the archaeological and landscape conditions across the proposed Development area. In addition, modern disturbance and previously unknown heritage assets were noted during the site visit, which are discussed below.

## Forecasting the Future Baseline

11.2.13 Further investigative fieldwork, targeted on the geophysical survey results, is planned and has been defined in consultation with the County Archaeologist and HE. The fieldwork will take the form of thirteen trenches and two test pits along the north and eastern boundary of the field south of Addenbrooke's Road.

11.2.14 Without the proposed Development the heritage assets would remain unaffected and below ground archaeological deposits would remain preserved in situ, although those within arable fields may be subject to gradual erosion from ploughing.

## Defining the Importance/Sensitivity of resource

11.2.15 This assessment was undertaken using professional judgement and methodology which draws on sources of guidance such as ICOMOS guidance, the NPPF and HE's Conservation Principles, GPA2 and GPA3. ICOMOS provides guidance on assessing the value (in this case, 'heritage significance') of all heritage assets, and not just World Heritage Sites. ICOMOS also provides guidance on how to assess impacts on heritage assets using a matrix system. Using the above guidance and professional judgement, an assessment of the heritage significance of each heritage asset was made (Table 11-4). Assessment of heritage significance has been made using professional judgement and reference to the NPPF and HE guidance mentioned above.

Table 11-3 Table of Value

Value Type	Definition of Interest
Evidential value (Archaeological interest)	<p>Deriving from the potential of a place to yield evidence about past human activity.</p> <p>This is sometimes called evidential or research value. There will be archaeological interest in a heritage asset if it holds, or potentially may hold, evidence of past human activity that could be revealed through investigation at some point. Archaeological interest in this context includes above-ground structures as well as earthworks and buried or submerged remains more commonly associated with the study of archaeology.</p>
Historic value (Historic interest)	<p>Deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be illustrative or associative. A heritage asset is most commonly valued for its historic interest – because of the way in which it can illustrate the story of past events, people, and aspects of life (illustrative value, or interest).</p> <p>Historic value also includes communal interest which derives from the meanings of a place for the people who relate to 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 but tend to have added and specific aspects. Communal value is not the same as Community Value which places value on a heritage asset due to its functional use as a place that can be used by the community.</p>
Aesthetic value (Architectural and artistic interest)	<p>The sensory and intellectual stimulation we derive from a heritage asset dictates its aesthetic value, which can be the result of conscious design, including artistic endeavour or technical innovation, or the seemingly fortuitous outcome of the way in which a place has evolved and been used over time.</p> <p>Architectural interest is an interest in the art or science of the design, construction, artistry and decoration of buildings and structures of all types.</p> <p>Artistic interest is derived from the use of human imagination and skill to convey meaning through all forms of creative expression.</p>

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Value Type	Definition of Interest
Communal Value	Value deriving from the ways in which past people, events and aspects of life can be connected through a place to the present.

11.2.16 Following determination of heritage significance, an assessment of the magnitude of impact was made based upon professional judgement (Table 11-5), and guided by legislation, national policies, acknowledged standards, designations, criteria and research priorities.

11.2.17 Significance (for heritage policy) is defined in the NPPF Annex 2 as “The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic, or historic. Significance derives not only from a heritage asset’s physical presence, but also from its setting.”

Table 11-4 Table of Significance

Heritage significance	Factors Determining Heritage Significance
Very High	World Heritage Sites
	Other heritage assets of recognised international importance
	Assets that can contribute significantly to acknowledged international research objectives
High	Scheduled Monuments
	Grade I and Grade II* Listed Buildings
	Grade I and Grade II* Registered Parks and Gardens
	Non-designated assets of equivalent heritage significance to a Scheduled Monument
	Registered Battlefields
Medium	Protected Wrecks
	Grade II Listed Buildings
	Grade II Registered Parks and Gardens
	Conservation Areas
Low	Some non-designated heritage assets
	Locally listed buildings
Negligible	Assets with little heritage significance, e.g. an element of the historic environment which may not be considered of sufficient significance to be deemed a non-designated heritage asset (meriting consideration in the planning process)

11.2.18 While the values set out in Table 11-3 and Table 11-4 above give a guide for the assessment of the importance of heritage assets, these may vary based on the outcomes of research, consultation, or based on professional judgement. Variation has been based on assessment of significance, including contributions of setting, for an asset.

## Methodology for Assessing Impacts

### Impact Characterisation

11.2.19 Table 11-5 (below) sets out the criteria for assessing the magnitude of impact to heritage assets and relates to the terminology used in the ICOMOS guidance, adapted to the current legislation, policy and guidance framework, using professional judgement.

11.2.20 Potential effects from the proposed Development can include changes to the setting of assets caused by visual intrusion from the proposed Development and changes to the fabric of an asset caused by construction and by direct changes to historic landscapes. Both forms of change can form a direct impact to heritage assets. The type of interest criteria (Table 11-3) assigned to the asset will also determine the nature and extent of the effect. For example, an asset with high aesthetic interest will be affected by visual impacts more than an asset with negligible or no aesthetic interest.

Table 11-5 Magnitude of Impact

Magnitude of Impact	Example
Major	Physical change (whether direct or indirect) to a heritage asset such that its heritage significance is harmed to a large degree, very much reduced or totally removed; or  Changes to setting which result in a large or very large reduction of the heritage significance or total loss of significance of the asset.
Moderate	Physical change (whether direct or indirect) to a heritage asset such that its heritage significance is moderately reduced; or  Changes to setting that result in a moderate reduction of the heritage significance of the asset.
Minor	Physical change (whether direct or indirect) to a heritage asset such that its heritage significance is slightly reduced; or  Change to setting that slightly reduces the heritage significance of the asset.
Negligible	Physical change (whether direct or indirect) to a heritage asset such that its heritage significance is hardly reduced; or  Changes to setting that hardly reduce the heritage significance of an asset.
No Change	Physical change (whether direct or indirect) to a heritage asset such that its heritage significance is not affected;  No physical change (whether direct or indirect) to a heritage asset; or  No change, or, change within the setting of an asset which does not affect its heritage significance.

### Assessing Effect Significance

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11.2.21 Table 11-6 illustrates how information on the heritage significance of the asset and the magnitude of impact is combined to arrive at an assessment of the significance of effect arising from the proposed Development, referred to as the 'significance of effects matrix'.

Table 11-6 Significance of Effects Matrix

Heritage significance of asset	Magnitude of Impact				
	Major	Moderate	Minor	Negligible	No Change
Very high	Very large	Large or very large	Moderate/large	Slight	Neutral
High	Large or 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

11.2.22 Based on professional judgement and the guidance set out in HE's GPA 2 (Ref 8.10), a 'significant' effect is considered to be one of **moderate** significance or above and/or one where (from an adverse perspective) it can be said that an asset would experience substantial harm.

11.2.23 For the purposes of this assessment, significant adverse effects are defined as an impact which will have a direct or physical impact on the heritage asset which will result in the removal of all or most of the heritage asset, or largely alter the historic setting of the asset. Significant adverse effects therefore include:

- Direct impacts by operations which are not able to be mitigated, resulting in total or partial loss of an asset (depending on how much of the asset is lost).
- Alterations to the historic setting of an asset, through intrusions to the asset's setting, which substantially alters the understanding of the asset.
- Any operational impacts which will result in the permanent alteration to an asset's character so that it cannot be fully understood.

## Limitations and Assumptions

### Limitations

11.2.24 Due to the nature of archaeological remains, their identification and assessment necessarily requires an element of assumption. In particular, the nature, extent, survival, and even the precise location, of buried archaeological remains is often uncertain, as the majority of such sites have never been subject to archaeological investigation to modern standards. As such, assessment of the value of such sites is often heavily reliant on informed extrapolation from limited data, comparison with similar assets in similar contexts, and on professional judgement.

### Assumptions

11.2.25 Data obtained from the CCoC HERs and the NHLE consists of secondary information derived from the original sources, only some of which were directly examined during the assessment. It is assumed that all data derived from secondary sources is accurate.

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## 11.3 Baseline

### Existing Baseline

- 11.3.1 A Cultural Heritage DBA for the area of the proposed Development was produced in 2020 (Ref: 11.16) (Appendix 11.2). The DBA contains a detailed historic background, illustrations and context for the proposed Development and surrounding area. Below is a summary of the baseline data contained within the DBA. Since the DBA has been compiled, the proposed Development boundary has been altered several times. This has not altered or invalidated the results or recommendations of the DBA as the main difference is that the study area for the DBA is larger than the study area for this Chapter. A geophysical survey of part of the proposed Development was undertaken in April 2020, the report detailing the results of this survey can be found in Appendix 11.3. The results from this survey are also included in the baseline section of this report.
- 11.3.2 This section is divided into Cultural Heritage subtopics - archaeological remains, historic buildings and historic landscapes. Each sub-topic is further divided by designated and non-designated heritage assets, and by archaeological period. All heritage assets have been given Scheme ID numbers which, for ease of reference, are the same as those assigned in the DBA (Appendix 11.2). Non-designated asset Scheme IDs have no prefix, Listed Buildings have the prefix 'BH', Conservation Areas have the prefix 'CA', Scheduled Monuments have the prefix 'SM' and Registered Parks and Gardens have the prefix 'RPG'. Archaeological events (such as previous investigations) have the prefix 'EV'. For consistency and ease of reference the Scheme ID numbers for individual assets have been kept the same across the documents, despite some now no longer being within the search area due to changes in the site boundary. For this reason, assets may not be in continual numerical order.
- 11.3.3 All heritage assets are listed in the tables in the gazetteer in Appendix 11.1.

### Designated Archaeological Assets

- 11.3.4 There are 3 Scheduled Monuments within the 1km study area. These are shown on Figure 11.1 of Appendix 11.1. One of these, (**SM4**) is within the proposed Development boundary.
- 11.3.5 Scheduled Monument **SM1** Settlement NW of Little Sherford is 804m south-west of the proposed Development, **SM2** Causewayed enclosure at Great Shelford is 438m southwest of the proposed Development have been scoped out of this assessment as they are sufficiently distant to the south-west of the proposed Development and could not be subject to any direct or indirect physical impact or any changes within their settings.
- 11.3.6 **SM4** 'Site revealed by aerial photography West of White Hill Farm' is a cropmark complex of rectangular enclosures, revealed by aerial photography west of White Hill Farm. The proposed Development is located within a flat arable field, the result of regular plough activity to a depth of 0.30m. This asset is partially within the proposed Development boundary and lies between the Cambridge to London railway to the east and Hobsons Brook to the west. A walkover survey of the site in 1989 noted slight variation in soil colour although no artefacts were recorded. Fieldwalking to the south of the monument produced animal bone and a thin scatter of oyster shell, along with ceramic fragments.
- 11.3.7 The 2020 geophysical survey has improved understanding of the SM4 monument as it detected archaeological activity, located both within the currently scheduled area as well as extending beyond the scheduled extent to the south, and also possibly to the north. The presence of buried utilities was also revealed to the north of SM4. Archaeological activity has been identified in the form of a potentially Romano-British field system consisting of multiple extended linear ditches, with some linear features corresponding with cropmarks of a former roman villa, inside the scheduled area. Along with three clearly identified rectilinear enclosures and two partial enclosures, as well as three further possible partial enclosures, the cropmarks have been interpreted as an Iron Age to Roman period settlement. An area of regular linear anomalies has been identified in the northwest area of the monument together with the lines of known buried services. Fieldwalking (EV17) identified finds from the 1st and 4th centuries, confirming the Romano-British date, although no Iron Age finds have been found. The 2021



Archaeological Evaluation carried out by Cambridge Archaeological Unit (CAU) took place in the areas surrounding the Scheduled Monument but not within SM4 itself. The results of the investigation are summarised in paragraph 11.3.19 and the full excavation report is in Appendix 11.4. The monument's setting to the west has been considerably changed by the recently developed Scotsdale garden centre, greenhouses and houses. To the east the Cambridge to London railway has also considerably changed its setting and views east across to White Hill. The asset has historic and evidential interest for its potential to yield further information on the Prehistoric and Roman settlement of the area. It has group value as it forms part of a multi-period landscape. It is of high value, as reflected by its nationally designated status.

### Non-Designated Archaeological Assets

- 11.3.8 There are 216 non-designated archaeological records within the 500m study area. Of these, 17 records are partially or wholly within the proposed Development boundary.
- 11.3.9 Archaeological investigations associated with nearby development of the Cambridge Biomedical Campus has taken place within the proposed Development boundary in 2008 and the wider study area since 2000. A total of 110 events (previous archaeological investigations) are recorded on the CHER in the 500m study area. All archaeological events are shown on Figure 11.3 of Appendix 11.1 and display the extent of past investigations. A large proportion of the land within the study area has been subject to intrusive archaeological investigation, namely excavation and evaluation trial trenching. In summary, the following areas have previously been subject to intense archaeological study:
- Clay Farm and the land including the housing estate immediately to the north of Addenbrooke's Road. This area has now been developed and encompasses what is now Hobson's Park Nature Reserve;
  - The Addenbrooke's Road;
  - Addenbrooke's Hospital site (including Cambridge Biomedical Campus, the multi-storey carpark, Hutchinsons site and the Royal Papworth Hospital);
  - Cambridgeshire Guided Busway;
  - Granham's Farm and the land to the northwest and northeast; and
  - At the junction of Hills Road and the railway line.
- 11.3.10 The results and data from these investigations has been incorporated into the baseline within the DBA (Appendix 11.2) and the summary below. They have also been considered in assessments of archaeological potential and informed recommendations for future archaeological assessment. The asset locations are illustrated with their Project IDs on Figure 11.2 of Appendix 11.1.

#### Prehistoric Period (30,000BC – 600BC) See DBA Section 6.4.1

- 11.3.11 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development. **152, 150, 76, 20, 14, 157, 71, 52, 54, 158, 146, 94, 91, 74, 24, 219, 106, 137, 99, 228, 214, 156, 82, 95, 210, 18, 30, 38, 40, 42, 36, 27, 37, 41, 39, 236.**
- 11.3.12 The following assets would not be subject to any direct or indirect impact from the proposed Development and have therefore been scoped out: **151, 186, 209.**
- 11.3.13 The Prehistoric period is well represented in the archaeological record in the study area. Mesolithic and Neolithic finds and features have been identified across the study area. A number of later Prehistoric settlement sites have also been identified close to the proposed Development, particularly to the south of Long Road. These multi-period sites indicate continuous settlement activity, typically from the late Bronze Age through to the Iron Age.
- 11.3.14 The geological sand and gravel deposits of the Middle Cam Valley, within which the proposed Development lies, have demonstrated potential to contain prehistoric archaeological and/or palaeoenvironmental remains, especially Palaeolithic material. These include organic remains which would be able to provide valuable information about past environments, landscapes and



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human activities. Should these deposits be present they would be of archaeological interest. They would be of **medium** value as they would contribute toward the future research topics set out in the Regional Research Framework relating to the Palaeolithic.

- 11.3.15 Middle Bronze Age features (**102**) were found during an archaeological evaluation in Hobson's Brook Nature Reserve, west of the railway line and within the proposed Development boundary. Evidence from the Prehistoric to Post Medieval period was produced from several ditches and pits. This asset has historic and archaeological interest, as it may hold further information on Prehistoric activity and settlement west of the railway line. It is of **low** value.
- 11.3.16 Undated cropmark enclosures (**11**) have been identified immediately to the west of the railway line, in Hobson's Park Nature Reserve. Investigations have revealed a series of features which appear to be stock enclosures rather than drainage ditches but the CHER records them as undated. These cropmarks appear to be a continuation of the ones to the north-east. They are located next to Bronze Age and Romano-British features (**102, 103**) and it seems likely that these cropmarks could be contemporary. The fieldwalking in this area found flint scatters which adds weight to a Prehistoric date for these cropmarks. A judgement has been made that these are likely to be Prehistoric (or Romano-British) in date. They may pose a constraint as they are within the proposed Development boundary. The features are of archaeological interest and of potentially Medium value if they are confirmed to be of Prehistoric or Romano-British date.

Iron Age (600BC – AD43) See DBA Section 6.4.2

- 11.3.17 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development: **96, 52, 158, 54, 93, 108, 105, 137, 80, 49, 55, 145, 182**.
- 11.3.18 Iron Age settlements have been identified in several places in the study area, including at Addenbrooke's Hospital, Trumpington Meadows and Great Shelford. In most instances, these settlements appear to have been occupied throughout the Middle to Late Iron Age and into the early Roman period.
- 11.3.19 An Iron Age and Roman settlement site (**SM4**) is known from cropmarks west of White Hill Farm. Aerial photography analysis has shown that the cropmarks (**17**) extend to the south and southeast, outside of the scheduled area. The cropmarks form a pattern of rectangular enclosures. Although fieldwalking produced Roman pottery finds from the 1st and 4th century AD no definite Iron Age pottery has been found. The archaeological evaluation carried out by CAU in 2021 (full excavation report is in Appendix 11.4) was the first intrusive archaeological evaluation to investigate this feature and took place in the areas outside the Scheduled Monument (**SM4**). Targeting the results of the 2020 geophysical survey as well as sampling previously uninvestigated areas, evidence was revealed of activity from both the Bronze Age and the Roman period. As these features were located in immediate proximity on almost identical alignments, which was also the case on other excavations within the study area at Granham's Farm, it indicates a continued use of the landscape from the Bronze Age through to the Roman period. The excavation also proved that the features in the non-designated area are associated with the Scheduled Monument (**SM4**). When viewed in conjunction with the geophysical survey results it is clear that a ditch just to the south of **SM4** represents part of a trackway that formed the northern limit of a settlement attached to the southeast corner of the building complex within the scheduled area. Aerial photographs show that this trackway extended southeast for at least 1km towards Granham's Farm. The cropmarks (**17**) and the archaeological features within the area of the cropmarks are of medium value, as the evaluation has shown them to be associated with the extensive, dense activity from the Bronze Age, through the Iron Age to the Roman period, present in the wider area, including that contained within the Scheduled Monument. An archaeological evaluation (**EV13**) revealed evidence of Mid to Late Iron Age settlement (**64**) northwest of Granham's Farm (**205**) within 140m of the proposed Development boundary. Evidence included an oven, the remains of a round house and extensive field systems. A single Late Iron Age cremation was found, which may indicate the presence of a cemetery in the vicinity. The focus of the settlement was not revealed but may be in the area surrounding Granham's, or to the south. Although the evaluation concluded that the remains were concentrated along the base of the hills from Nine

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Wells to Hinton Way, on the eastern edge of the study area. However, as many of the remains extended across field boundaries, it is possible that the asset extends into the proposed Development boundary. This asset has historic and archaeological interest and is of Medium value.

Roman Period (AD43 – 410) See DBA Section 6.4.3

- 11.3.20 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development: **22, 23, 61, 62, 85, 150, 21, 31, 45, 72, 14, 33, 35, 29, 34, 32, 46, 68, 212, 216, 213, 215, 218, 67, 70, 159, 104, 83, 3, 225, 134, 25, 154, 227.**
- 11.3.21 There is considerable evidence for Romano-British settlement activity within the study area. Roman Roads cross the area including one that follows the line of Hills Road (**23**) and one that crosses the Cambridge Biomedical Campus into the proposed Development boundary (**239**). There are settlements identified to the east of the proposed Development boundary at Addenbrooke's Hospital and west of Granham's Farm (**205**) and to the west of the proposed Development boundary at Clay Farm in east Trumpington. With all of these settlements, they appear to be continuations of earlier occupation during the Middle and Late Iron Age. Evidence of Roman activity has also been found further to the north at Perse School and to the south of Cambridge Station to the east of the proposed Development boundary. These assets have historic and archaeological interest. They are of Low value.
- 11.3.22 The CHER records undated ditches (**58**) at the former Charrington Oil Depot, directly adjacent to the west of the railway line and east of Shaftesbury Road opposite Cambridge University Press. Although the CHER states these ditches are undated, an archaeological evaluation in 2000 revealed features indicative of a Romano-British field system, possibly part of a wider known 1<sup>st</sup>-2<sup>nd</sup> century system, although the dating was too sparse to date them specifically to a period. This asset is recorded within 10m west of the proposed Development boundary and may partially extend east into the limits. The ditches are assets of archaeological interest and are of Low value.
- 11.3.23 Romano-British agricultural activity (**100**) has been recorded in the form of lazy beds (a form of arable cultivation comprising wide raised beds and furrows) in the Hobson's Brook Nature Reserve to west of the railway line. Romano-British and Medieval agricultural features (**103**) have also been recorded to the west. The features took the form of ditches, gullies, a field boundary and ridge and furrow. These assets have historic and archaeological interest. They are of Low value.
- 11.3.24 The line of a Roman road (**239**) was revealed running east to west across Addenbrooke's and through the proposed Development boundary south of Long Road. The Roman road was exposed for 95m across Addenbrooke's, flanked by a pair of ditches 13m apart, although no trace of metalling was present. The road is projected to continue east and west, beyond the study area. The road has historic and archaeological interest for its potential to retain important deposits which will contribute to the knowledge and understanding of the form and construction of Roman infrastructure. The Roman road is of Low value, with the potential to be of Medium value if it can be associated with other sections of Roman road in the area.
- 11.3.25 A Romano-British settlement (**62**) is known to have existed to the east of Granham's Farm (**205**) 425m east of the proposed Development boundary. Evidence of a late Roman settlement was identified comprising ditches, gullies, pits, and a substantial timber framed building. The core of the settlement was not discovered and may lie in the immediate area around Granham's Farm and Manor, or to the south. A Roman field system (**63**) was identified to the west of Granham's Farm (**205**) 45m east of proposed Development boundary. Both of these assets have historic and archaeological interest, with the potential for further below ground remains to survive. These assets are of Medium value.

Early Medieval Period (AD410 – 1066) See DBA Section 6.4.4

- 11.3.26 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development: **9, 155, 122, 123, 141, 90, 97 and 59.**

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- 11.3.27 There is evidence for Early Medieval settlement within the study area. The village of Great Shelford is thought to have Early Medieval origins and its name has Early Medieval origins suggesting the settlement formed around the ford over the River Cam. Documentary evidence does attest to the existence of Great Shelford in the late 10th or early 11th century, and it is known that the area had been settled and farmed prior to this.

Medieval Period (1066 – 1540) See DBA Section 6.4.5

- 11.3.1 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development. **66, 60, 57, 119, 125, 124, 139, 122, 126, 128, 129, 131, 140, 143, 113, 98 and 133.**
- 11.3.2 Evidence of Medieval agricultural activity and ridge and furrow cultivation (**101**) has been found in Hobson's Park Nature Reserve and the south of Brooklands Avenue. These assets have historic and archaeological interest and are of Low value.
- 11.3.3 Evidence of Medieval activity in the study area is concentrated towards the southern end of the proposed Development. Both Great Shelford and Little Shelford appear in Domesday, with a combined population of 71.

Post Medieval Period (1540 – 1914) See DBA Section 6.4.6

- 11.3.4 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development: **78, 79, 166, 167, 168, 51, 162, 164, 194, 196, 199, 161, 48, 50, 190, 200, 84, 16, 191, 192, 195, 202, 203, 204, 201, 220, 197, 221, 222, 193, 198, 15, 87, 88, 107, 110, 111, 73, 118, 120, 121, 127, 130, 136, 138, 142, 144, 112, 13, 114, 206, 81, 86, 149, 170, 171, 172, 175, 177, 179, 173, 174, 175, 176, 178, 188, 162, 180, 181, 187 163, 231, 234, 238, 241, 205 and 208.**
- 11.3.5 The Post Medieval period is mostly represented across the study area by extant buildings and structures which date from the 18th, 19th and early 20th centuries.
- 11.3.6 There are examples of extant agricultural buildings and structures within the study area. The 19<sup>th</sup> century Granham's Farm (**205**) with a late 18th to 19th century dovecote (**LB78, 6**) located in the former farmyard. With the exception of the listed building (**LB78**), this asset (**205**) is of historic interest and **low** value. The changes to the rail line in the south of the proposed Development, opposite Granham's Farm (**205**) will not create any additional features; the existing overhead gantry will be replaced with a similar overhead gantry so visual changes will be minimal.
- 11.3.7 The Great Eastern Railway (Shepreth Branch) (**240**) was constructed in 1851 by the Royston and Hitchin Railway Co. and the Cambridge Line, West Anglia Main Line (**241**) both still exist, the latter being the first railway to service Cambridge, and to connect it to London. The line is now known as the West Anglia Main Line. Both assets have historic and archaeological interest and are of Low value.
- 11.3.8 Hobson's Conduit and Hobson's Brook (**237**) is a 17<sup>th</sup> century fresh water supply system which crosses into the proposed Development boundary at several places. It flows from south-east at Nine Wells Nature Reserve to the north along the western side of the study area, from Great Shelford into the city centre. It is fed by the springs at Nine Wells, crossing the proposed Development boundary close to Addenbrooke's Road. To the south, the brook crosses into the proposed Development boundary north of Great Shelford. The open watercourse, although non-designated, is a highly important feature within the landscape of south Cambridge, forming a constant historic element within an area that has changed from open pasture and arable fields to 19th-21st century suburban sprawl. The level of survival of the route of the open watercourse is good although at any particular point the actual shape and profile of the watercourse is unlikely to be wholly original. Linear cropmarks (**4**) located north of Long Road near Rutherford Road have been associated with the Conduit. It has group value with a range of associated structures, such as the designated Nine Wells Monument (**LB48**). It has historic and archaeological interest, as well as group value. As a non-designated asset, it is of Medium value.

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Modern Period (1914 – Present) See DBA Section 6.4.7

11.3.9 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development. **10, 75, 89, 115, 117, 161, 211, 223, and 53**. There are no other assets of modern date within the study area which are relevant to the assessment for this period.

Unknown Date See DBA Section 6.4.7

11.3.10 The following assets have been scoped out of this assessment due to their being findspots, already excavated or at no risk of being impacted by the proposed Development. **4, 56, 58, 16, 184, 5, 69, 47, 99, 147, 185, 153, 12, 28, 224, 230 and 19**. There are no other assets of unknown date within the study area which are relevant to the assessment for this period.

11.3.11 Immediately east of the railway line and west of Francis Crick Avenue, a possible ditch (**217**) of unknown date was revealed during archaeological monitoring on geotechnical pits in 2014. This feature is of archaeological interest and of Low value.

**Designated Historic Buildings**

11.3.12 There are 80 listed buildings located within the 1km study area (Figure 11.2) which are discussed in detail in the DBA (Appendix 11.2). These comprise one Grade I, six Grade II\* and 92 Grade II listed buildings. The majority of these have been scoped out of the assessment as they are sufficiently distant to the proposed Development to not be subject to any direct or indirect impact or any changes within their historic settings. These assets are **LB3, LB4, LB5, LB6, LB7, LB8, LB9, LB10, LB11, LB12, LB13, LB14, LB15, LB16, LB17, LB18, LB19, LB20, LB21, LB22, LB23, LB24, LB25, LB26, LB27, LB28, LB30, LB32, LB33, LB34, LB35, LB36, LB37, LB38, LB39, LB40, LB41, LB42, LB43, LB45, LB46, LB50, LB52, LB53, LB54, LB55, LB56, LB57, LB58, LB59, LB63, LB64, LB65, LB66, LB68, LB69, LB70, LB72, LB73, LB74, LB75, LB76, LB77, LB79, LB86, LB88, LB89, LB93, LB94, LB96, LB99**.

11.3.13 There will be no direct impact to any Listed Buildings as part of the proposed Development. Those identified as having the potential to be impacted indirectly by the proposed Development and their significance value are described below. At the crossing of the railway line with the Cambridge Road (A1301), there are a number of listed buildings within the very close proximity of the line, notably Maris Farmhouse (**LB61**), Four Mile House (**LB62**), and De Freville Farmhouse complex (**LB47, LB60, LB67**) and its boundary wall. There is one listed building at Granham's Farm (**LB78**) within 45m of the proposed Development boundary as well as 32-38 Granham's Road (**LB71**).

11.3.14 Maris Farmhouse (**LB61**), located approximately 70m south of the proposed Development boundary, is an early to mid-17th century house. The house is timber-framed and plastered with a steeply pitched roof now with cement tiles. The settings of this asset is informed by its village location and proximity to De Freville Manor.

11.3.15 Four Mile House (**LB62**) is located 18m west of the proposed Development SW boundary. The house mainly dates from c.1700 but incorporates part of a 15th century open hall house in the rear wing and underwent minor alterations in the 19th and 20th centuries. The house is timber framed and plaster rendered with decorative plaster pargetted panels and a plain tiled roof. The house is situated directly to the north of the railway line and its setting extends into the proposed Development boundary.

11.3.16 The three buildings which form part of De Freville Farm (**LB47, LB60, LB67**) form a group of buildings with views to the north, west and south. The settings of these assets are informed by their village location and proximity to De Freville Manor. Their settings are primarily informed by each other as part of a historic farmstead and the settings extend into the proposed Development boundary.

11.3.17 The dovecote at Granhams Farm (**LB78**) located 45m east of the proposed Development boundary, is a former early 19th century dovecote, converted into a house. The building is timber framed and plaster rendered with a hipped plain tiled roof with gables. The house is located on a former moated site which may be curtilage listed. The setting of the dovecote (**LB78**) is informed by its location within a historic farmstead.

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11.3.18 **LB61, LB62, LB47, LB60, LB67, LB78 and LB71** are all Grade II Listed, have historic and artistic interest and are of Medium value.

11.3.19 The Nine Wells Monument (**LB48**), although only 130m east of the proposed Development boundary, is situated within an area of dense tree cover. The polished granite obelisk monument was erected in 1861 in dedication to Hobson's Conduit, a water course and conduit which was built as the principal water supply to the city of Cambridge for over 250 years from the 17th century (**237**). The monument also carries an inscription to the benefactors on the water course including Thomas Hobson, the 16<sup>th</sup> and 17<sup>th</sup> Century carrier (from where the term 'Hobson's Choice' is supposedly named after) who was a prominent local figure and businessman. This asset has historic interest for its connections to the city of Cambridge, Hobson's Conduit and Nine Wells Springs. It is sited by the springs that source the water for the conduit so its setting includes the brook/conduit and therefore extends into the proposed Development boundary. The setting has already been impacted by the railway, however and the Monument is shielded by trees therefore there is no intervisibility between the proposed Development and the Monument. This asset is of Medium value.

### Conservation Areas

11.3.20 There are seven Conservation Areas within the 1km study area but none extend into the site boundary of the proposed Development. The Great Shelford Conservation Area (CA3) does extend up to the proposed Development boundary at its southernmost extent. They are discussed in detail in the DBA (Appendix 11.2).

11.3.21 None of the Conservation Areas will be impacted by the proposed Development either directly or indirectly. There will be no changes within their settings either.

### Non-Designated Historic Buildings

11.3.22 There are 24 non-designated, locally listed buildings within the 500m study area, all of local significance. With the exception of Long Road Sixth Form College (**LLB2**) these are all located toward the northern end of the proposed Development boundary. They are discussed in detail in the DBA (Appendix 11.2).

11.3.23 None of the Locally Listed Buildings will be impacted by the proposed Development, either directly or indirectly. There will be no changes within their settings either.

### Designated Historic Landscape

11.3.24 There is one Registered Park and Garden within the 1km study area, the Grade II\* listed Botanic Garden (**RPG1**). The Cambridge University Botanic Garden (**RPG1**) is located c.1km to the south of the city centre and occupies c.16ha of land. It is located 250m northwest of the proposed Development boundary. The site was acquired by the University in 1831 to provide an area for teaching and research. The garden has historic and artistic interest and is of Medium value.

11.3.25 The Grade II\* Listed Cambridge University Botanic Garden (**RPG1**) is located 250m northwest of the proposed Development boundary. It lies in an area surrounded by urban development, roads and infrastructure which provide sufficient intervening build form to mitigate any potential impact on its setting. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant** and has therefore been scoped out of the assessment.

### Non-Designated Historic Landscape

11.3.26 A broad overview of the historic landscape within the proposed Development boundary is provided below, with a more detailed analysis given in section 6.7.2 'Cartographic Analysis' of the DBA (Appendix 11.2).

11.3.27 The Historic Landscape within the proposed Development boundary is characterised by the following features:

- Arable fields (mainly south of the proposed Development boundary with some minor boundary changes from the 19th century);

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- Nature reserves and green belt corridor (Hobson's Park Nature Reserve and Nine Wells Nature Reserve being within the proposed Development boundary);
- Small wooded areas (centre of the proposed Development boundary along the railway line);
- 19th century railway lines (Cambridge to London Railway including the Cambridge Line, the dismantled Bedford and Cambridge Branch, and Shepreth Branch Junction);
- An ancient watercourse and 17th century brook (Hobson's Brook (237) and Conduit and a tributary which supplies the natural springs at Nine Wells), and
- Roads, housing and infrastructure (housing and infrastructure north of the proposed Development boundary along the railway, Addenbrooke's Road across the centre of the proposed Development boundary, and roads and housing north of Great Shelford).

11.3.28 The Historic Landscape demonstrates evidence of continuous occupation from the Prehistoric period onward. It is of archaeological and historic interest for the contribution towards both archaeological and historical knowledge about the past use of the landscape. It is of Medium value.

11.3.29 The Historic Landscape demonstrates evidence of continuous occupation from the Prehistoric period onward. It is of archaeological and historic interest for the contribution towards both archaeological and historical knowledge about the past use of the landscape. The works have to potential to slightly impact upon this in the southern part of the proposed Development boundary by the construction of a haul road through what is currently undisturbed agricultural land. However, the route would be adjacent to the rail line which has already impacted upon the historic landscape. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant** and has therefore been scoped out of the assessment.

## Future Baseline

11.3.30 Without the proposed Development the heritage assets would remain unaffected and below ground archaeological deposits would remain preserved in situ.

## 11.4 Design and Mitigation

11.4.1 The design features of the proposed Development and mitigation measures that would ameliorate adverse effects on Cultural Heritage are set out in this section. A number of features have been embedded in the design which serve to reduce the indirect impact on heritage assets close to the proposed Development.

## Construction Approach and Mitigation of Construction Effects

11.4.2 Mitigation measures are proposed to prevent, reduce, and where possible, offset any potential effects of the proposed Development. The proposed Development will involve extensive groundworks at the construction phase in the form of topsoil stripping for compounds, soil storage and haul roads; foundations for new buildings; drains; sewers; roads; and creation of channels and shallow basins for SUDs. There will also be areas of ecological mitigation possibly involving creation of ponds. These groundworks will inevitably have a permanent effect on below-ground archaeological remains, where they are known or suspected to exist, and archaeological mitigation will be required.

11.4.3 While it is acknowledged in local and national planning guidance that 'preservation in situ' of archaeological remains is the preferred option, the proposed development presents an opportunity to advance our knowledge of the historic environment through 'preservation by record' e.g. by archaeological excavation or historic building recording before construction.

11.4.4 Archaeological assessment and mitigation is a phased successive approach where the results from one phase informs the next. The initial phases of archaeological assessment have taken place. The first stage comprised desk-based studies. This was followed by field evaluation involving geophysical survey and trial trenching over part of the site, this phase is ongoing. The results of the desk-based studies, geophysical surveys and trial trenching evaluation has

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provided sufficient information to develop an understanding of the heritage resource within the Site and informed how mitigation is approached. However, it is recognised that in the area south of Addenbrooke's Road the evaluation is incomplete. This area will be subject to a trench evaluation.

- 11.4.5 The scope and extent of the mitigation measures would be agreed with the local planning authority and close consultation with both HE and the CCoC HET has already taken place.
- 11.4.6 Mitigatory measures will be implemented through planning conditions. As part of these conditions, the archaeological contractors, working on behalf of the Applicant, will be required to submit and agree a written scheme of investigation (WSI) with the local planning archaeological advisor prior to the commencement of this work. Broad mitigation measures have been included in the Code of Construction Practice (COCOP) Part A (Appendix 2.4).

### Below Ground Archaeological Deposits

- 11.4.7 The proposed Development is in an area of known archaeological deposits, predominantly in the area east of the rail track, north of Addenbrooke's Road and south of the guided busway. These have been identified in previous archaeological evaluation excavations. Before construction works would begin, the area of known archaeological deposits would be subject to a strip, map and record excavation to preserve these features by record. This record will comprise of a written report, photographic archive and archive of finds recovered from site. The report will include a narrative discussion of the archaeological sequence alongside the matrix-based approach.
- 11.4.8 It is not anticipated that the proposed Development will have an impact on buried organic or waterlogged deposits. However, provision should be made in the detailed WSI for archaeological excavation for the potential to encounter deposits of this nature in areas of mitigation and the use of appropriate excavations and storage methods will be agreed with both HE and the County Archaeologist.
- 11.4.9 There are known archaeological deposits in the southern part of the site, south of Addenbrooke's Road, both within the Scheduled Monument (**SM4**) and in the non-designated area as found during the 2021 evaluation. The features are related to the known features north of Addenbrooke's Road. The evaluation also proved that some of the archaeological features revealed during the excavation were not picked up by the 2020 geophysical survey. The survey cannot therefore be used as an indicator of areas of no archaeological deposits which will not require mitigation. This means that before construction works would begin, the footprint area of the haul road and associated compounds would be subject to a strip, map and record excavation to preserve these features by record. This record will comprise of a written report, photographic archive and archive of finds recovered from site. The report will include a narrative discussion of the archaeological sequence alongside the matrix-based approach. The shallow nature of the archaeological features found during the evaluation (0.35m) means that any additional ground intrusive works in the area of archaeological potential, such as topsoil stripping, would also need to be subject to an archaeological strip map and record.

### Built Heritage Assets

- 11.4.1 Best practice construction methodologies would form part of the CoCP Part B to be produced by the contractor when there is sufficient design detail and submitted to the Local Planning Authority for approval. This will describe the procedures for the management of environmental effects during construction, including the implementation of good site housekeeping practices during construction. This includes impacts to the settings of heritage assets caused by construction activity through increased dust, noise and vehicle movement. These impacts will be mitigated through use of fencing, hoarding and bunding, damping down of the construction area, as appropriate.
- 11.4.2 The flow of construction traffic will be controlled through and around the proposed Development using traffic management i.e. control of vehicle movement, speed limits and defined routes. Where possible, the defined routes would avoid designated heritage assets.

11.4.3 Built heritage assets which will benefit from the above mitigation are:

- The Nine Wells Monument (**LB48**) which is 195m from Site Haul Road HR1, 225m from Site Access Road AR6, Site Haul Road HR2 and 325m from Site Access Road AR1.
- Dovecot at Granhams (**LB78**) which is 60m from Site Access Road AR7.
- Granham's Road (**LB71**) which is 200m from Site Access Road AR7.

## Scheme Design and Mitigation of Operational Effects

11.4.4 The operational phase of the proposed Development has been designed to increase use of public transport and therefore reduce traffic and noise within the local area. This will have a beneficial impact on the historic assets within the local area as it would preserve the rural aspects of their setting by reducing traffic and noise.

11.4.5 Designed planting around the proposed substation building will provide screening for views across from the approach to the Nine Wells Monument (**LB48**). The monument itself is screened by existing vegetation and tree cover.

## 11.5 Assessment of Residual and Cumulative Effects

### Introduction

11.5.1 The following section outlines the residual effects once the design features and mitigation measures described in Section 11.4 have been implemented.

### Residual Effects from Construction

#### Archaeological Remains

##### Designated Heritage Assets

11.5.2 There is a known designated archaeological feature within the southern part of the proposed Development boundary (**SM4**). The ground intrusive element of the proposed Development in this area would cause a direct, physical impact on the parts of the designated asset within the footprint of the proposed Development and any associated features resulting in severe truncation or complete removal. The recent site investigation found that the archaeological features are shallow in nature (0.35m below ground level). This means that the features would be vulnerable to either crushing and/or compaction by heavy vehicles, especially if the area became very wet due to heavy rain, even if a temporary trackway were to be laid on the ground surface. The works would therefore result in a Major magnitude of impact on this asset of High value resulting in a Large adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Moderate adverse and remain **Significant**.

##### Non-Designated Heritage Assets

11.5.3 There are known archaeological features within the southern part of the proposed Development south of Addenbrooke's Road (**17**). These are associated with the Scheduled Monument **SM4** and highly likely to be associated with the Bronze Age, Iron Age and Roman activity to the north (**11, 102, 103, 64**). The shallow nature of the features of 0.35m below ground surface, as revealed during the 2021 investigation, means the ground intrusive element of the proposed Development in this area would cause a direct, physical impact on the parts of the designated asset within the footprint of the proposed Development and any associated features resulting their severe truncation or complete removal. The recent site investigation found that the archaeological features are shallow in nature (0.35m below ground level). This means that the features would be vulnerable to either crushing and/or compaction by heavy vehicles, especially if the area became very wet due to heavy rain, even if a temporary trackway were to be laid on the ground surface. The works would therefore result in a Major magnitude of impact on this asset of Medium value resulting in a Large adverse significance of effect, especially as these features are associated with the Scheduled Monument **SM4** which is of High value. This effect would be considered Significant. Following



mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Moderate Adverse and remain **Significant**.

- 11.5.4 Middle Bronze Age features (**102**) were revealed during previous archaeological investigations within the central part of the proposed Development boundary, west of the railway line. The ground intrusive element of the proposed Development in this area would cause a direct, physical impact on these features and any associated features resulting their severe truncation or complete removal. The works would therefore result in a Major magnitude of impact on these assets of Medium value resulting in a Moderate Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Slight Adverse and **Not Significant**.
- 11.5.5 Undated cropmark enclosures (**11**) are located within the central part of the proposed Development boundary, west of the railway line. It is likely these are associated with or a continuation of the Bronze Age and Romano-British features (**102, 103**). The works would cause a direct, physical impact on these features and any associated features resulting their severe truncation or complete removal. The works would therefore result in a Major magnitude of impact on these assets of Medium value resulting in a Moderate Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Slight Adverse and **Not Significant**.
- 11.5.6 Mid to Late Iron Age settlement (**64**) 140m east of the proposed Development boundary was discovered during previous archaeological investigation. Although outside the boundary it is possible that associated features could extend within the proposed Development boundary, as trackway features were found to extend within the footprint of the proposed haul road during the 2021 archaeological investigation. It is likely that part of the asset has already been disturbed, truncated and/or removed by previous works associated with the construction of the railway line, however if part of the feature does survive outside of areas of previous disturbance then the works would cause a direct, physical impact on this feature resulting in the severe truncation or complete removal of any surviving element. The recent site investigation found that the archaeological features within the haul road footprint are shallow in nature (0.35m below ground level). This means that the features would be vulnerable to either crushing and/or compaction by heavy vehicles, especially if the area became very wet due to heavy rain, even if a temporary trackway were to be laid on the ground surface. The works would therefore result in a Moderate magnitude of impact on this asset of Medium value resulting in a Moderate Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Slight Adverse and **Not Significant**.
- 11.5.7 The probable Roman Road (**239**), revealed during previous archaeological investigations, crosses the proposed Development boundary in the north of the site, to the south of Long Road. It is likely that part of the asset has already been disturbed, truncated and/or removed by previous works associated with the construction of the railway line, however if part of the feature does survive outside of areas of previous disturbance then the works would cause a direct, physical impact on this feature resulting in the severe truncation or complete removal of any surviving element. The works would therefore result in a Moderate magnitude of impact on this asset of Low value resulting in a Slight Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.
- 11.5.8 Romano-British agricultural activity (**100**) has been revealed during previous archaeological investigations 25m west of the proposed Development boundary. Due to the nature of the asset and its close proximity there is potential for the asset or features associated with the asset to extend into the proposed Development boundary. It is likely that part of the asset has already been disturbed, truncated and/or removed by previous works associated with the construction of the railway line, however if part of the feature does survive outside of areas of previous disturbance then the works would cause a direct, physical impact on this feature

resulting in the severe truncation or complete removal of any surviving element. The works would therefore result in a Moderate magnitude of impact on this asset of Low value resulting in a Slight Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.

- 11.5.9 Romano-British and Medieval agricultural features (**103**) were revealed during previous archaeological investigations within the central part of the proposed Development boundary, west of the railway line. The works would cause a direct, physical impact on these features and any associated features resulting their severe truncation or complete removal. The works would therefore result in a Moderate magnitude of impact on these assets of Low value resulting in a Slight Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.
- 11.5.10 A Romano-British field system (**63**), most likely associated with (**62**), is located 35m east of the proposed Development boundary. Due to the nature of the asset and its close proximity there is potential for the asset or features associated with the asset to extend into the proposed Development boundary. It is likely that part of the asset has already been disturbed, truncated and/or removed by previous works associated with the construction of the railway line, however if part of the feature does survive outside of areas of previous disturbance then the works would cause a direct, physical impact on this feature resulting in the severe truncation or complete removal of any surviving element. The works would therefore result in a Moderate magnitude of impact on this asset of Medium value resulting in a Moderate Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Slight Adverse and **Not Significant**.
- 11.5.11 Evidence of Medieval agricultural activity and ridge and furrow cultivation (**101**) has been revealed during previous archaeological investigations 140m west of the proposed Development boundary. Due to the nature of the asset and its proximity there is potential for the asset or features associated with the asset to extend into the proposed Development boundary. It is likely that part of the asset has already been disturbed, truncated and/or removed by previous works associated with the construction of the railway line, however if part of the feature does survive outside of areas of previous disturbance then the works would cause a direct, physical impact on this feature resulting in the severe truncation or complete removal of any surviving element. The works would therefore result in a Moderate magnitude of impact on this asset of Low value resulting in a Slight Adverse significance of effect. This effect would be considered Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.
- 11.5.12 The route of the Great Eastern Railway (Shepreth Branch) (**240**) is still the route of the current rail line in the south-west of the proposed Development boundary. The works would alter this line slightly to soften the bend to allow faster trains to use this line but also enable the line to continue to be used effectively by modern rail traffic. This would be a Negligible magnitude of impact on this asset of Low value resulting in a Slight significance of effect. This effect would be considered Not Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.
- 11.5.13 Hobson's Brook (**237**) runs north-south to the west of the proposed Development boundary but passes through it along Addenbrooke's Road. The works in this area of the site will not directly impact the asset. It has been a constant historic element within an area that has changed from open pasture and arable fields to 19th-21st century suburban and the open landscape of the Hobson's Park Nature Reserve and the agricultural land south of Addenbrooke's Road informs its setting. The changes within the Hobson's Park open space (construction of a new rail station) would have negligible effect upon its setting as it would be set against the already urban backdrop of the Cambridge Biomedical Campus. This would be a Negligible magnitude of impact on this asset of Medium value resulting in a Slight Adverse

significance of effect. This effect would be considered Not Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.

- 11.5.14 A possible ditch (**217**) of unknown date was revealed within the proposed Development boundary during archaeological monitoring on geotechnical pits (**EV35**). It is likely that part of the asset has already been disturbed, truncated and/or removed by previous works associated with the construction of the railway line, however if part of the feature does survive outside of areas of previous disturbance, then the works would cause a direct, physical impact on this feature resulting in the severe truncation or complete removal of any surviving element. The works would therefore result in a Moderate magnitude of impact on this asset of Low value resulting in a Slight Adverse significance of effect. This effect would be considered Not Significant. Following mitigation of a strip, map and record excavation prior to construction to preserve assets by record, this would be reduced to Neutral and **Not Significant**.

## Residual Effects from Operation

### Archaeological Remains (both Designated and Non-Designated)

- 11.5.15 For archaeological assets, permanent impacts from the construction phase would continue into the operational phase (as they are permanent) but would not give rise to additional effects. Therefore, no additional mitigation during operation is considered necessary for these assets.

### Built Heritage Assets

- 11.5.16 Maris Farmhouse (**LB61**) located approximately 70m south-east of the proposed Development boundary and its setting is informed by its village location and proximity to De Freville Manor. Although in close proximity to the proposed Development boundary, the works at the southern end closest to the asset are the widening of the track and will have no direct impact to the asset or its setting. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant**.
- 11.5.17 Four Mile House (**LB62**) is located 18m north of the proposed Development boundary. The house is situated directly to the north of the railway line and its setting extends into the proposed Development boundary. The work would enable trains to travel at a higher speed along this section of the railway and it is possible that this could cause a slight indirect impact to the setting of the asset. However, the setting of the asset has already been compromised by the presence of the railway and this slight indirect impact would not necessarily be discernible above the current level of railway traffic. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant**.
- 11.5.18 The De Freville Farmhouse complex (**LB47**, **LB60**, **LB67**) is between 60m and 100m south-east of the Shepreth branch line and proposed Development boundary. They form a group of buildings with views to the north, west and south. The settings of these assets are informed by their village location and proximity to De Freville Manor. Their settings are primarily informed by each other, as part of a historic farmstead, and do extend into the site boundary. The work would enable trains to travel at a higher speed along this section of the railway and it is possible that this could cause a slight indirect impact to the setting of these assets. However, the setting of the asset has already been compromised by the presence of the railway and this slight indirect impact would not necessarily be discernible above the current level of railway traffic. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant**.
- 11.5.19 The dovecote Granham's Farm (**LB78**) is located 45m east of the proposed Development boundary and 185m from the rail line. There would be no direct, physical impact on the asset. Its setting is informed by its location within a historic farmstead and extends across the surrounding fields to the east and west and into the site boundary. However, the widening of the track on the section of line closest to (**LB78**) will not noticeably create any changes within

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its setting. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant**.

- 11.5.20 32-38 Granham's Road (**LB71**) is located 85m east of the proposed Development boundary and rail line. There will be no direct, physical impact on the asset. Its setting is informed by its roadside location and extends across the surrounding fields to the east and west and into the site boundary. However, the widening of the track on the section of line closest to (**LB71**) will not noticeably create any changes within its setting. The works would therefore result in a Negligible magnitude of impact on this asset of Medium value resulting in a Neutral significance of effect. This effect would be considered **Not Significant**.

## Cumulative Effects

- 11.5.21 This sub-section considers the inter-project cumulative effects of the proposed Development with other schemes with regard to cultural heritage. Below is Table 11-7 showing the projects which have been identified as having the potential to have cumulative effects with the proposed Development. Each of the below schemes are approved and will have its own WSI to address effects on below ground archaeology.

Table 11-7 Inter-project Cumulative Effects

Map ID	Application Number	Development Description	Approx. distance from Scheme	Cumulative Effects
1	16/0653/REM	Reserved matters consent, pursuant to outline approval 06/0796/OUT (varied by S73 application reference 14/2094/S73) for a 9,033sqm (Gross External Area excluding plant) Biotech and Biomedical Research and Development building, including associated car and cycle parking, hard and soft landscaping, internal access roads, supporting facilities and ancillary infrastructure.	0km (adjacent east of railway track)	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
2	16/1078/OUT	Outline Application with all matters reserved for up to 14,193 sqm (excluding plant areas) of biomedical and biotech research and development (Use Class B1(b)); landscaping; car and cycle parking areas and all other associated infrastructure.	0km (adjacent east of railway track)	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
3	19/1070/REM	Reserved matters application pursuant to outline approval 06/0796/OUT (amended by Section 73 approval 17/2258/S73) for: an R&D Enabling Building of 13,197 sqm; an Amenities Hub of 3,261 sqm; associated car, motorbike and cycle parking including a Multi Storey Car Park; a temporary Multi Use Games Area; hard and soft	Adjacent east of red line boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.

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Map ID	Application Number	Development Description	Approx. distance from Scheme	Cumulative Effects
		landscaping; and internal roads, supporting facilities and ancillary infrastructure. Includes partial discharge of conditions 13, 16, 18, 24, 25, 45, 47, 48, 49, 56, 57, 58 and 59 pursuant to outline consent 06/0796/OUT.		
4	16/1884/FUL	Demolition of an existing sports pavilion, erection of a new sports pavilion, alterations to an existing car park and a vehicular access, a cycle shelter, new flood-lit artificial surfaced sports pitches and associated soft and hard landscaping.	0km (adjacent west of railway track)	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
5	14/1736/REM	Reserved matters application (access, appearance, landscaping, layout and scale) pursuant to outline planning permission 07/0620/OUT for the development of 165 residential dwellings, plus associated open space, infrastructure and car parking. Parcels 6 and 7 of the Clay Farm development site.	Adjacent western site boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
7	16/0165/FUL	Erection of a building for Biotech and Biomedical research and development and production together with associated supporting Headquarters and Logistics function along with associated infrastructure to include; access, services, drainage, electric and gas infrastructure, external ancillary structures, car and cycle parking and hard and soft landscaping.	Adjacent to the site boundary – there are some areas where the red line boundaries overlap	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
8	16/0176/OUT	Development of up to 75,000 sqm floorspace (excluding plant areas) of Research and Development (B1b) and Clinical (C2 and/or D1), sui generis and higher education uses, including related support activities within use class B1; ancillary uses in addition (A1, A3, A4, A5, D1 and/or D2); up to two multi storey car parks; open space and landscaping and all other	Adjacent to site – there are some areas where the red line boundaries overlap	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.

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Map ID	Application Number	Development Description	Approx. distance from Scheme	Cumulative Effects
		associated supporting infrastructure.		
9	S/2449/18/FL	Demolition of existing buildings and structures and conversion and construction of four residential dwellings including associated access and landscaping	East of Granham's Road (adjacent south east of red line boundary)	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
16	S/4279/19/FL	Erection of 21 dwellings (almshouses) the relocation of existing allotments and public open space provision together with associated landscaping and infrastructure.	Approximately 50m from red line boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
19	15/1829/REM	Neighbourhood equipped area of play (NEAP) including a skate park, trim trail, kick about area, landscaping and open space pursuant to outline approval 07/0620/OUT	Adjacent west of the red line boundary (west of rail track)	The scheme in is an area of high but has been approved and suitable mitigation for heritage will be in place as part of the permission.
29	16/1523/REM	Reserved matters (access, appearance, landscaping, layout and scale) pursuant to outline approval 06/0796/OUT (varied by S73 application reference 14/2094/S73) for the erection of a 6,639sqm (Gross External Area excluding plant) building to form the new Heart and Lung Research Institute (Clinical Research/Higher Education Use), with associated access, landscaping and ancillary infrastructure.	Adjacent east of the red line boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
32	14/1633/REM	Reserved matters application pursuant to outline approval 06/0796/OUT for a total of 59,821sqm (Gross External Area excluding plant) Biotech and Biomedical Research and Development floorspace, to include: i) R&D Centre and Corporate Headquarters, ii) R&D Enabling Building, iii) Support Building and Energy Centre, iv) Associated car, motorbike and cycle parking, v) Hard and soft landscaping,	Adjacent east of red line boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.

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Map ID	Application Number	Development Description	Approx. distance from Scheme	Cumulative Effects
		vi) Internal roads, supporting facilities and ancillary infrastructure.		
37	None Yet	Construction of an extension to the Cambridge South East Transport (CSET) guided busway and associated construction infrastructure and compounds.	Adjacent east of red line boundary	The scheme in is the same area of high archaeological potential as the proposed Development and may impact on archaeological assets associated with those present within the proposed Development by disturbing, truncating or removing them.
39	15/0844/REM	Reserved matters application (access, appearance, landscaping, layout and scale) pursuant to outline planning permission 07/0620/OUT for the development of 251 mixed tenure dwellings including 40% affordable housing, 967 sq.m of retail floorspace, public open space, drainage and associated infrastructure on Parcels 8A and 8B of the Clay Farm development site.	Adjacent west of the redline boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
45	20/05027/REM	Reserved Matters application pursuant to outline approval 06/0796/OUT (amended by Section 73 approval 17/2258/S73) for: a South Office Building of 13,502 sqm; a Hive of 3,593 sqm; associated car, motorbike and cycle parking including a Travel Hub of 2,970 sqm; a temporary Multi Use Games Area; hard and soft landscaping; and internal roads, supporting facilities and ancillary infrastructure. Includes partial discharge of conditions 13, 16, 18, 23, 24, 25, 45, 47, 48, 49, 56, 57, 58 and 59 pursuant to Section 73 approval 17/2258/S73.	Approximately 30m from the red line boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.
46	20/03950/REM	Reserved Matters application for the erection of a five-storey mixed use laboratory and office building and associated plant, internal roads, car parking, cycle parking, landscaping and public open space. The Reserved Matters include	Approximately 100m from the red line boundary	The scheme in is an area of high archaeological potential but has been approved and suitable mitigation for heritage will be in place as part of the permission.

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Map ID	Application Number	Development Description	Approx. distance from Scheme	Cumulative Effects
		access, appearance, landscaping, layout and scale.		



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## 11.6 Assessment Summary

11.6.1 Table 11-8 **Error! Reference source not found.** provides assessment summary with respect to heritage and how they have been addressed.

Table 11-8 Assessment Summary

Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Cropmark Complex SM4	Large Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Moderate Adverse <b>Significant</b>
Cropmark Complex (17)	Large Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Moderate Adverse <b>Significant</b>
Middle Bronze Age features (102)	Moderate Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Undated cropmark enclosures (11)	Moderate Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Mid to Late Iron Age settlement (64)	Moderate Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Roman Road (239)	Moderate Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Romano-British	Slight Adverse	C	Asset is within an area of known archaeological assets	Slight Adverse

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
agricultural activity (100)			which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	<b>Not Significant</b>
Romano-British and Medieval agricultural features (103)	Slight Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Romano-British field system (63)	Moderate Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Evidence of medieval agricultural activity and ridge and furrow (101)	Slight Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
Great Eastern Railway (Shepreth Branch) (240)	Negligible	C, O	None	Neutral <b>Not Significant</b>
Hobson's Conduit and Hobson's Brook (237)	Slight Adverse	C, O	Sympathetic planting and landscaping would help to soften the transition from open space to urban form.	Negligible <b>Not Significant</b>
possible ditch (217) of unknown date	Slight Adverse	C	Asset is within an area of known archaeological assets which would be subject to a strip, map and record excavation prior to construction to preserve assets by record.	Slight Adverse <b>Not Significant</b>
<b>Historic Buildings</b>				
Maris Farmhouse (LB61)	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B	Neutral <b>Not Significant</b>

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Four Mile House (LB62)	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B	Neutral <b>Not Significant</b>
De Freville Farmhouse complex (LB47, LB60, LB67)	Neutral	C, O	Follow best practice construction methodologies secured in the oCPCoCP Part B	Neutral <b>Not Significant</b>
Dovecote at Granham's Farm (LB78)	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B	Neutral <b>Not Significant</b>
32-38 Granham's Road (LB71)	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B	Neutral <b>Not Significant</b>
Nine Wells Monument (LB48)	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B. Sympathetic planting around new substations building.	Neutral <b>Not Significant</b>
<b>Historic Landscape</b>				
Cambridge University Botanic Garden (RPG1)	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B	Neutral <b>Not Significant</b>
Non-Designated Historic Landscape	Neutral	C, O	Follow best practice construction methodologies secured in the CoCP Part B	Neutral <b>Not Significant</b>

## 11.7 References

Reference	Title
Ref 11.1	Planning (Listed Buildings and Conservation Areas) Act 1990
Ref 11.2	Ancient Monuments and Archaeological Areas Act 1979
Ref 11.3	National Planning Policy Framework 2019
Ref. 11.4	Cambridge (City Council) Local Plan (adopted October 2018)
Ref. 11.5	South Cambridgeshire Local Plan (adopted September 2018)
Ref. 11.6	Cambridge Southern Fringe Area Action Plan; Development Plan Document (DPD) (adopted February 2008)
Ref. 11.7	Emerging Greater Cambridge Local Plan
Ref. 11.8	International Council on Monuments and Sites (ICOMOS) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011)
Ref. 11.9	Chartered Institute for Archaeologists (CIfA) 'Code of conduct' (2019)
Ref. 11.10	Chartered Institute for Archaeologists (CIfA) 'Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment' (2014)
Ref. 11.11	Chartered Institute for Archaeologists (CIfA) 'Standard and guidance for historic environment desk-based assessment' (2017)
Ref. 11.12	Historic England's 'Managing Significance in Decision-Taking in the Historic Environment, Historic Environment Good Practice Advice in Planning Note 2' (henceforth referred to as 'GPA2'): (2015)
Ref. 11.13	Historic England 'The Setting of Heritage Assets, Historic Environment Good Practice Advice in Planning Note 3' (henceforth, 'GPA3') (2017)
Ref. 11.14	Historic England 'Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment' which sets out guidance on assessing and articulating the significance of heritage assets' (2008)
Ref. 11.15	Historic England proposed changes to Conservation Principles (2017 consultation draft)
Ref. 11.16	Arcadis, Cambridge South Infrastructure Enhancements – Cultural Heritage Desk Based Assessment for Outline Business Case Designs (GRIP 2) (2020)
Ref. 11.17	Network Rail, Heritage Care and Development, [NR/GN/CIV/100/05]

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Environmental Statement – Volume 2:  
Chapter 12 – Ground Conditions and Contamination



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 12 – Ground Conditions and Contamination**

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## 12 Ground Conditions and Contamination

### 12.1 Introduction

- 12.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction of the proposed Development with respect to Ground Conditions and Contamination. The assessment incorporates relevant design and other mitigation measures that would be employed during construction of the A proposed Development.
- 12.1.2 This Chapter should be read in conjunction with the following chapters of the ES:
- Chapter 11: Cultural Heritage which assesses the impact of the proposed Development on the built historic environment (designated and non-designated heritage assets);
  - Chapter 14: Materials and Waste which assesses potential effects relating to material consumption and waste arising during the demolition and construction phases;
  - Chapter 16: Socio-economics which includes an assessment of impacts to agricultural enterprises; and
  - Chapter 18: Water Resources and Flood Risk which assesses impacts to surface water and groundwater levels and quality and flood risk.

### Relevant Aspects of the Proposed Development

- 12.1.3 A description of the proposed Development is provided in Chapter 4. Specific aspects of the proposed Development that relate to Ground Conditions and Contamination are detailed in the subsequent sections.
- 12.1.4 There is the potential for localised contamination to be present associated with the existing railway infrastructure. There is also the potential for best and most versatile (BMV) land (as assessed through the Agricultural Land Classification (ALC) system) to be present.

#### Construction Phase

- 12.1.5 There is the potential for the introduction of new contamination sources from construction activities. These could introduce contaminant pathways to human health receptors, controlled waters and buildings and infrastructure.
- 12.1.6 The proposed Development has the potential to result in the loss of BMV land and the wider ecosystem services the soils this land provides.

#### Operational Phase

- 12.1.7 In terms of ground conditions, soils and BMV land it is assumed that procedures will be in place to mitigate operational effects in the design, and in agreement with the GCSP, operational impacts have been scoped out of this chapter.

### 12.2 Assessment Methodology

#### Legislation, Policy and Guidance

- 12.2.1 This impact assessment has been undertaken in accordance with current national legislation, and national, regional and local plans and policies relating to Ground Conditions and Contamination in the context of the proposed Development. A summary of the relevant legislation and policies, the requirements of these policies and the project response is provided below.

#### Legislation

- 12.2.2 The Environmental Protection Act 1990 (EPA (Ref 12.23)) defines, within England, the system for waste management and control of emissions into the environment. The EPA was intended to strengthen pollution controls and support enforcement with heavier penalties. Before the EPA there had been separate environmental regulation of air, water and land



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pollution and the EPA brought in an integrated scheme that would seek the "best practicable environmental option".

- 12.2.3 Part 2A of the EPA (which was inserted into that Act by section 57 of the Environment Act 1995) (Ref 12.24) contains a regulatory regime for the identification and remediation of contaminated land, as defined by the EPA. In addition to the requirements contained in the primary legislation, operation of the regime is subject to secondary regulations and statutory guidance.
- 12.2.4 The main objective underlying the introduction of the Part 2A contaminated land regime was to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment, assessed in the context of the current use and circumstances of the land.
- 12.2.5 The identification of contaminated land, as defined in Part 2A of the EPA 1990, comprises a risk-based approach. For harm to the non-aquatic environment or pollution of controlled waters to occur, there must be a 'pollutant linkage'. This linkage is based on the following being present:
- A source of contamination (hazard);
  - A pathway for the contaminant to move from source to receptor; and
  - A receptor (target), which is affected by the contaminant. This includes humans, ecosystems, controlled waters, physical systems and built structures, which could be affected by the hazard.
- 12.2.6 Part 2A would normally be applied to orphan sites and/ or where no redevelopment was to occur. For development schemes, Planning Policy would normally be applied.
- 12.2.7 The Water Environment (Water Framework Directive [WFD]) (England and Wales) Regulations 2017 (Her Majesty's Stationery Office (HMSO), 2017) (Ref 12.25) implements the WFD in England and Wales. This legislation provides a framework for the protection of surface (fresh) water, estuaries, coastal water and groundwater. The objectives of the WFD are to enhance the status, and prevent further deterioration, of aquatic ecosystems, promote the sustainable use of water, reduce pollution of water and ensure progressive reduction of groundwater pollution.
- 12.2.8 The Water Resources Act 1991, as amended, (Ref 12.26) sets out the regulatory regime under which water abstraction and impounding is licensed by the Environment Agency (EA). It is a criminal offence to knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters.
- 12.2.9 Geological sites of national importance are principally afforded protection under the Wildlife and Countryside Act 1981 (as amended) (Ref 12.27) or the National Parks and Access to the Countryside Act 1949, by designation as Sites of Special Scientific Interest (SSSIs) or National Nature Reserves (NNRs) (Ref 12.29)
- 12.2.10 There are no legislative requirements governing the assessment of agricultural matters relating to soils and land grade, and the framework of any assessment is derived from a combination of EU and national agricultural and land use policies and measures, combined with professional judgement.

## Policy

- 12.2.11 This assessment has considered the National Planning Policy Framework (NPPF) produced by the Department for Communities and Local Government, 2019 (Ref 12.29) which sets out Government policy in relation to development on contaminated land.
- 12.2.12 Table 12-1 below provides a summary of national policy relevant to Ground Conditions and Contamination and sets out how this policy has been taken into account.

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Table 12-1 National Policy

Policy Document	Policy/ Reference	Summary of Requirements	Project Response
National Planning Policy Framework, as amended (2019)	Paragraph 117	<i>“Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or “brownfield” land.”</i>	The assessment has considered the impact on receptors from land quality including controlled waters and agricultural land quality and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.
	Paragraph 118	<i>Planning policies and decisions should:</i> <i>c) Give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;</i>	
	Paragraph 137	<i>Before concluding that exceptional circumstances exist to justify changes to Green Belt boundaries, the strategic policy-making authority should be able to demonstrate that it has examined fully all other reasonable options for meeting its identified need for development. This will be assessed through the examination of its strategic policies, which will take into account the preceding paragraph, and whether the strategy:</i> <i>a) Makes as much use as possible of suitable brownfield sites and underutilised land;</i>	
	Paragraph 170	<i>Planning policies and decisions should contribute to and enhance the natural and local environment by:</i> <i>b) Recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services - including the economic and other benefits of the best and most versatile agricultural land<sup>1</sup>, and of trees and woodland (where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality);</i> <i>e) Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soils, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water</i>	

<sup>1</sup> Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use, and Grade 5 is very poor quality land, with severe limitations due to adverse soil characteristics, relief, climate or a combination of these. Grade 3 land is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Grades 1, 2 and 3a are defined as best and most versatile land.

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Policy Document	Policy/ Reference	Summary of Requirements	Project Response
		<i>quality, taking into account relevant information such as river basin management plans; and</i>  <i>f) Remediating and mitigating despoiled, degraded, derelicts, contaminated and unstable land, where appropriate</i>	The assessment has considered the impact on receptors from land quality including controlled waters and agricultural land quality and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.
	Paragraph 178	<i>Planning policies and decisions should ensure that:</i>  <i>a) A site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);</i>  <i>b) After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the EPA; and</i>  <i>c) Adequate site investigation information, prepared by a competent person, is available to inform these assessments.</i>	
	Paragraph 179	<i>Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/ or landowner</i>	
	Paragraph 180	<i>Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.</i>	
A Strategy for England; Safeguarding Our Soils (Ref 12-1)		This Policy sets out the Government aims in relation to protecting agricultural soil and in relation to protecting the soil resource during construction and development. This includes a requirement that Planning decisions take sufficient account of soil quality, particularly where significant areas of the best and most versatile (BMV) agricultural land are involved.  Accordingly, whilst the presence of BMV agricultural land is a material consideration in taking Planning decisions this is one of a number of matters that have to be taken into account including other sustainability considerations such as: biodiversity, the quality and character of the landscape, accessibility to infrastructure, workforce and markets and maintaining viable communities.	The assessment has considered the impact on agricultural land quality and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.

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12.2.13 The assessment also considers those relevant policies of the Cambridge City Council Local Plan (2018) (Ref 12.34), South Cambridgeshire District Council Local Development Framework/ Local Plan (2018) (Ref 12.30) and Cambridgeshire and Peterborough Minerals and Waste Plan – Core Strategy Development Plan (2011) (Ref 12.32). These have been summarised within Table 12-2 below.

Table 12-2 Local Policy

Local Policy Document	Policy/ Reference	Description in Relation to Ground Conditions & Contamination	Project Response
Cambridge City Council Local Plan (2018)	Policy 8 Setting of the City	Development on the urban edge, including sites within and abutting green infrastructure corridors and the Cambridge Green Belt, open spaces and the River Cam corridor, will only be supported where it: ..... c. safeguards the best and most versatile agricultural land unless sustainable development considerations and the need for development are sufficient to override the need to protect the agricultural value of land	The assessment has considered the impact on agricultural land quality and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.
	Policy 33: Contaminated Land	Where contamination is suspected or known to exist, an assessment should be undertaken to identify existing/former uses in the area that could have resulted in ground contamination; and if necessary: d. design and undertake an intrusive investigation to identify the risks of ground contamination, including groundwater and ground gases; and if proven there is a risk; e. submit a remediation strategy and/or adopt and implement mitigation measures, to ensure a safe development and ensure that the site is stable and suitable to the new use in accordance with the National Planning Policy Framework (2012); f. ensure that there are no adverse health impacts to future/surrounding occupiers and groundwater impacts and that there is no deterioration of the environment.	The assessment has considered the impact on receptors from land quality including controlled waters and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.

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Local Policy Document	Policy/ Reference	Description in Relation to Ground Conditions & Contamination	Project Response
South Cambridgeshire District Council (SCDC) Local Development Framework/ Local Plan (adopted September 2018)	SC/11: Contaminated Land	Where development is proposed on contaminated land or land suspected of being impacted by contaminants the Council will require developers to include an assessment of the extent of contamination and possible risks. Proposals will only be permitted where land is, or can be made, suitable for the proposed use.	The assessment has considered the impact on receptors from land quality including controlled waters and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.
	Policy CC/7: Water Quality	In order to protect and enhance water quality, all development proposals must demonstrate that: b. The quality of ground, surface or water bodies will not be harmed, and opportunities have been explored and taken for improvements to water quality, including re-naturalisation of river morphology, and ecology; c. Appropriate consideration is given to sources of pollution, and appropriate Sustainable Drainage Systems (SuDS) measures incorporated to protect water quality from polluted surface water run-off.	The assessment has considered the impact on receptors from land quality including controlled waters and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.
	Policy NH/3: Protecting Agricultural Land	Planning permission will not be granted for development which would lead to the irreversible loss of Grades 1, 2 or 3a agricultural land unless: a. Land is allocated for development in the Local Plan; b. Sustainability considerations and the need for the development are sufficient to override the need to protect the agricultural value of the land.	The assessment has considered the impact on agricultural land quality and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.

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Local Policy Document	Policy/ Reference	Description in Relation to Ground Conditions & Contamination	Project Response
	CS26 Mineral Safeguarding Areas	<p>Mineral Safeguarding Areas are designated for deposits of Sand and Gravel, Brick Clay, Limestone and Chalk that are considered to be of current or future economic importance and defined on the Proposals Map. The Mineral Planning Authority must be consulted on Planning applications for developments in these areas. The following types of development proposal are excluded from the need to consult with the Mineral Planning Authority:</p> <p>a) Applications for development on land which is allocated in other adopted Local Development Plan documents</p> <p>Development will only be permitted where it has been demonstrated to the Mineral Planning Authority that</p> <ol style="list-style-type: none"> <li>1. the mineral concerned is no longer of any economic value or potential value, or</li> <li>2. the mineral can be extracted prior to the development taking place, or</li> <li>3. the development will not inhibit extraction if required in the future, or</li> <li>4. there is overriding need for the development and prior extraction cannot be reasonably undertaken, or</li> <li>5. the development is not incompatible</li> </ol> <p>Separate planning applications will be required for the prior extraction of minerals and the non-minerals development.</p>	The assessment has considered the impact on minerals and appropriate mitigation is detailed in Section 12.4 Design and Mitigation.
Cambridgeshire and Peterborough Minerals and Waste Plan – Core Strategy Development Plan Document (Adopted 19 July 2011)			The assessment has considered the impact on minerals and appropriate mitigation is detailed in Section 12.4 Design and Mitigation

## Guidance

12.2.14 A number of standards and non-statutory guidelines, which provide details of assessment methodologies and mitigation techniques, have been used to inform the assessment, including:

- EPA 1990: Part 2A Contaminated Land Statutory Guidance (Ref 12-1)
- Land Contamination: Risk Management (LCRM). (Ref 12-2)

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- Design Manual for Roads and Bridges (DMRB), LA109 Geology and Soils. (Ref 12-3)
- CIRIA Contaminated land risk assessment. A guide to good practice (C552). (Ref 12-4)
- Guiding Principles for Land Contamination. Environment Agency, 2010 (Ref 12-5)
- Contaminated Land: Applications in Real Environments (CL:AIRE), 2011 Definition of Waste: Development Industry Code of Practice, Version 2 (Ref 12-6)
- Construction Code of Practice for the sustainable re-use of soils on construction sites, also published by Department for Environment, Food and Rural Affairs (Defra). (Ref 12-7)
- BS10175 Code of Practice for the Investigation of Potentially Contaminated Sites. (Ref 12-8)
- BS8485 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. (Ref 12-9)
- Environmental Permitting Guidance (Defra). (Ref 12-10)
- CIRIA Assessing risks posed by hazardous ground gases to buildings (C665) (Ref 12-11).
- Defra, 2009. Construction Code of Practice for the sustainable re-use of soils on construction sites. (Ref 12-12)
- Natural England, 2012. Technical Information Note (TIN) 049. Agricultural Land Classification: protecting the best and most versatile agricultural land. (Ref 12-13)
- MAFF, 2000. Good Practice Guide for Handling Soils (Ref 12-14).
- CIRIA, Construction Industry Research and Information Association (2009) Unexploded Ordnance (UXO): a guide for the Construction industry. London. (Publication C681). (Ref 12.35)

## Consultation and Scoping

### Consultation

- 12.2.15 **Error! Reference source not found.** Table 12-3 provides a summary of consultee responses with respect to Ground Conditions and Contamination and how they will be addressed.

Table 12-3 Summary of Consultation

Consultee/ Contact/ Date	Summary of Consultee Issue	How the Issue will be Addressed/
Environment Agency (EA)/ Neville Benn/ 3 <sup>rd</sup> March 2020	<p>The proposed Development could have negative environmental impacts during both construction and subsequent phases. It is important that groundwater is adequately managed and protected throughout the development lifecycle, considering potential impacts upon both water quality and quantity.</p> <p>Temporary dewatering of excavations during construction may therefore be required. Dewatering activities could have an adverse impact upon local wells, water supplies and/or nearby watercourses and environmental interests. Subject to a detailed impact assessment compensation and/or monitoring measures may be required for the protection of other water users and water features. The</p>	<p>This chapter of the ES details the baseline conditions at the site, as presented in section 12.3, with design and mitigation measures presented in section 12.4.</p> <p>Issues relating to water resources are assessed within Chapter 18 Water Resources and Flood Risk.</p>



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Consultee/ Contact/ Date	Summary of Consultee Issue	How the Issue will be Addressed/
	EA would strongly recommend that any development does not involve basements as these would very likely be sub-water table.	
Greater Cambridge Shared Planning (GCSP)/ 19 <sup>th</sup> June 2020	<p>The following scope was agreed with GCSP at the meeting of 19 June 2020:</p> <p>The ES methodology will follow DMRB LA109 Guidance.</p> <p>The scope will include all construction impacts but not include operational impacts as there will be procedures in place to mitigate operational effects in the design.</p> <p>The Environmental Impact Assessment (EIA) will report on the effects on bedrock geology and superficial deposits, including geological designations and sensitive/ valuable non-designated features; and effects from contamination on human health, surface water and groundwater.</p> <p>Review of publicly available documents relating to the adjacent biomedical campus to better understand the actual ground conditions.</p> <p>Desk-based approach to be followed first, before determining whether site investigations are warranted, although currently not anticipated to be required prior to the Transport and Works Act Order (TWAO) submission.</p>	This chapter of the ES details the baseline conditions at the site, as presented in section 12.3, with design and mitigation measures presented in section 12.4.
South Cambridge District Council (SCDC)/ Nick Atkins (Environmental Health Officer)/ 9 <sup>th</sup> September 2020	Contaminated land issues should be considered where works are to be carried out.	This chapter of the ES details the contaminated land issues associated with the proposed Development.
Natural England / 13 <sup>th</sup> January 2021	<p>Impacts from the development should be considered in light of the Government's policy for the protection of the best and most versatile (BMV) agricultural land as set out in paragraph 170 and 171 of the NPPF.</p> <p>It is also recommended that soils should be considered under a more general heading of sustainable use of land and the valuing of ecosystem services they provide as a natural resource, in line with paragraph 170 of the NPPF.</p>	The potential presence of BMV agricultural land, and the functions of the soils which support this land (in relation to the ecosystem services they provide), have been assessed.

## Scoping

- 12.2.16 The construction works could introduce potential new sources of contamination such as fuels, oils, and other construction materials. Incorrect storage and handling could present a potential risk to site neighbours, soil and controlled waters from leakages or spillages.



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Therefore, effects on sensitive receptors from land contamination is scoped in for further assessment.

- 12.2.17 Construction workers are not considered to be receptors for the assessment as they are covered by Health and Safety legislation. This requires suitable risk assessment to be undertaken with appropriate mitigation measures implemented to address identified risks.
- 12.2.18 The Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref 12-15) was used to search for any statutory designated sites of nature conservation importance, priority habitats and European Protected Species (EPS) licences. There are no geological SSSIs or other designated geological sites within 2km of the proposed Development.
- 12.2.19 The Zetica Limited Unexploded Bomb (UXB) Risk Map (Ref 12-16) was used to review the risk presented from Unexploded Ordnance. The site lies in an area assessed with a low risk and therefore, following relevant guidance (Ref 12.35), no mitigation measures are considered necessary. Therefore, this has been scoped out.

## The Study Area

- 12.2.20 For the geological and soils environment, as set out in section 9.3.4 of the Scoping Report, the study area is the area within the proposed Development site boundary, as detailed on Figure 12-1.
- 12.2.21 With regards to land quality and hydrogeology, the study area reflects the surrounding geological, hydrogeological and environmental (e.g. landfill sites) features and the distance over which significant effects can reasonably be considered to have the potential to occur. The study area has therefore been set as the proposed Development site boundary with an additional 250m buffer.
- 12.2.22 The study area is considered appropriate for the consideration of historical and current potentially contaminative land uses which could be impacted by, or impact on the proposed Development as set out in section 9.3.4 of the Scoping Report. The 250m buffer, as defined within the scoping report, is based on professional judgement on the significance of offsite sources and low likelihood of plausible contaminant linkages at greater distance. Features located at greater distance will only be described if they are particularly large or have the potential to affect the land quality at the proposed Development.

## Methodology for Establishing Baseline Conditions

- 12.2.23 Baseline conditions have been characterised using available published data sources and Groundsure Enviro and Geo Insight Reports (Ref 12-17 & 12-18) and included as Appendices 12.2 and 12.3. Historical mapping has been obtained to understand previous land uses and the potential for contaminated land to be present due to historical activities within the Study Area (Appendix 12.4).
- 12.2.24 Environmental information from regulator databases has been reviewed. Table 12-4 identifies the data sources used to inform the desk study.

*Table 12-4 Desk Study Data Sources*

Data Source	Date	Data Obtained
Groundsure Enviro Insight (Ref 12-17) and Geo Insight Reports (Ref 12-18)	Report dated 15 May 2019	Historical mapping, aquifer classifications and environmental data

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Data Source	Date	Data Obtained
British Geological Survey (BGS) online viewer <a href="http://mapapps.bgs.ac.uk/geologyofbritain/home.html">http://mapapps.bgs.ac.uk/geologyofbritain/home.html</a> (Ref 12-19)	Accessed November 2020	Geological Data
Geology Map 188 for Cambridge, Solid and Drift (Ref 12-22)	Accessed November 2020	Geological Data
MAGIC <a href="https://magic.defra.gov.uk">https://magic.defra.gov.uk</a> (Ref 12-15)	Accessed November 2020	Environmental, soil groundwater and Agricultural Land Classification (ALC) Data
CSIE – Geotechnical Design Report (Ref 12-21)	Dated 09 October 2019	Geological Data
ESG (2014) NCS – AZ North and AZ South – Cambridge Factual and Interpretative Report, reference E4016-14 (Ref 12.33)	Dated June 2014	Geological Data

## Forecasting the Future Baseline

- 12.2.25 Further site investigation is proposed, to be defined in consultation with the regulatory authorities, which will define any future baseline if the development is to proceed. With no development the ground conditions at the site would remain unaffected.

## Defining the Importance/ Sensitivity of Resource

- 12.2.26 There is currently no defined methodology for assessing the value of receptors relating to ground conditions and contamination, so assessment of significance has been undertaken using professional judgement in line with guidance in the Design Manual for Roads and Bridges (DMRB) LA 109 Section 3, Part 11 – Geology and Soils, (Ref 12-3). This provides a methodology for assessing the impacts to geology and soils from development and its use has been agreed with the GCSP.
- 12.2.27 In relation to pre-existing (i.e. historic) contaminated land, a source-pathway-receptor approach in accordance with Environment Agency (EA) LC:RM (Ref 12-2) and CIRIA C552 (Ref 12-4) has been adopted for assessing risks from contaminated soil and/ or groundwater.
- 12.2.28 The adopted assessment methodology comprises a number of stages and has drawn from the DMRB LA 109 and informed by professional judgement.
- 12.2.29 The value of the identified agriculture/contamination receptors/ resources are assessed against the criteria shown in Table 12-5.

Table 12-5 Criteria for Determining Value/Sensitivity of Receptors/ Resources

Receptor (Sensitivity)	Value	Description
Very high		<b>Soil:</b> Soil directly supporting an EU designated site (e.g. Special Areas of Conservation [SAC], Special Protection Area [SPA], Ramsar). ALC grade 1 & 2.

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Receptor (Sensitivity)	Value	Description
		<p><b>Geology:</b></p> <p>Site protected by International, EU or UK legislation (World Heritage Sites, Geopark, Site of Special Scientific Interest.)</p> <p><b>Contamination:</b></p> <p>Human Health: Very high sensitivity land use such as residential with gardens or allotments</p> <p>Surface Water: Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) and 2Q95 <math>\geq 1.0\text{m}^3/\text{s}</math>.</p> <p>Site protected/ designated under European Commission (EC) or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/ Species protected by EC legislation LA108 (Highways England, 2020).</p> <p>Groundwater: Principal Aquifer providing a regionally important resource and/ or supporting a site protected under EC and UK legislation LA108 (Highways England, 2020).</p> <p>Groundwater locally supports Groundwater Dependent Terrestrial Ecosystems (GWDTE).</p> <p>Groundwater Source Protection Zone (SPZ) 1 (Inner)</p>
High		<p><b>Soil:</b></p> <p>Soil directly supporting a UK designated site (e.g. SSSI).</p> <p>ALC grade 3a.</p> <p><b>Geology:</b></p> <p>Site of local geological importance (Local Geological Site – previously Regionally Important Geological Site)</p> <p>Mineral Safeguarding Area</p> <p><b>Contamination:</b></p> <p>Human Health: High sensitivity land use such as public open space</p> <p>Surface water: Watercourse having a WFD classification shown in an RBMP and Q95 <math>&lt; 1.0\text{m}^3/\text{s}</math>.</p> <p>Species protected under EC or UK legislation LA108 (Highways England, 2020).</p> <p>Groundwater: Principal Aquifer providing locally important resource or supporting a river ecosystem.</p> <p>Groundwater supports a GWDTE.</p> <p>Groundwater SPZ 2 (Outer).</p>
Medium		<p><b>Soil:</b></p> <p>Soil supporting non-statutory designated sites (e.g. Local Nature Reserves (LNR), LGSs, Sites of Nature Conservation Importance (SNCIs)).</p> <p>ALC grade 3b.</p> <p><b>Geology:</b></p> <p>Localised mineral resources</p> <p><b>Contamination:</b></p>

<sup>2</sup> Q95 = The flow equaled or exceeded in a watercourse 95% of the time

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Receptor (Sensitivity)	Value	Description
		<p>Human Health: Medium sensitivity land use such as commercial or industrial.</p> <p>Surface Water: Watercourses not having a WFD classification shown in an RBMP and Q95 &gt; 0.001m<sup>3</sup>/s.</p> <p>Groundwater: Aquifer providing water for agricultural or industrial use with limited connection to surface water.</p> <p>Groundwater SPZ 3.</p>
Low		<p><b>Soil:</b></p> <p>Soil supporting non-designated notable or priority habitats.</p> <p>ALC grade 4 &amp; 5.</p> <p><b>Geology:</b></p> <p>Sites with little geological interest.</p> <p><b>Contamination:</b></p> <p>Human Health: Low sensitivity land use such as highways and rail.</p> <p>Surface Water: Watercourses not having a WFD classification shown in an RBMP and Q9 5 ≤ 0.001m<sup>3</sup>/s.</p> <p>Groundwater: Unproductive Strata.</p>
Negligible		<p><b>Soil:</b></p> <p>Previously developed land formally in 'hard uses' with little potential to return to agriculture.</p> <p><b>Geology:</b></p> <p>Sites with no geological interest.</p> <p><b>Contamination:</b></p> <p>Human Health: Undeveloped surplus land/ no sensitive land use e.g. housing proposed.</p>

- 12.2.30 In consideration of human health, the duration and frequency of exposure to contamination and number of pathways of exposure to contamination increases from commercial/ industrial (minimum) to residential with private garden (maximum) land uses. Therefore, future users of industrial sites are considered to be of low to medium sensitivity as they would have minimal contact with underlying soil, whilst residential end users are likely to be in contact with underlying soil on a more regular basis and are therefore attributed very high sensitivity.

## Methodology for Assessing Impacts

### Impact Characterisation

- 12.2.31 As for sensitivity there is no defined methodology for assessing the magnitude of impacts to ground conditions and contamination, therefore this assessment has been undertaken using professional judgement in line with guidance in the Design Manual for Roads and Bridges (DMRB) LA 109 Section 3, Part 11 – Geology and Soils, (Ref 12-3). This provides a methodology for assessing the impacts to geology and soils from development and its use has been agreed with the GCSP.

*The magnitude of impacts has been determined using the criteria outlined in*

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## 12.2.32 Table 12-6.

Table 12-6 Criteria for Determining the Scale of Impact on the Ground Conditions and Contamination

Magnitude of Impact	Definition
Major Adverse	<p>Geology – The proposed Development is very damaging to the geological environment/ soil resource of the study area; may result in loss of or damage to areas designated as being of regional or national geodiversity value; and the effects cannot be mitigated.</p> <p>Soils: physical removal or permanent sealing of soil resource or agricultural land.</p> <p>Human Health – Significant harm to a designated receptor (e.g. human health) is likely to arise from an identified hazard at the site without appropriate remedial action.</p> <p>Hydrogeology – Loss of, or extensive change to an aquifer used for potable supply, potential high risk of pollution of groundwater.</p> <p>Hydrology – Major decrease in water quality; loss or extensive change to a fishery, loss or extensive change to a designated Nature Conservation Site</p> <p>Buildings – Catastrophic damage to buildings, structures or the environment.</p>
Moderate Adverse	<p>Geology – The proposed Development may result in the loss of or damage to areas designated as being of national and/ or regional geodiversity value within the study area. Some mitigation may be possible but would not prevent damage to the geological environment, as some features of interest would be lost or partly destroyed.</p> <p>Soils: permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).</p> <p>Human Health – It is possible that without appropriate remedial action, significant harm to a designated receptor (e.g. human health) could arise to a designated receptor but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild.</p> <p>Hydrogeology – Partial loss or change to an aquifer, potential medium risk of groundwater pollution. Partial loss of the integrity of groundwater supported designated wetlands.</p> <p>Hydrology – Moderate decrease in water quality; partial loss in productivity of a fishery.</p> <p>Buildings – Significant damage to buildings, structures or the environment</p>
Minor Adverse	<p>Geology – The proposed Development would not affect areas with regional or national geodiversity value but may result in the loss of or damage to areas of local geodiversity value. The effects cannot be completely mitigated but opportunities exist for local enhancement of geodiversity value.</p> <p>Soils: temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).</p> <p>Human Health – It is possible that harm could arise to a designated receptor (e.g. human health) from an identified hazard but it is likely that at worst this harm if realised would normally be mild.</p> <p>Hydrogeology – No significant change to an aquifer, potential low risk of pollution to groundwater. Minor effects on groundwater supported wetlands</p>

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Magnitude of Impact	Definition
	<p>Hydrology – Slight decrease in water quality</p> <p>Buildings – Minor damage to sensitive buildings, structures services or the environment.</p>
Negligible Adverse	<p>Geology – The proposed Development would result in very minor loss of geodiversity value of local areas of geological interest/soils resource such that mitigation is not considered practical.</p> <p>Soils: no discernible loss / reduction of soil function(s) that restrict current or approved future use.</p> <p>Human Health – There is a low possibility that harm could arise to a designated receptor. In the event of such harm being realised, it is likely to be mild or minor.</p> <p>Hydrogeology – The Development is unlikely to affect the integrity of the water environment.</p> <p>Hydrology – Negligible decrease in water quality</p> <p>Buildings – Easily repairable effects of damage to buildings or structures</p>
No Change	No observable effect either adversely or beneficially.
Negligible Beneficial	<p>Geology – The proposed Development would be of minor benefit to geodiversity value by potentially providing greater exposure and or protection. The Development may resolve minor impact from existing land or water contamination.</p> <p>Contaminated Land – The proposed Development may resolve slight impact from existing land or water contamination.</p>
Minor Beneficial	<p>Geology – The proposed Development may result in the exposure of geological formations that may become of significant local interest.</p> <p>Contaminated Land – The proposed Development may resolve minor impact from existing land or water contamination.</p>
Moderate Beneficial	<p>Geology – There is benefit to the geodiversity value of the geological/ soil resource of the area as a result of the proposed Development. The proposed Development may result in the exposure of geological formations that may become of significant regional interest. The proposed Development may resolve moderate impact arising from existing land or water contamination</p> <p>Contaminated Land – The Development may resolve moderate impact arising from existing land or water contamination.</p>
Major Beneficial	<p>Geology – The proposed Development is very beneficial to the geodiversity value of the geological/ soil resource of the area. The proposed Development may result in the exposure of geological formations that may become of significant regional and or national interest. The proposed Development may resolve major impact arising from existing land or water contamination. Note; although very few projects are likely to meet this criterion, enhancement of the SSSI presents such an opportunity.</p> <p>Contaminated Land – The proposed Development may resolve major impact arising from existing land or water contamination.</p>

12.2.33 With respect to agricultural land, the England Annex to LA109 provides additional guidance as follows:

- A major magnitude impact should be assigned to the physical removal or sealing of >20ha of agricultural land.

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- A moderate magnitude impact should be assigned to the physical removal or sealing of 1 - 20ha of agricultural land or where permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).
- The physical removal or permanent sealing of <1ha of agricultural land should be reported as not discernible.

## Assessing Significance

- 12.2.34 The determination of significance of the impact is a factor of the value/ sensitivity of the feature/ resource (receptor) and the magnitude of the impact (change) as described above. Table 12-7 shows how the significance of effect is derived.

Table 12-7 Determination of the Significance of Effects

Magnitude of Impact (Change)	Value/ Sensitivity of Receptor/ Resource				
	Very High	High	Medium	Low	Negligible
<b>Major</b>	Very Large	Large/ Very Large	Moderate/ Large	Moderate	Slight
<b>Moderate</b>	Large/ Very Large	Moderate/ Large	Moderate	Slight	Neutral
<b>Minor</b>	Moderate/ Large	Moderate	Slight	Neutral	Neutral
<b>Negligible</b>	Slight	Slight	Neutral	Neutral	Neutral
<b>No Change</b>	Neutral	Neutral	Neutral	Neutral	Neutral

- 12.2.35 Significance of effects which are Very Large, Large or Moderate/ Large are considered to be significant for the purposes of EIA. Effects which are considered to be Moderate, Slight or Neutral are considered to be non-significant and would not require further consideration.

## Limitations and Assumptions

## Limitations

- 12.2.36 An intrusive ground investigation has not been undertaken to date at the proposed Development site. Widespread contamination is not anticipated based on the historical use of the site, however there could be localised ground conditions and/ or contamination within the proposed Development which are currently unknown.
- 12.2.37 The assessment of BMV agricultural land and the soils which support this is based on publicly available information.
- 12.2.38 This Chapter has been compiled from a number of sources. It is not possible to guarantee the accuracy of information provided by third parties. The report is based on information available at the time of the baseline review (May 2019). Consequently, there is a potential for further information to become available, which may change this report's conclusion and for which the authors of this Chapter cannot be responsible.

## Assumptions

- 12.2.39 An intrusive ground investigation will be undertaken at the detailed design stage which may identify areas of contamination that require remediation. This is to be undertaken as part of the design process.



## 12.3 Baseline

### Existing Baseline

#### Topography and Geomorphology

- 12.3.1 The site boundary covers an area of approximately 46.52 ha and lies within and adjacent to the existing railway corridor from Hills Road overbridge in the north to the west of the Cambridge Road overbridge.
- 12.3.2 The proposed Development site is generally level and contains the existing railway line. The site is centred around National Grid Reference TL 458 548 in the area immediately west of the Cambridge Biomedical Campus.
- 12.3.3 The general topography of the wider area is undulating, rising to more than 20m Above Ordnance Datum (AOD) on Stone Hill to the south-west and dropping to below 14m AOD in Hobson's Park Nature Reserve before rising up to 19m AOD close to Hills Road. The land rises to the east at White Hill, forming the start of a chalk ridge which continues to the south-east.
- 12.3.4 Residential areas in the vicinity of the proposed Development include: Cambridge City to the north; Trumpington to the west, Great Shelford village to the south and Red Cross to the east.

#### Published Geology

- 12.3.5 A review of the available BGS data (Ref 12-19) and Groundsure Report (Ref 12-17 and 12-18) indicates that there are superficial deposits beneath parts of the site toward the north, west and south of the site. These are predominantly River Terrace Deposits (RTD), with a very small section of Alluvium to the south, near Great Shelford. The RTD are described by the BGS as sand and gravel, and the Alluvium as clay, silt, sand, and gravels. Figures 12-1 and 12-2 (Appendix 12.1) present the superficial and bedrock geology.
- 12.3.6 The bedrock beneath the site consists of the West Melbury Marly Chalk Formation, Zig Zag Chalk Formation, Totternhoe Stone Member - Chalk, over the Gault Formation. The Gault Formation is described by the BGS as a mudstone and is the oldest in sequence. The remaining formations are described as chalk (Ref 12-19).
- 12.3.7 The Groundsure Report (Ref 12-17 and 12-18) noted numerous borehole logs recorded within the site boundary. Not all the boreholes provide adequate data, but a review of the available records indicate the geology encountered as follows:

#### South

- Two shallow boreholes from 1998 (located at NGR TL45SE108 and TL45SE10) to the south of the site, near 'Granham's Road', indicate Made Ground between 1.20 – 1.50m thick, overlying natural clay, sand, and occasional gravel to a maximum depth of 2.10m below ground level (bgl). The Made Ground comprised medium dense/firm to stiff sandy silty clay and disturbed firm to stiff very sandy silty clay. No groundwater was encountered.
- One deeper borehole (approx. 30m) to the south of the A1301, near the railway line (located at National Grid Reference grid square TL45SE17), recorded topsoil approximately 0.60m thick, overlying RTD comprising chalk gravels and sand approximately 2.20m thick. Underlying the RTD is Chalk Marl, recorded at approximately 21.9m thickness, before the Gault Formation with an approximate thickness 5.4m. The base of the Gault was not proven.

#### North

- One borehole dated 1978 (TL45NE27), located on 'Clifton Way' to the east of the A1307, records Fill comprising clayey sand and gravels approximately 4.50m thick. Underlying the fill is the Lower Chalk Formations comprising chalk and silt approximately 8.0m thick.



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Beneath this is the Gault Formation comprising stiff silty clay and the recorded thickness was approximately 6.0m. The borehole was 18.50m in depth.

- A borehole (TL45NE197) located to the west of the A1307, near 'The Busway', is recorded to be approximately 20m deep and dated 1998. The log recorded Made Ground comprising firm silty, sandy, slightly gravelly clay to a depth of 1.20m bgl. Underlying the Made Ground is medium dense, silty, sandy flint gravel to a depth of 3.60m bgl, before very stiff to stiff friable silty clay to a depth of 10.50m bgl. Underlying this is stiff fissured clay with sporadic bands of chalk throughout to a final depth of 20.0m bgl. Groundwater was encountered at 8.00m bgl and rose to 6.00m bgl after 20 minutes.

## Historical Site Investigation

- 12.3.8 No ground investigation records were available for review with respect to the survey site.
- 12.3.9 A ground investigation was undertaken on the site adjacent to the east for the proposed AstraZeneca New Cambridge Site in 2014 by ESG (Ref 12.33).
- 12.3.10 The ground conditions encountered comprised Made Ground to depths of 1 to 3m, with some limited Topsoil, recorded in areas across the site.
- 12.3.11 Superficial deposits were encountered underlying the Made Ground. These were generally recorded as River Terrace Deposits and/or Head Deposits to depths of up to 4.5m. A thin layer of probable Alluvium was encountered in the south.
- 12.3.12 The bedrock was reported as the West Melbury Marly Chalk, including basal Cambridge Greensand, to depths of between 12 and 20m. This was in turn underlain by the Gault, proven 40m, the maximum depth of investigation.
- 12.3.13 Groundwater was recorded to be encountered during the exploratory holes within the lower West Melbury Marly Chalk. Subsequent groundwater monitoring indicated piezometric levels of between 1 to 4m below ground level (bgl).
- 12.3.14 Ground gas monitoring was undertaken, with an indicative "low risk" (Characteristic situation 1) for the site (based on guidance in BS8485, Ref 12.8) although this was not considered definitive based on limited monitoring and isolated elevations of Carbon Dioxide.
- 12.3.15 A risk assessment screening on contamination testing undertaken as part of the investigation concluded that the site presented no significant risks for future site users and controlled waters.

## Soils

- 12.3.16 Published soil maps (Ref 12-19 and Ref 12-22) show that the soils are predominantly described as freely draining lime-rich soils with some shallower lime-rich soils over chalk. The mapped distribution of soils is shown on Figure 12-3 (Appendix 12.1).
- 12.3.17 Provisional ALC mapping (Ref 12-12) and Figure 12-4 (Appendix 12.1) shows this land to be mapped as Grade 2 and Grade 3 land. This mapping does not distinguish between Grades 3a and 3b and is not suitable for informing site-based assessments. It does however provide an indication of the likely ALC grades which may be present.
- 12.3.18 There is no published detailed ALC mapping available for the site, although land to the south and west has been mapped at a detailed level as Grades 2, 3a and 3b. Based on the presence of freely draining lime-rich soils and high-grade land in the locality it is assumed that the proposed Development is likely to comprise BMV land, potentially at Grade 2. The area of land in agricultural use mapped as Grade 2 within the proposed Development boundary is approximately 7.5ha.
- 12.3.19 As well as being high quality soils in terms of agricultural productivity, these soils will support other ecosystem services, such as reducing flood risk, supporting biodiversity (both above and below ground) and holding carbon in the form of soil organic carbon.

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## Minerals

- 12.3.20 The Cambridgeshire and Peterborough Minerals and Waste Core Strategy and Proposals Map C: Mineral Safeguarding Areas, adopted 19 July 2011, indicate the site is not located within a safeguarding area for mineral extraction.
- 12.3.21 The Mineral Resource Information Development Plans Cambridgeshire BGS technical report (Ref 12-20) and BGS mineral resource maps (Ref 12-19) indicates that the following minerals are present within the site boundary:
- Sand & Gravel: River Terrace Deposits – north and southern extents of the site; and,
  - Chalk: Grey chalk subgroup – central to the site.
- 12.3.22 Both resources are noted to be significantly sterilised beneath existing infrastructure, the chalk beneath the existing railways, and the sand and gravels within the development footprints associated with the suburban extension of Cambridge and as such can be considered to represent a limited mineral resource.
- 12.3.23 Network Rail Stage 1 Preliminary Mining Assessment (Ref 12-21) indicates no recorded mining or dissolution features issues in the vicinity of the site. A search of the BGS Coal Authority website indicated no previous mining exploration within the Study Area.

## Unexploded Ordnance

- 12.3.24 A Zetica regional Unexploded Ordnance (UXO) bomb map for the site was reviewed (Ref 12-16). The regional bomb risk map is compiled from multiple sources of information including records held by the UK Government, the Ministry of Defence and the German Luftwaffe. The Study Area is considered to have low UXO risk.

## Hydrogeology

- 12.3.25 The superficial RTD to the north, south and west of the site are classified by the EA as a Secondary 'A' Aquifer. These deposits have permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The bedrock geology across the entire site is classified as a Principal Aquifer. These units have high permeability and may support water supply or base flow to rivers on a strategic scale. Figure 12-5 (Appendix 12.1) presents the aquifer designations.
- 12.3.26 There are no groundwater Source Protection Zones (SPZ) or licenced groundwater abstractions on the proposed Development site. The nearest groundwater abstraction recorded is a historical abstraction point approximately 20m to the east. It is detailed for Network Rail Infrastructure Ltd and expired in 2011. The closest active abstraction is approximately 250m to the west and is detailed for irrigation for Scotsdale Nursery & Garden Centre. There are no potable drinking water abstraction licenses within 1km of the site boundary. Further detail is included in Chapter 16: Water Resources and Flood Risk.

## Hydrology

- 12.3.27 There are multiple surface water features (ponds, drains etc) that are either landscape features or land-drainage assets present across the site that are listed within the Groundsure Report (Ref 12-17 & 12-18). Hobson's Brook is located within the site boundary and runs north to south. The catchment area for the surface water features is the Cam Ely Ouse and South Level which is classified by the EA as moderate for ecological status and good for chemical status, with moderate for an overall water body quality. Further details of water features are provided in Chapter 18 Water Resources and Flood Risk.

## Historical Review

- 12.3.28 A summary of the historical development (focussing on potentially contaminative land uses) of the proposed Development Study Area has been developed from a review of the available

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Ordnance Survey (OS) maps included within the Groundsure Report (Ref 12-17 & 12-18). The salient points are discussed below and shown on Figure 12-6 (Appendix 12.1).

- The 1888 OS map indicates the railway line was present, reflecting the current railway orientation of north to south. Branch lines were indicated running south-west of Cambridge Station (Cambridge & Bletchley Branch), east of Cambridge Station (Cambridge, Newmarket, Bury & Haughley Line), east of New Market Road, the A1134 in current day (Barnwell Junction – Cambridge & Mildenhall Line) and west of the River Cam in the northern area of the site (Chesterton Junction – Cambridge & St Ives Branch). Land at the southern part of the site comprised mostly agricultural use with Brick & Tile works, clay pits and Tramways then present at the northern area of the site (north of Coldhams Lane). Gravel Pit, Gas works and Exchange Iron works were shown to be present west of the railway line to the south, north and north of the Coldhams Lane, respectively.
- The 1903 OS map indicates development had occurred in the surrounding area. The CCH (Cambridge – Haughley Junction) Branch line was now shown north-east of Coldhams Lane, connecting to the existing Cambridge, Newmarket & Bury Branch line. North of the River Cam, Ballast Pits and a Gravel Pit were indicated west and east of the railway line, respectively. Coal yards were indicated at the south-western end of Cambridge station. A sewage pumping station was located north-west of the railway line and a timber yard adjacent to the railway line by Homerton College.
- The 1927 OS map indicates that the stretch of the Cambridge Newmarket & Bury Branch line to the east side of the Cambridge station and the Ballast Pit to the north of the River Cam no longer existed, with the Ballast Pit indicated then to have been grassland. A Coal Depot was present to the north-west of Cambridge Station and a Petrol Depot was present to the north-east of the Barnwell Junction. A number of properties were now present to the south of Cambridge Station.
- The site and surrounding area do not change significantly over the next 40 years.
- The 1967 OS map indicates that residential properties had been developed along the rail alignment. A Sewage Works and Rail Central Materials Depot were then shown north-west of the Cambridge and St Ives Branch line. Addenbrookes Hospital was present (with the first building opened on its present site in 1962). Gravel Pits and Brick Works were no longer indicated to be present. The Bedford & Cambridge (former Cambridge & Bletchley Branch) and the Cambridge & Mildenhall Branch lines had been dismantled.
- The 1973 OS map indicates that further properties had been developed in the northern part of the site. The Gas Holder Station and Sewage Works (between Newmarket Road and the River Cam, approximately 500m north-west of the site) were indicated to still be present. The southern end of the site remained mostly grassland.
- No significant development occurred in the following 10 years, but by the current day Cambridge North Station had been constructed and was operational. The Cambridge & St Ives Branch line is no longer present. The Cambridgeshire Guided Busway runs within the site of the former Cambridge & Bletchley Branch line, which is to the west of the existing railway. This runs parallel to the railway for approximately 1km. The Gas Holder Station and Sewage Works are no longer present. The Sewage Works located to the north of Cambridge North Station remain present. Further development has taken place east of the railway line, between Long Road and Nine Wells Bridge. Laboratories, health institutes, hospitals and University of Cambridge campus are now located within this area.

## Environmental Data

- 12.3.29 Public register information for the site and the surrounding area has been obtained from the Groundsure Report (Ref 12-17 & 12-18). The locations of these features are illustrated on the maps included within the Groundsure Report.
- 12.3.30 Table 12-8 provides a summary of the statutory information on permits and consents on and within 250m of the study area.

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Table 12-8 Summary of Environmental Statutory Information

Subject	Number Present		Details
	On-Site	0 – 250m	
Industrial Sites Holding Licences and/ or Authorisations			
Records of Historic Integrated Pollution Control (IPC) Authorisations	No records located.		
Records of Part A(1) and Integrated Pollution Prevention and Control (IPPC) Authorised Activities	No records located.		
Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	No records located.		
Records of List 1 Dangerous Substances Inventory Sites	0	1	The Groundsure Report provides one record. Maintrain Limited, located 36m north-west of the site. The record indicates that the Authorised Substances are Mercury (other) and Cadmium.
Records of List 2 Dangerous Substance Inventory Sites	2 (non-active)	11 (one active)	The Groundsure Report provides two records of List 2 Dangerous Substance Inventory Sites on-site and a further 11 records for within 250m of the site. The two on-site records are indicated to be non-active. Of the 11 off-site records, only one is indicated to be active, for Exhaust & Former Tyco Sites, located 7m east of the site and the record indicates that the Authorised Substances are pH.
Records of Category 3 or 4 Radioactive Substances Authorisations	0	4 (non-active)	The Groundsure Report provides four within 250m of the site (none on-site). The four records all relate to Pic Fyfield Limited, located 21m north-west of the site but the records have either been revoked or superseded by variations.
Agency and Hydrological			
Discharge Consents	2 (one active)	10 (three active)	The Groundsure Report provides two records of discharge consents on-site and a further 10 records for within 250m of the site. Of the two on-site records one is indicated to be revoked. The other is licenced to NCS CAMBRIDGE, (Gate A & Gate B, Francis Crick Avenue) with a drainage tributary of the Hobson's Brook identified as the receiving water body. Records indicate that three of the surrounding 10 discharge consents remain active.
Environment Agency/ Natural Resources Wales	1	1	The Groundsure Report provides two records of recorded pollution incidents, one on-site and one off-site (within 250 m radius of the site). The

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Subject	Number Present		Details
	On-Site	0 – 250m	
Recorded Pollution Incidents			on-site incident occurred in July 2002, with the pollutant described as Hydraulic Oils, resulting in a minor (Category 3) impact to land.
Sites Determined as Contaminated Land under Part 2A EPA 1990	No records located.		
Groundwater Abstraction Licences	0	1 (expired)	The Groundsure Report provides a record of one licenced groundwater abstraction within 250m of the site. The licence, which expired in 2011, granted to Network Rail Infrastructure Limited for the abstraction of groundwater from a borehole located 22m east of the site with a maximum abstraction rate of 30m³ per day.
Surface Water Abstraction Licences	1	3	The Groundsure Report provides records of one surface water abstraction on-site and a further three off-site (within 250 m radius of the site). The on-site abstraction is licenced to Pemberton, for the abstraction of water from Hobson's Brook at a maximum daily rate of 1,364m³. The abstraction is noted to be historical, but no expiry date is provided.
Potable Water Abstraction Licences	No records located.		
<b>Historical Military Sites</b>			
No records located. <sup>3</sup>			
<b>Waste</b>			
Records from Environment Agency/Natural Resources Wales Landfill Data	No records located.		
Records of Environment Agency/Natural Resources Wales Historic Landfill Sites	No records located.		
Records of BGS/ Department of Environment (DoE) Non-Operational Landfill Sites	No records located.		
Records of Landfills from Local Authority and Historical Mapping Records	No records located.		

<sup>3</sup> Certain military installations were not noted on historic mapping for security reasons. This research was drawn from a number of different sources and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

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Subject	Number Present		Details
	On-Site	0 – 250m	
Records of Waste Treatment, Transfer or Disposal Sites	5	3	The Groundsure Report provides five records of waste treatment, transfer or disposal sites on-site and a further three records for within 250m of the site. The five on-site records relate to a scrap yard and date from 1966 to 1986. The three within 250m of the site also relate to scrap yards, the closest of which is located 13m north of the site and the associated Planning Application is dated 1967.

**Hazardous Substances**

Dangerous or Hazardous Sites	No records located.
Radon Protection	No radon protective measures are necessary <sup>4</sup> .

**Industrial Land Use**

Records of Potentially Contaminative Industrial Sites	30	164	The Groundsure Report provides records of 30 potentially contaminative industrial premises on-site and a further 164 premises within 250m of the site. The premises comprise a range of industrial uses including vehicle repair, testing and servicing, railway stations, junctions and halts, tanks and precision engineers.
Petrol and Fuel Sites	1 (obsolete)	4 (obsolete)	The Groundsure Report provides records of one petrol/ fuel site on-site and a further four premises within 250m of the site. The record relating to the on-site petrol/ fuel site is indicated to be obsolete as are the four off-site premises.
Records of National Grid High Voltage Underground Electricity Transmission Cables	No records located.		
National Grid High Pressure Gas Transmission Pipelines	No records located.		

12.3.31 Potential sources of contamination on site and in the immediate surrounding area (generally within a 250m buffer unless considered to represent a significant source of contamination) are summarised in Table 12-9 below.

Table 12-9 Summary Potential Contaminant Sources

	Source
On-Site	Made Ground Surface water features including ponds and drains Railway infrastructure including stations and historic coal yards/ depot Petrol filling station

<sup>4</sup> As described in Building Research Establishment publication BR211 (2015) Radon.

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	Source
	Waste treatment/ disposal facilities (scrapyard) Historic gravel/ ballast and clay pits Historic works including brick and tile works Multiple industrial land uses such as vehicle repairs, tanks and engineering works One (known) historic pollution incident (July 2002, hydraulic oil classified as Minor by EA).
Off-Site	Made Ground Railway infrastructure including stations and historic coal yards/ depot Petrol filling stations Waste treatment/ disposal facilities including scrapyards Sewerage works Gas holder station/ gas works Addenbrookes Hospital Historic gravel/ ballast and clay pits Historic works including Exchange Iron Works Multiple industrial land uses such as vehicle repairs, tanks and engineering works One (known) historic pollution incident

12.3.32 Potential exposure pathways are the routes that link the receptor to the contamination. The potential pathways for this site are considered to be those listed within Table 12-10 below.

Table 12-10 Summary Potential Contaminant Sources

Receptor	Pathway
Human health (future site users, visitors, maintenance workers and contractors)	Accidental ingestion of contaminants within soil, water and dust. Inhalation of dusts, vapours or hazardous ground gas. Dermal contact with contaminants in soil, water and dust.
Controlled waters (Principal Aquifer)	Leaching of contaminants from Made Ground and vertical migration into groundwater. Horizontal migration of contaminants in groundwater.
Infrastructure (current and proposed services/foundations)	Direct contact of buildings, services or foundations with contaminants in the soil and shallow groundwater. Migration and accumulation of ground gas which may lead to an explosive risk within confined spaces of buildings or services.

12.3.33 Table 12-11 provides a summary of the sensitivity values assigned to receptors relevant to the Study area. These have been assigned using the criteria presented in [Error! Reference source not found.](#)

Table 12-11 Summary of the Value of Geology, Hydrogeology & Land Quality Receptors

Receptor Type	Receptors	Value (Sensitivity)
Geology	Superficial Deposits	Medium
	Bedrock	High



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Receptor Type	Receptors	Value (Sensitivity)
	Minerals	High
BMV Agricultural Land and soil function	Land in Grades 1, 2 and 3a (assumed the entire extent of agricultural land comprises Grade 2 land) and the range of ecosystem services these soils support	Very High
Human Health	Existing residents in nearby properties Users of Public Open Space	Very High High
Hydrogeology	Principal Aquifer (Chalk Formation)	High
	Secondary A (River Terrace Deposits)	Medium
Surface Water	HobAson's Brook	Medium
	Ponds, drains	Medium
Buildings / Structures	Existing and proposed	High to Low

## Future Baseline

- 12.3.34 The proposed Development is expected to be constructed in phases over an approximate 2-year programme between 2023 and 2025. Existing baseline conditions with respect to geology, hydrogeology and land quality would be unlikely to change significantly between now and 2025 in the absence of the proposed Development.
- 12.3.35 Contamination, if present, is anticipated to result from historic/ current land uses. Therefore, the existing baseline conditions are considered likely to represent the future baseline conditions for the proposed Development study area.
- 12.3.36 The land grade under the ALC system is unlikely to change over time. The grade of agricultural land is determined predominantly by the soil's physical characteristics (in particular texture and related structure) which will not change.
- 12.3.37 Climate change is considered likely to have an effect on soil characteristics (resulting from increased temperatures and increased intensity of rainfall events), potentially reducing soil carbon levels and affecting yields. However, the main soil types are freely draining or shallow soils which may already be affected by droughtiness. It is therefore considered that this will not materially change the baseline over the course of the construction period of the proposed Development.
- 12.3.38 It is not possible to predict future changes to regulatory policy and frameworks so the future baseline assumes no significant changes with respect to these. It is not envisaged that future minor changes or refinements would materially affect this assessment.

## 12.4 Design and Mitigation

- 12.4.1 The design features of the proposed Development and mitigation measures that would avoid/reduce/remediate adverse effects on ground conditions and contamination are set out in this section.



## Construction Approach and Mitigation of Construction Effects

- 12.4.2 The layout has been rationalised to minimise the extent of land required permanently for the proposed Development.
- 12.4.3 An assessment of the effects on the ground conditions, contamination and hydrogeological receptors resulting from the construction of the proposed Development has been undertaken. This has considered the baseline information presented and the types of construction activities likely to be involved. When assigning magnitude of the impacts identified, in accordance with Table 12-5, the following measures and controls have been assumed to be in place.
- 12.4.4 An intrusive ground investigation will take place across the proposed Development to establish the general ground conditions at the detailed design stage. The data will be assessed using the source-pathway-receptor principles and a Conceptual Site Model for the proposed Development created. Further detailed intrusive investigations may need to be undertaken at specific locations during detailed design to increase the understanding of ground conditions and further define areas of contamination.
- 12.4.5 If unacceptable risks are identified during the intrusive investigation due to the concentrations of contaminants found, remediation would be proposed to reduce the risk to receptors. This could include removal of contaminated materials (excavation) or remediation by appropriate *in-situ* or *ex-situ* techniques. The action required would be detailed in a Remediation Strategy. Procedures detailed in paragraphs 12.4.4 and 12.4.5 will be agreed with the Local Planning Authority as part of the discharge of the contaminated land deemed planning condition.
- 12.4.6 Construction works will include the removal of vegetation, stripping of topsoil, excavation and localised earth movements. These activities have the potential to mobilise contaminants (if present) into the water environment in these areas. During these works a watching brief protocol would be adopted, the principles of which will be detailed in a Code of Construction Practice (CoCP) Part B and associated Remediation Strategy, to be produced by the contractor and approved by the relevant Local Planning Authority prior to construction commencing. Suspected contaminated material would be analysed to determine if it is suitable for re-use on the site or requires disposal off-site to an appropriate soil recycling or disposal facility.
- 12.4.7 The sustainable re-use of the soil resource would be undertaken in line with the CoCP for the Sustainable Use of Soil on Construction Sites (Ref 12-12). This would be achieved by the development of a Soil Resources Plan (based on a detailed pre-construction soil survey) and a Soil Management Plan (SMP) to identify the soils present, proposed storage locations and handling methods and how the resource will be re-used. The Soil Resources Plan and SMP would be produced by an appropriately qualified and experienced soil scientist who holds full membership of a relevant professional body such as the British Society of Soil Science (BSSS).
- 12.4.8 The Soils Resources Plan and the SMP would form part of the CoCP Part B. Measures which would be implemented include (but are not limited to):
- completion of a Soil Resources Survey and incorporate results into a SMP;
  - link the SMP to the Site Waste Management Plan (SWMP);
  - ensure soils are stripped and handled in the driest condition possible;
  - confine vehicle movements to defined haul routes until all the soil resource has been stripped;
  - protect stockpiles from erosion and tracking over; and
  - ensure physical condition of the entire replaced soil profile is sufficient for post-construction use.
- 12.4.9 As far as possible, soils would be re-used on site. The soils stripped from the construction areas would be re-used appropriately to provide suitable conditions for the required end use.

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Any reuse of materials on site would be managed, recorded and verified under an appropriated Materials Management Plan (MMP).

- 12.4.10 All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.
- 12.4.11 Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to neighbouring agricultural activities.
- 12.4.12 In line with best practice and as outlined in the CoCP Part A, prior to any construction compound area being prepared, a baseline survey will be undertaken to determine the current land quality across the compound area. The survey would be designed to highlight localised contamination, if present, above risk-based 'suitable-for-use' criteria. If appropriate such areas will be remediated prior to, or as part of, the soil stripping/ enabling works or other measures such as the use of an appropriate cover system/ barrier to reduce the risk of exposure to site workers. This action is outlined in the CoCP (Part A), with the detail to follow in the CoCP (Part B).
- 12.4.13 Within the construction site compounds, specific areas would be designated for the storage of chemicals, waste oils and fuel, and refuelling activities. These areas will be bunded and placed on hardstanding to prevent downward migration of contaminants. Any transfer of fuel or other potentially contaminated liquids would only take place within a designated fuel transfer area. Appropriate secondary spill containment would be provided to reduce the risk of spillages. These areas would be designed with appropriate drainage to ensure any spillages can be isolated. Wastewater generated from the construction compound will be disposed of via appropriate means, e.g. pumped out and removed from site by tanker or disposal under consent. This action is outlined in the CoCP (Part A), with the detail to follow in the CoCP (Part B).
- 12.4.14 An Emergency Response/ Spill Response Plan would be produced by the main works contractor as part of the CoCP (Part B). Appropriate equipment (e.g. spill kits, absorption mats) would be made easily accessible on-site and personnel will be trained in using them. Clear protocols and communication channels would be provided and included in the CoCP Part B to ensure that any spillages are dealt with immediately and adequately. This would prevent large areas of soil/geology potentially becoming contaminated and in turn protect surface water quality. This action is outlined in the CoCP (Part A), with the detail to follow in the CoCP (Part B).
- 12.4.15 During the construction phase, localised contamination may occur within the compound areas through spillages/leakages of fuel and, therefore, a repeat baseline survey would be undertaken once the construction is complete and the compound dismantled, to demonstrate the area has been returned to its previous state. If contamination has occurred during the lifetime of the compounds, remediation would be undertaken to return the land to its previous land quality state and would be detailed in the CoCP Part B.
- 12.4.16 Mitigation measures following best practise to prevent pollution incidents to receptors during the construction phase would be provided in the CoCP Part B. The plan would include pollution prevention guidelines for activities such as excavation and dewatering, storage of fuels, chemicals and oils, vehicle washing, pollution control and emergency contingency.
- 12.4.17 Excavated soil, whether for construction or as remediation action, would be appropriately stored to ensure that if dust is generated in dry weather periods, it is not likely to be directed towards surrounding receptors. Other best practice measures such as damping down areas, vehicle wheel washing, covering stockpiles and lorries containing excavated soil would also be implemented. This action is outlined in the CoCP (Part A), with the detail to follow in the CoCP (Part B). Further information is presented in Chapter 7 Air Quality.
- 12.4.18 Should contaminated soil be encountered, the material will be treated so it can be reused within the proposed Development site or if this is not possible, the material would be disposed of at an appropriate waste facility. Re-use criteria (protective of human health and

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groundwater) would be defined within a Remediation Strategy (if required), which would be approved by the regulator prior to implementation.

- 12.4.19 Geotechnical methods such as piling for the foundations of the structures may be used to construct proposed infrastructure. Such techniques can introduce pathways for contaminants in pore water to migrate into underlying groundwater. Appropriate techniques would be reviewed, and appropriate design would be included to safeguard the underlying groundwater regime to ensure that groundwater quality is not compromised. Foundations for buildings and infrastructure will be appropriately designed to accommodate the ground conditions across the site and reduce the risk of instability.
- 12.4.20 To reduce the risk to surface water, excavated materials will be appropriately stored to ensure that water runoff from stockpiles does not enter the water environment via drains and nearby watercourses. If necessary, stockpiles would be covered. Pollution prevention best practice protocols would be adopted to ensure contaminated material does not enter surface water and will be detailed in the CoCP Part B.
- 12.4.21 A Site Waste Management Plan (SWMP) and a Materials Management Plan (MMP) that would form part of the CoCP Part B would be developed by the Contractor. The MMP would be prepared following the protocols within the CL:AIRE Definition of Waste: Development Industry Code of Practice (Ref 12-6) to ensure that excavated material are re-used appropriately, sustainably and remain outside the waste hierarchy.
- 12.4.22 During the construction phase, site operatives could potentially be exposed to soil via accidental ingestion, inhalation or dermal contact. If contamination is present to mitigate risks, all persons engaged in site construction works would be made aware of the findings of the intrusive investigations and the hazards associated with handling potentially contaminated materials via the CoCP Part B and Construction Phase (Health and Safety) Plan. All works would be conducted in accordance with the Health and Safety Executive publication entitled Protection of Workers and the General Public during the Development of Contaminated Land (HSE, 1991) and follow Construction (Design and Management) Regulations (2015).
- 12.4.23 Suitable Personal Protective Equipment (PPE) including Respiratory Protective Equipment (RPE) would be available to all site workers as detailed in the Construction Phase Plan. Appropriate site hygiene protocols would be adopted during the construction phase.
- 12.4.24 Where any hazardous chemicals are used in the construction works, risk assessments would be developed under the Control of Substances Hazardous to Health Regulations 2002 (as amended) and detailed in the CoCP Part B.
- 12.4.25 The Study Area is considered to have low UXO risk. However, a tool box talk would be recommended to ensure that all personnel are aware of the risks from UXOs.
- 12.4.26 The groundwater is known to be relatively shallow in areas where superficial River Terrace Deposits are present. During construction of infrastructure and foundations in these areas, groundwater control may be required. No data is currently available regarding groundwater contamination. If during future investigations or the construction works, contamination is found, produced groundwater would be disposed of appropriately and with the necessary agreements in place. During such activities, consideration would be given to soil concentrations in the locality to ensure that contaminants do not become mobilised and enter the water environment.
- 12.4.27 If required, assessment of ground conditions near to existing infrastructure would be undertaken to demonstrate that construction techniques (e.g. piling) and excavations near to existing features would not have a detrimental effect on the foundations of these features. If a potential structural risk is considered to be present, appropriate mitigation would be implemented.
- 12.4.28 No information is available regarding the gas regime across the proposed Development. An investigation and multiple rounds of gas monitoring will be required for detailed design. Based on the results of the assessment, appropriate gas protection measures (if required) will be designed into the buildings to mitigate the risk from ground gases present.

## Scheme Design and Mitigation of Operational Effects

12.4.29 The assessment of the operational effects of the proposed Development has been scoped out of the assessment.

## 12.5 Assessment of Residual and Cumulative Effects

### Introduction

12.5.1 The following sections outline the residual effects once the mitigation measures described in Section 12.4 have been implemented.

### Residual Effects from Construction

- 12.5.2 During construction activities there is the potential for accidental spillages of oils, chemicals, cement and fuels from the movement of construction traffic and the storage of chemicals. This could impact the underlying ground, with the potential for contamination to migrate into the water environment. Geology across the site is considered to have a low value. If the design and mitigation measures A detailed in Section 12.4 are implemented, the magnitude of impact is considered to be negligible with an overall Neutral significance of effects, considered to be Not Significant. Groundwater underlying the site is considered to have a low value with regards to the Secondary A Aquifer and to be high value when considering the Principal Aquifer designation. With the implementation of the design and mitigation measures detailed in Section 102.4 (Ref 12-3) the magnitude of impact is considered to be negligible with an overall Slight Adverse or Neutral significance of effects. Surface water is considered to be of medium value and assuming the appropriate environmental design measures and mitigation are adopted, the magnitude of impact is considered to be negligible. The significance of effects is assessed as Neutral. These effects are all considered to be **Not Significant**.
- 12.5.3 Infrastructure such as existing railway infrastructure and buildings and utilities are present. Damage could occur to these features during construction. With the implementation of the design and mitigation measures detailed in Section 12.4, the magnitude of impact on these receptors is considered to be minor adverse resulting in an overall Neutral significance of effects which is considered to be **Not Significant**.
- 12.5.4 During construction some loss of mineral resources (primarily sands and gravels) will occur. The site does not lie within a mineral safeguarding area and the resource is considered to represent a medium value receptor with the magnitude of impact on this receptor considered to be negligible adverse resulting in an overall Neutral significance of effects which is considered to be **Not Significant**.
- 12.5.5 During construction a total of approximately 7.5ha (based on available mapping) of BMV (Grade 2) land (a receptor of Very High sensitivity) in agricultural use would be temporarily lost from agricultural production. However, following the restoration of land required temporarily, the permanent loss would be reduced to approximately 4.5ha of BMV (Grade 2) land in current agricultural use. This would be a Moderate Adverse impact which would be of Large / Very Large significance.
- 12.5.6 These effects are considered to be **Significant** for the purposes of this EIA. There are no additional measures available to mitigate for the loss of BMV land. As detailed above, all soils will be handled according to best practice to ensure their effective re-use and therefore the retention of a range of ecosystem services which they can support.

### Residual Effects from Operation

12.5.7 The impacts from potential contamination during the operational phase have been scoped out.

## Cumulative Effects

- 12.5.8 As per the Scoping Report, this Chapter does not consider the cumulative effects of the proposed Development with other schemes in the Cambridge vicinity with regard to ground conditions, soils, contamination and hydrogeology. The committed developments should follow best practice with regards to land quality and soils. Under existing regulatory and planning requirements, identified committed developments (in Appendix 2.3) would be required to have appropriate measures in place during the demolition and construction phases (such as remediation and dust control) and during operation to minimise potential risks to human health and the environment. As such, the development of these sites would not result in cumulative effects related to ground conditions and contamination.
- 12.5.9 However, due the interface between the proposed Development and the CSET scheme, potential cumulative agricultural land effects have been considered in relation to these two schemes. Whilst the CSET scheme will affect BMV land, the majority of this would be restored by the end of the construction phase and so it is considered that this will not have a cumulative effect above that already assessed for the proposed Development.

## 12.6 Assessment Summary

- 12.6.1 Table 12-12 [Error! Reference source not found.](#) provides assessment summary with respect to construction activities and how they have been addressed.

Table 12-12 Assessment Summary

Receptor	Potential Significant Effect	Phase (Construction [C], Operation [O])	Mitigation Measure	Residual Effect Significance
Human Health – Nearby Residents	Exposure to potentially contaminated soil (as dust generated from earthwork activities)	C	Use of best practice on site to avoid creation of dust. Determine areas of contaminated soil prior to earthworks detail mitigations within CoCP Part B.	Slight Adverse – <b>Not Significant</b>
Geology/ Land Quality	Potential impact to land quality via small scale spills/ leakage from tanks or vehicles.	C	Baseline survey prior to development of construction compounds. Best practice e.g. implementation of pollution prevention measures as detailed in CoCP Part B. Repeat survey at end of construction and removal of any contamination created.	Neutral – <b>Not Significant</b>
Soils / BMV land	Permanent loss of approximately 4.5ha of BMV (Grade 2) land in current agricultural use	C	Best practice soil handling to ensure effective soil re-use and retention of a range of ecosystem services which they can support.	Large / Very Large - <b>Significant</b>

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Receptor	Potential Significant Effect	Phase (Construction [C], Operation [O])	Mitigation Measure	Residual Effect Significance
Hydrogeology (Principal and Secondary Aquifer)	Mobilisation of contaminants from soil to groundwater.	C	Use of pollution prevention measures on site. Removal of contaminated materials via remediation to reduce mobilisation. Appropriate construction techniques (e.g. piling) to reduce risk of creating pathways.	Slight Adverse or Neutral – <b>Not Significant</b>
Surface Water	Mobilisation of contaminants from soil to surface water.	C	Use of pollution prevention measures on site. Removal of contaminated materials via remediation to reduce mobilisation. Best practice in stockpiling of materials away from water courses	Neutral – <b>Not Significant</b>
Existing Buildings/ Infrastructure	Potential damage to existing infrastructure during excavation or foundation works.	C	Assessment of ground conditions around and structural assessment of existing features.	Neutral – <b>Not Significant</b>

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## 12.7 References

Reference	Title
Ref 12-1	Defra (2009). A Strategy for England; Safeguarding Our Soils
Ref 12-2	Environment Agency 2020 Land Contamination: Risk Management
Ref 12-3	Highways England 2019 Design Manual for Roads and Bridges (DMRB) LA109 Geology and Soils
Ref 12-4	Rudland et al. 2001. CIRIA (formerly known as the Construction Industry Research and Information Association) Report C552 'Contaminated Land Risk Assessment: A Guide to Good Practice.'
Ref 12-5	Environment Agency 2010 Guiding Principles for Land Contamination
Ref 12-6	CL:AIRE 2011 Definition of Waste: Development Industry Code of Practice Version 2
Ref 12-7	Defra (2009). Construction Code of Practice for the sustainable re-use of soils on construction sites
Ref 12-8	BS 2011. BS10175 +A2:2017 Code of Practice for the Investigation of Potentially Contaminated Sites. London. British Standards Institution.
Ref 12-9	BS 2015. BS8485 +A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. London. British Standards Institution.
Ref 12-10	Defra (2013). Environmental Permitting Guidance, Core Guidance for the Environmental Permitting (England and Wales) Regulations 2010. London. The Stationery Office Limited.
Ref 12-11	CIRIA (2006). CIRIA C665 Assessing risks posed by hazardous ground gases to buildings. London. Construction Industry Research.
Ref 12-12	Defra, 2009. Construction Code of Practice for the sustainable re-use of soils on construction sites.
Ref 12-13	Natural England, 2012. Technical Information Note (TIN) 049. Agricultural Land Classification: protecting the best and most versatile agricultural land.
Ref 12-14	MAFF, 2000. Good Practice Guide for Handling Soils.
Ref 12-15	Defra (2019). Multi-Agency Geographic Information for the Countryside (MAGIC Map, Online) Available at: <a href="https://magic.defra.gov.uk">https://magic.defra.gov.uk</a> (Accessed Sept 2020).
Ref 12-16	Zetica Limited (2020). Unexploded Bomb (UXB) Risk Map (Online). Available at: <a href="https://zeticauxo.com/downloads-and-resources/risk-maps/">https://zeticauxo.com/downloads-and-resources/risk-maps/</a> (Accessed November 2020).
Ref 12-17	Groundsure (2019). Enviro Insight Report Reference GS-6030568, dated 15 May 2019. Groundsure Limited.
Ref 12-18	Groundsure (2019). Geo Insight Report Reference GS-6030569, dated 15 May 2019. Groundsure Limited.
Ref 12-19	BGS (2020). BGS Online Viewer. Available at: <a href="http://mapapps.bgs.ac.uk/geologyofbritain/home.html">http://mapapps.bgs.ac.uk/geologyofbritain/home.html</a> (Accessed November 2020).

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Reference	Title
Ref 12-20	Harrison, DJ, Henney, PJ, Cameron, DG, Spencer, NA, Steadman, EJ, Evans, DJ, Lot, GK and Highley, DE, 2003. Mineral Resource Information in Support of National, Regional and Local Planning: Cambridgeshire (comprising Cambridgeshire and the City of Peterborough). BGS Commissioned Report CR/02/131N.
Ref 12-21	Cambridge South Infrastructure Enhancement – Geotechnical Design Report (GRIP 2), document number 158454-ARC-GV_000-ZZ-REP-EGE-000002. Prepared by Arcadis Consulting (UK) Limited for Network Rail Infrastructure Limited and dated 09 October 2019.
Ref 12-22	Geology Map 188 for Cambridge, Solid and Drift Edition, 1981.
Ref 12-23	Environmental Protection Act 1990 (EPA) (HMSO)
Ref 12.24	Environment Act 1995 (HMSO)
Ref 12.25	Water Environment (Water Framework Directive [WFD]) (England and Wales) Regulations 2017 (HMSO)
Ref 12.26	Water Resources Act 1991, as amended (HMSO)
Ref 12.27	Wildlife and Countryside Act 1981 (as amended) (Her Majesty's Stationery Office (HMSO))
Ref 12.28	National Parks and Access to the Countryside Act 1949 (Her Majesty's Stationery Office (HMSO))
Ref 12.29	National Planning Policy Framework (NPPF) produced by the Department for Communities and Local Government, 2019 (Her Majesty's Stationery Office (HMSO))
Ref 12.30	South Cambridgeshire District Council Local Development Framework/ Local Plan (2018)
Ref 12.32	Cambridgeshire and Peterborough Minerals and Waste Plan – Core Strategy Development Plan (2011).
Ref 12.33	ESG (2014) NCS – AZ North and AZ South – Cambridge Factual and Interpretative Report, reference E4016-14
Ref 12.34	Cambridge City Council Local Plan (2018) <a href="https://www.cambridge.gov.uk/local-plan-2018">https://www.cambridge.gov.uk/local-plan-2018</a>
Ref 12.35	CIRIA, Construction Industry Research and Information Association (2009) Unexploded Ordnance (UXO): a guide for the Construction industry. London. (Publication C681).





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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 13 – Landscape and Visual**

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## 13 Landscape and Visual

### 13.1 The Introduction

- 13.1.1 This Chapter of the Environmental Statement (ES) reports on the environmental impact of the construction and operation of the proposed Development with respect to landscape character and visual amenity matters.
- 13.1.2 A full description of the proposed Development is given in Chapter 4 and should be read alongside this Chapter.
- 13.1.3 Other parts of the Transport and Works Act Order (TWAO) application which are also relevant to this Chapter and should be read alongside it are the Parameter Plans, Deemed Planning Drawings, the Design Principles which are appended to the Design & Access Statement (DAS), The Consideration of Green Belt Matters Report (which assesses the degree of likely harm to the openness and purpose of the Cambridge Green Belt), and the Planning Statement (which assesses the proposed Development against relevant planning policy at national, regional and local levels).
- 13.1.4 This Chapter includes a summary of relevant legislation, policy and guidance, and a description of the methodologies used to assess the potential effects of the construction and operational phases of the proposed Development. Baseline conditions are discussed, and potential effects described, followed by details of mitigation measures and assessment of residual effects. A summary of the assessment and conclusion is then provided.

### 13.2 Assessment Methodology

#### Legislation, Policy and Guidance

##### Legislation

##### European Legislation

- 13.2.1 The European Landscape Convention (ELC) (Ref. 13.1), ratified by the UK in 2006, defines 'landscape' in Article 1 as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.' The convention recognises in the preamble that 'the landscape is an important part of the quality of life for people everywhere; in urban areas and in the countryside, in degraded areas as well as in areas of high quality, in areas recognised as being of outstanding beauty as well as everyday areas.'
- 13.2.2 It also defines in Article 1 'landscape protection' as 'actions to conserve and maintain the significant or characteristic features of a landscape, justified by its heritage value derived from its natural configuration and/or from human activity.'

##### Policy

##### National Planning Policy

- 13.2.3 The National Planning Policy Framework (NPPF) published by the Ministry of Housing, Communities and Local Government (MHCLG) in February 2019 (Ref. 13.2) sets out the Government's planning policies for achieving and delivering sustainable development. The response to policies which relate to the landscape character and/or visual amenity of the site and its surrounds and which are considered to have a bearing on the proposed Development and its potential effects highlighted are described in the following paragraphs.
- 13.2.4 Section 8 of the NPPF addresses 'Open Space and Recreation'. To accord with Paragraph 98, public rights of way (PRoW), such as those that cross near to the site and through the Landscape & Visual Impact Assessment (LVIA) study area, should be protected and enhanced.
- 13.2.5 Section 9 addresses the promotion of sustainable transport. Whilst the main thrust of the policy relates to new residential and commercial development it also addresses the

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environmental impact of transport infrastructure and traffic relating to all development. To accord with Paragraph 102 within this section of the NPPF the environmental impacts (including those relating to landscape and visual amenity) of traffic and transport infrastructure relating to the proposed Development should be ‘identified, assessed and taken into account—including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains.’ To accord with Paragraph 110 the proposed Development should create places that are ‘attractive ... avoid unnecessary street clutter and respond to local character and design standards.’

- 13.2.6 Section 12 highlights the connection between a sustainable development and well-designed places. In response to Paragraph 124 the planning of the landscape-related aspects of the proposed Development should involve the local community and stakeholders to help achieve acceptability.
- 13.2.7 In response to Paragraph 127 the proposed Development should:
- Add to the overall quality of the area over its lifetime.
  - Be ‘visually attractive a result of good architecture, layout and appropriate and effective landscaping’.
  - Ensure it is ‘sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation’.
  - Use materials to maintain a strong sense of place.
  - Create a place with a high standard of amenity for existing and future users.
- 13.2.8 In response to Paragraph 130, the proposed Development should show consideration of potential opportunities for improving the character and quality of the area, using local design guides to assist this process, where available.
- 13.2.9 Section 13 of the NPPF sets out the government’s aims for Green Belts and their purposes. The matter of potential harm to these purposes and to the openness of the Green Belt (GB) is addressed in The Consideration of Green Belt Matters Report and the Planning Statement that accompany the TWA0 application.
- 13.2.10 In direct relation to the proposed Development, Section 14 of the NPPF highlights the critical nature of supporting mitigation and adaptation to climate change. In response to paragraph 150 the proposed Development should use aspects of green infrastructure planning to integrate suitable adaptation measures.
- 13.2.11 In response to Section 15 of the NPPF, and in particular paragraph 170, the proposed Development should ‘contribute to and enhance the natural and local environment’ by, in part, ‘recognising the intrinsic character and beauty of the countryside’.
- 13.2.12 Section 16 of the NPPF address the conservation and enhancement of the historic environment. With regards to the landscape character impact assessment the proposed Development should seek to make ‘a positive contribution to local character and distinctiveness.’

#### Local Planning Policy

- 13.2.13 The proposed Development site straddles the administrative areas of both Cambridge City Council (CCiC) and South Cambridgeshire District Council (SCDC).
- 13.2.14 The planning policy and development control services of both authorities have recently come together to create a joint planning authority –Greater Cambridge Shared Planning (GCSP). As the planning authority for both administrative areas GCSP is developing its own local plan. The preparation for this is at very early stages, and the plan is not expected to reach the ‘draft plan’ stage until the summer of 2022.

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13.2.15 Therefore, this LVIA relies upon the current Cambridge Local Plan (CLP) adopted October 2018 (Ref. 13.3), and the South Cambridgeshire Local Plan (Ref. 13.4) (SCLP) which was adopted in September 2018.

13.2.16 Those policies which relate to the landscape character and/or visual amenity of the site and its surrounds and which are considered to have a bearing on the proposed Development and its potential effects, are set out below.

*Cambridge Local Plan 2018*

13.2.17 **Policy 4 ‘The Cambridge Green Belt’** confirms that new development in the Cambridge Green Belt (CamGB) will only be approved ‘in line with Green Belt policy’ set out in the NPPF. The policy’s supporting text reiterates the established purposes of the CamGB and the factors that define its special character.

13.2.18 With regards to landscape character and visual amenity matters, the policy’s supporting text describes how recent changes to the CamGB around the edge of Cambridge have increased the value the designation has in providing an ‘important setting for a compact, historic city and contributing to the high quality of life and place enjoyed’.

13.2.19 To accord with the CLP **Policy 8: ‘Setting of the City’** the proposed Development must, in relation to landscape and visual matters, conserve and enhance the ‘setting, and special character of the city, in accordance with the Cambridge Landscape Character Assessment 2003, Green Belt assessments, Cambridgeshire Green Infrastructure Strategy and their successor documents’, and include ‘landscape improvement proposals that strengthen or re-create the well-defined and vegetated urban edge, improve visual amenity and enhance biodiversity.’

13.2.20 In response to **Policy 17: ‘Cambridge Biomedical Campus (including Addenbrooke’s Hospital)- Area of Major Change’** the proposed Development, in relation to relevant landscape and visual matters must:

- ‘respect key views, especially of and from the chalk hills, create new vistas, and create an attractive landscape and building edge along the railway and landscape buffer areas of at least 20 metres along the southern boundary;’
- ‘maximise opportunities to improve the ‘legibility’ of the Cambridge Biomedical Campus (CBC) by providing a network of cycle and pedestrian routes, high quality new public realm and open space;’
- ‘retain and incorporate the existing watercourses.’

13.2.21 The proposed Development must also align with **Policy 18 ‘Southern Fringe Area of Major Change’** by retaining and enhancing the ‘strategic green corridor that extends from the Chalk Hills to Long Road along the Vicar’s Brook/Hobson’s Brook corridor’, and creating ‘a distinctive gateway to the city and a high quality urban edge as approached by road from the south and respect key views.’

13.2.22 The CLP states that **Policy 18** was informed by the ‘Southern Fringe Area Development Framework’, 2006 (Ref. 13.5). Appendix D of the CLP contains an update to the Framework in order to ‘reiterate the council’s support for the Framework’s content (as updated) and to ensure its status is strengthened by virtue of it being included in a local plan.’ The Appendix has been prepared to ‘direct the preparation of future planning applications and the planning of services and infrastructure.’

13.2.23 Whilst the majority of the application site lies outside of the Framework area the proposed station building, eastern platforms and their associated infrastructure sits partly within the ‘Addenbrooke’s 2020 Vision’ part of the Framework. With regards to landscape character and visual amenity matters the relevant key development principles listed in the CLP (Appendix D) are:

- ‘Development must not exceed five commercial storeys (plus associated plant) along the western and southern boundaries in order to minimise the impact on the adjoining

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countryside ... These heights represent maximum overall building heights and will only be acceptable providing they do not cause an unacceptable visual impact on the green corridor and the countryside beyond.'

- 'Development should be orientated to create 'active frontages' which define streets and spaces.'
- 'Connections across the green corridor for all modes of transport to Trumpington should be maximised.'

13.2.24 Figure D.2 (Appendix D) of CLP shows a composite of the key development principles across the Framework area. Whilst the plan was developed before the construction of the current CBC, the Clay Farm housing area and the associated infrastructure, it highlights the location of 'important views/vistas', 'gateways' and 'existing and proposed significant vegetation.' These have been transposed onto Figure 13.6 of this LVIA.

13.2.25 To accord with **Policy 34** of the CLP: '*Light Pollution Control*' any lighting that forms part of the proposed Development must be the 'minimum required to undertake the task, taking into account public safety and crime prevention'. In addition, upwards or intrusive light spillage, impact to local residential amenity and landscape character should be minimised, particularly at 'sites on the edge of Cambridge.'

13.2.26 The proposed Development also must accord with CLP **Policy 55**: '*Responding to context*'. It must be demonstrated that the scheme 'responds positively to its context and has drawn inspiration from the key characteristics of its surroundings to help create distinctive and high-quality places'. Elements of the Policy that are considered relevant to the LVIA are identifying and responding positively to 'existing features of natural, historic or local importance on and close to the Development site'. The Policy also seeks identification of 'appropriate local characteristics to help inform the use, siting, massing, scale, form, materials and landscape design of new development'.

13.2.27 With regards to landscape character and visual amenity matters, **Policy 56** '*Creating successful places*' determines that the proposed Development must be designed to successfully integrate its 'buildings, the routes and spaces between buildings, topography and landscape'. It must:

- 'create attractive and appropriately-scaled built frontages to positively enhance the townscape where development adjoins streets and/or public spaces',
- 'create active edges on to public space by locating appropriate uses, as well as entrances and windows of habitable rooms next to the street',
- 'use materials, finishes and street furniture suitable to the location and context', and
- 'create and improve public realm, open space and landscaped areas that respond to their context and development as a whole and are designed as an integral part of the scheme'.

13.2.28 **Policy 57** '*Designing new buildings*' determines that the proposed buildings that form part of the proposed Development should have a positive impact on its setting in terms of 'location on the site, height, scale and form, materials and detailing, ground floor activity, wider townscape and landscape impacts and available views'.

13.2.29 **Policy 59** '*Designing landscape and the public realm*' determines that the external spaces, landscape, public realm, and boundary treatments of the proposed Development must be designed as an integral part of the proposals and 'coordinated with adjacent sites and phases'. Consideration should also be made of matters such as the character and function of designed spaces, retention and protection of 'existing features including trees, natural habitats, boundary treatments and historic street furniture and/or surfaces that positively contribute to the quality and character of an area' and ensure that proposed 'materials are of a high quality and respond to the context to help create local distinctiveness'.

13.2.30 To adhere to **Policy 60** '*Tall buildings and the skyline in Cambridge*' there must be 'visual assessment or appraisal with supporting accurate visual representations' to demonstrate how the proposals, should they break the existing skyline and/or if they are significantly taller than



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the surrounding built form, ‘fit within the existing landscape and townscape.’ In addition, suitable graphic representation should be employed to display the proposed Development’s ‘high quality addition to the Cambridge skyline and clearly demonstrate that there is no adverse impact.’

- 13.2.31 Appendix F of the CLP defines ‘tall buildings’ in the context of this area of Cambridge as ‘buildings of four storeys and above (assuming a flat roof with no rooftop plant and a height of 13m above ground level).’
- 13.2.32 The Appendix also identifies key strategic viewpoints across the city. The view cones of some of these include the application site.
- 13.2.33 **Policy 65** ‘*Visual pollution*’ concerns the potential landscape and visual effects of street furniture, signage, telecommunications cabinets and ‘other items that could constitute visual pollution within the public realm’ that form part of the development. The policy decrees that only developments that demonstrate that ‘they do not have an adverse impact on the character and setting of the area and its visual amenity’, and ‘are in keeping with their setting, in terms of size, design, illumination, materials and colour’ would be permitted.
- 13.2.34 For the proposed Development to accord to **Policy 67** ‘*Protection of open space*’ it must not ‘harm the character of, or lead to the loss of, open space of environmental and/or recreational importance unless the open space can be satisfactorily replaced in terms of quality, quantity and access with an equal or better standard than that which is proposed to be lost; and the re-provision is located within a short walk (400m) of the original site.’
- 13.2.35 With regards to landscape character and visual amenity matters **Policy 71** ‘*Trees*’ determines that development would not permitted should it lead to the ‘felling, significant surgery (either now or in the foreseeable future) and potential root damage to trees of amenity or other value, unless there are demonstrable public benefits accruing from the proposal which clearly outweigh the current and future amenity value of the trees’. The Policy stipulates that development should ‘preserve, protect and enhance existing trees and hedges that have amenity value as perceived from the public realm’, ‘provide appropriate replacement planting, where felling is proved necessary’, and ‘provide sufficient space for trees and other vegetation to mature.’

*South Cambridgeshire Local Plan (SCLP) 2018*

- 13.2.36 **Policy S/4** ‘*Cambridge Green Belt*’ of the SCLP confirms that new development in the CamGB will only be approved ‘in accordance with Green Belt policy’ in the NPPF. The policy’s supporting text lists among the established purposes of the CamGB the preservation of the ‘unique character of Cambridge as a compact, dynamic city with a thriving historic centre’ and the maintenance and enhancement of its ‘quality setting.’
- 13.2.37 The factors the SCLP lists, at paragraph 2.3.1, as defining the special character of the CamGB include:
- key views of Cambridge from the surrounding countryside;
  - a soft green edge to the city;
  - a distinctive urban edge;
  - green corridors penetrating into the city;
  - designated sites and other features contributing positively to the character of the landscape setting;
  - the distribution, physical separation, setting, scale and character of Green Belt villages; and
  - a landscape that retains a strong rural character.

- 13.2.38 With regards to relevant landscape character and visual amenity matters **Policy HQ/1** ‘*Design Principles*’ states that:

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'All new development must be of high quality design, with a clear vision as to the positive contribution the development will make to its local and wider context. As appropriate to the scale and nature of the development, proposals must:

- a. Preserve or enhance the character of the local urban and rural area and respond to its context in the wider landscape;
- b. Conserve or enhance important natural and historic assets and their setting;
- c. Include variety and interest within a coherent, place-responsive design, which is legible and creates a positive sense of place and identity whilst also responding to the local context and respecting local distinctiveness;
- d. Be compatible with its location and appropriate in terms of scale, density, mass, form, siting, design, proportion, materials, texture and colour in relation to the surrounding area'.

13.2.39 To accord with **Policy NH/2** '*Protecting and Enhancing Landscape Character*' the proposed Development must demonstrate respect and retention, or enhancement of 'local character and distinctiveness of the local landscape and of the individual National Character Area in which it is located.'

13.2.40 The text supporting **Policy NH/2** cites the additional importance of the East of England Landscape Typology (Ref. 13.6) in describing the 'number of smaller and more detailed landscapes which add to and enhance the local landscape character of the district', and the role of the '*District Design Guide Supplementary Planning Document*' (Ref. 13.7) in providing more detailed guidance about these areas. The text also adds that there are 'opportunities to enhance the landscape particularly in the growth areas around Cambridge.'

13.2.41 To adhere to **Policy NH/6** '*Green Infrastructure*' the proposed Development must not cause loss or harm to the green infrastructure (GI) network 'unless the need for and benefits of the development demonstrably and substantially outweigh any adverse impacts.' Development should include proposals to 'reinforce, link, buffer and create new green infrastructure' particularly those that assist in the realisation of the strategic GI 'network and priorities set out in the '*Cambridgeshire Green Infrastructure Strategy*' (Ref.13.8).

13.2.42 The matters relating to **Policy NH/8** '*Mitigating the Impact of Development in and adjoining the Green Belt*' are addressed in the '*The Consideration of Green Belt Matters Report*' that accompanies the TWAO application that this ES supports.

13.2.43 The **Policy E/2** '*Cambridge Biomedical Campus Extension*' allocates an area of employment land use to the east of the portion of the site that lies immediately south of Nine Wells Bridge (see Figure 13.7). This area has been removed from the CamGB to allow a future extension of the CBC. With regards to the potential landscape character and visual amenity effects of the proposed Development this policy states that 'substantial and attractive landscaped edges to the western, eastern and southern boundaries' should be created, and an 'appropriate landscaped setting for the Nine Wells Local Nature Reserve' should be provided. In addition, any built form shall be 'no higher than those on the adjoining part of the Cambridge Biomedical Campus and which provide a suitable transition in reflection of the site's edge of settlement location.'

13.2.44 To accord with **Policy SC/9** '*Lighting Proposals*' any lighting that forms part of the proposed Development must be the 'minimum required for reasons of public safety, crime prevention / security, and living, working and recreational purposes'. In addition, light spillage and glare, must also be minimised, to ensure that there 'is no unacceptable adverse impact on the local amenity of neighbouring or nearby properties, or on the surrounding countryside.'

## Guidance

13.2.45 The following relevant landscape-related planning policy guidance documents are also applicable to the LVIA.

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National Guidance

13.2.46 The MHCLG published the National Design Guide (NDG) (Ref. 13.9) in September 2019 and updated it in January 2021. This document ‘addresses the question of how we recognise well-designed places, by outlining and illustrating the Government’s priorities for well-designed places in the form of ten characteristics.’

13.2.47 Those characteristics that are relevant to landscape character and visual amenity matters of the proposed Development are set out in

13.2.48 Table 13-1:

Table 13-1 Characteristics of well-designed places set out in the NDG

Principle	Description within NDG	Relevance to the LVIA
Context	<p>37) ‘Context is the location of the development and the attributes of its immediate, local and regional surroundings.’</p> <p>38) ‘An understanding of the context, history and the cultural characteristics of a site, neighbourhood and region influences the location, siting and design of new developments. It means they are well grounded in their locality and more likely to be acceptable to existing communities. Creating a positive sense of place helps to foster a sense of belonging and contributes to well-being, inclusion and community cohesion.’</p>	<p>The proposed Development should:</p> <ul style="list-style-type: none"> <li>- display a sound assimilation with the valued features of the site and its surrounding context;</li> <li>- be positively integrated into the landscape character of its surroundings.</li> </ul>
Identity	<p>49) ‘The identity or character of a place comes from the way that buildings, streets and spaces, landscape and infrastructure combine together and how people experience them. It is not just about the buildings or how a place looks, but how it engages with all of the senses. Local character makes places distinctive. Well-designed, sustainable places with a strong identity give their users, occupiers and owners a sense of pride, helping to create and sustain communities and neighbourhoods.’</p>	<p>The proposed Development should:</p> <ul style="list-style-type: none"> <li>- have a positive and coherent identity that all users can identify with.</li> <li>- be visually attractive, to delight all users.</li> </ul>

13.2.49 Natural England (NE) have published Character Area Profiles (CAP) for the identified 159 National Character Areas (NCA) of broadly similar landscape at a national scale that form the National Character Map of England (Ref. 13.10). Those aspects of this document that are relevant to an understanding of the baseline of the site and its surrounds are set out in section 13.3 of this Chapter.

Regional Guidance

13.2.50 Landscape East have published a landscape typology for the east of England region (Ref.13.6). Those aspects of this document that are relevant to an understanding of the baseline of the site and its surrounds are set out in section 13.3 of this Chapter.

Local Guidance

13.2.51 CCiC prepared a ‘*Landscape Character Assessment*’ for their administrative area and its immediate surrounds in 2003 (Ref. 13.11) as part of its design and conservation-related planning policy publications. Those aspects of this document that are relevant to an understanding of the baseline of the site and its surrounds are set out in section 13.3 of this Chapter.

13.2.52 CCiC in partnership with SCDC prepared the ‘*Cambridge Inner Green Belt Boundary Study*’ (CIGBBS) in 2015 (Ref. 13.12). Those aspects of this document that are relevant to an understanding of the baseline of the site and its surrounds are set out in section 13.3 of this Chapter.

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Other Relevant Guidance*Network Rail*

13.2.53 The Network Rail (NR) publication ‘*Our Principles of Good Design*’ (OPGD) (ref. 13.13) set out the ‘core principles which should be analysed, defined and responded to in the development of any Network Rail asset as part of a planned process.’

13.2.54 Those principles that are relevant to this Chapter are set out in Table 13-2.

Table 13-2 Principles of Good Design contained within OPGD

Principle	Description within OPGD	Relevance to the LVIA
Identity	<p>Page 24) ‘<i>Network Rail is the latest chapter in the long and well-established story of railways in Britain.</i>’</p> <p>Page 23) ‘<i>Assets should be developed in a way which provides delight, value for money and a high-quality experience to the user. We should take every opportunity to enhance the sustainability of our assets. This will help our property to become easily identified as part of the high quality Network Rail landscape.</i>’</p>	The proposed Development should be of high design quality in terms of users’ visual experience.
Community Focused	<p>Page 33) ‘<i>Local communities are the neighbours to our assets and our customers. It is critical that the design and development of our assets is undertaken in a way which enhances lives in a positive and socially responsible manner. Our assets are incorporated into the narrative of daily lives, so we need to understand how any changes will impact the character of local communities. Our assets should emphasise a sense of place and enhance the local aesthetic.</i>’</p>	Those aspects of the site’s existing landscape character and visual amenity that are valued by the local community should be identified. These should then be used to emphasise the sense of place and to enhance the local aesthetic within the proposed Development.
Contextual	<p>Page 48 ‘<i>Our assets should complement and enhance the areas in which they are located. The opportunity should be taken when developing an asset to respond to the scale and harmony of the surrounding area. Improvements to our assets should be completed in a way which is in proportion and sympathetic to the local character. We want our assets to be recognisable as part of our world class infrastructure but embedded within their local context.</i>’</p>	<p>The physical character of the area surrounding the proposed Development should be identified.</p> <p>Using this, a design should be developed that is complementary, in terms of scale, proportion, and which enhances the scheme’s local context.</p>

13.2.55 The Landscape Institute (LI) is the governing body for the profession of landscape architects. It published the third edition of the Guidelines for Landscape and Visual Impact Assessment, (Ref. 13.14) (GLVIA3) in 2013 which sets out the principles for assessing the landscape and visual effects of developments and their significance, and provides guidance upon establishing methodologies for undertaking such assessments. This guidance document forms the basis of the LVIA’s methodology.

13.2.56 Accompanying GLVIA3, the LI have prepared a ‘*Statement of Clarification 1/13 10-06-13*’ (Ref. 13.15) and guidance upon the ‘*Visual Representation of Development Proposals 06/19*’ (Ref. 13.16).

## Consultation and Scoping

### Consultation

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13.2.57 **Error! Reference source not found.** Table 13-3 provides a summary of Consultee issues raised with respect to landscape character and visual amenity matters and confirms how these have been addressed.

Table 13-3 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
GCSP Charlotte Burton, Jonathan Brookes, Dinah Foley-Norman 14 <sup>th</sup> May 2020	Need for potential harm to the purposes and openness of the CamGB to be considered separately from the LVIA.	Preparation of a site-specific Green Belt study (158454-ARC-00-ZZ-ASS-EEN-000005 - P03 Consideration of Green Belt Issues), that accompanies the TWAO application that this ES supports
GCSP Charlotte Burton, Dinah Foley-Norman 19 <sup>th</sup> June 2020	Approach and methodology of the LVIA.	Agreement to discuss the location of representative viewpoints for inclusion within the LVIA; and the method of visualisation of these.
GCSP Charlotte Burton, and Dinah Foley-Norman 19 <sup>th</sup> June 2020	Possible landscape mitigation measures, including potential for spoil arising from the proposed Development to be appropriately placed/formed within Hobson's Park.	Agreement in principle to proposals but further studies needed with respect to biodiversity and sustainability impacts, and identification of spoil content.
GCSP Dinah Foley-Norman 25 <sup>th</sup> March 2021	Agreement on viewpoint locations and visualisation types.	Agreed viewpoints included within the LVIA and visualisations prepared accordingly (see Appendix 13.1 Figures 13.8 to 13.21).

## Scoping

13.2.58 Table 13-4 provides a summary of consultee responses contained within the Scoping Opinion in relation to landscape character and visual amenity matters, and the corresponding location in the ES where they are addressed.

Table 13-4 Summary of Scoping Opinion

Consultee / Contact	Summary Scoping Opinion Response	Location in the ES
GCSP	<p>An Environmental Lighting Impact Assessment should be included within the ES to determine the Environmental Zone and obtrusive light limitations in accordance with the Institute of Lighting Professionals (ILP) document PLG04 'Guidance on Undertaking Environmental Lighting Impact Assessments' (Ref. 13.17).</p> <p>This is required in terms of prevention of loss of amenity at nearby occupied premises due to light trespass / intrusion.</p> <p>In addition, any artificial lighting installed must meet the Obtrusive Light Limitations for Exterior Lighting Installations contained within the ILP 'Guidance Notes for the Reduction of Obtrusive</p>	<p>The detailed design of lighting would be achieved through the future discharge of a deemed planning condition.</p> <p>The Design Principles appended to the DAS, and summarised in paragraph 13.4.21 of the ES describes the necessary mitigation to any harm brought about by the lighting of the proposed Development to landscape character and visual amenity at night so that significant adverse effects are avoided.</p>

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Consultee / Contact	Summary Scoping Opinion Response	Location in the ES
	Light, 2020- GN01/20' (ILP-GNROL) (Ref. 13.18). (or as superseded)' both on-site and off-site.	
GCSP	<p>The additional Cambridge Local Plan (2018) policies should be included in the Landscape and Visual section of the ES:</p> <ul style="list-style-type: none"> <li>• <b>Policy 55:</b> Responding to Context</li> <li>• <b>Policy 56:</b> Creating Successful Places</li> <li>• <b>Policy 57:</b> Designing New Buildings and</li> <li>• <b>Policy 59:</b> Designing landscape and the public realm.</li> </ul>	Included in section 13.2 of this Chapter of the ES.
GCSP	<p>The additional South Cambridgeshire Local Plan (2018) policies should be included in the Landscape and Visual section of the ES:</p> <ul style="list-style-type: none"> <li>• <b>Policy HQ/1:</b> Design Principles</li> </ul>	Included in section 13.2 of this Chapter of the ES.
GCSP	Inclusion of the additional PRoW 198/2, 39/115, 39/119 and 212/3 within the LVIA	Included in section 13.3 of this Chapter of the ES. PRoW 198/2 and 212/3 have been included as visual receptors as summarised in Table 13-10.
GCSP	Include consideration of the impact on night-time views within the visual assessment, particularly from the residential development west of Hobson's Park, from Addenbrooke's Road to the south and from the CGB to the north should be carried out.	Included in section 13.3 and 13.4 and Appendix 13.3 of this Chapter of the ES.
GCSP	Consider inclusion of the findings of the 'emerging Draft Greater Cambridge Landscape Character Assessment' within the LVIA., however the weight to be given to it over the 2003 LCA would 'depend on its progress through consultation, review and adoption'.	The 'Draft Greater Cambridge Landscape Character Assessment' has not been available during the preparation of the LVIA, so has not been considered within the Landscape and Visual section of the ES.

## The Study Area

13.2.59 The study area for the LVIA has been established through an identification of the visual envelope of the key areas of built form that make up the operational phase of the proposed Development. A visual envelope for the construction phase of the proposed Development has not been established given the temporary nature of these works.

13.2.60 Establishment of the visual envelope for the operational phase has required:

- gaining an understanding of the various distinct parts of the overall proposed operational Development,
- desk-top work to identify likely landscape and visual receptors that may be sensitive to change brought about by them;
- field study at different times of the year and both during the day and after dark and the preparation of a digitally generated Zone of Theoretical Visibility (ZTV) for those elements



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of the proposed Development's built form that are likely to bring about significant effects to such receptors.

- 13.2.61 The distinct, and visually separate elements of the proposed Development (as described in Chapter 4 of the ES) that were considered likely to bring about significant effects to the identified receptors included the station building, the covered cycle parking area, the platforms and their canopies, the southern secondary footbridge (referred to collectively in the LVIA as the 'station buildings' from hereon), and the track widening between Addenbrooke's Bridge and Nine Wells Bridge.
- 13.2.62 The remaining works, that were not considered likely to bring about significant effects, and which are located in areas visually separate from the proposed station area, are:
- the minor track works and track widening and north of Addenbrooke's Bridge;
  - the minor track widening, railway-systems compound, and new agricultural field access bridge over Hobson's Brook south of Nine Wells Bridge;
  - the closure of two agricultural track level crossing points, minor track alignment and associated line running improvement works at Shepreth Branch Junction; and
  - the movement of the Global System for Mobile Communications-Railway (GSM-R) mast and its compound, and safety works to the existing footbridge at Shepreth Branch Junction.
- 13.2.63 The track widening north of Addenbrooke's Bridge and south of Nine Wells Bridge would involve a minor increase to the horizontal extent of the existing track and ballast generally within the existing railway estate. As such our initial considerations concluded that there would be a barely perceptible change to the character of the landscape and to visual amenity as a result of these.
- 13.2.64 The proposed rail systems compound (RSC) (located approximately 450m from the station's secondary footbridge and separated from it by Nine Wells Bridge) would involve the creation of a small single storey building within a fenced enclosure just south of bridge's embankment for the housing of railway signalling and electrical supply equipment. The compound would be set back from the edge of its plot so that an approximately 10m wide belt of native vegetation would be planted around it as shown in the Land-use & Landscape Parameter Plan. Detailed landscape design will be approved by the Local Planning Authority via the deemed planning conditions.
- 13.2.65 The new agricultural field crossing over Hobson's Brook would be simple and discrete in form and conventional nature such that it would not be visually apparent away from its immediate surrounds.
- 13.2.66 As a result of the commonplace nature of the proposed agricultural field access bridge, the small scale of the compound and its building, and the size of the proposed belts of native vegetation surrounding it, it was considered that the likely change to the character of the landscape and to visual amenity would be very small.
- 13.2.67 The works at Shepreth Branch Junction (located approximately 1175m south of the railway systems compound), would involve minor changes to the alignment of the track to improve line speed, slight movement of the existing GSM-R mast and compound, the creation of a railway maintenance area to the east of the existing footbridge, and minor additions to the footbridge itself. As such our initial considerations concluded that there would be a small change to the character of the landscape and to visual amenity as a result.
- 13.2.68 Therefore, only the likely combined visible extent of the proposed station buildings (between Addenbrooke's Bridge and Nine Wells Bridge) were included within the ZTV (shown on Figure 13.2).
- 13.2.69 The preparation of this ZTV involved use of:
- 2019 LIDAR 1m resolution DTM as the base digital terrain model,

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- Building footprints from OS Open Map Local (including recently constructed buildings within the CBC and the Clay Farm housing development that have been mapped)
- 2019 LIDAR 1m resolution Digital Surface Model for building heights.
- OS Open Map Local Woodland data to a height of 15m.
- A viewer height set at 1.5m above ground levels.

13.2.70 Whilst the layering of datasets in this way allows for a good representation of the proposed Development's likely visibility, vegetation such as individual trees, tree groups and hedgerows cannot be included within the calculations. Therefore the actual visibility of the proposed Development is likely to be less than shown on this plan. Additionally, it is important to note that the ZTV does not reflect the extent to which visibility reduces with distance from the proposed Development. We have, however, used the ZTV to help identify potential visual receptors to the proposed Development.

13.2.71 The ZTV reveals that the station buildings would: be visible from a maximum of approximately 4km away; have little effect on areas over 1km to the north; and be predominantly visible along three 'view corridors': to the south, the south west and the south-east.

## Methodology

13.2.72 The methodology for the LVIA has been prepared in accordance with GLVIA3.

13.2.73 As the guidance contained within GLVIA3 is not prescriptive, but instead seeks to establish certain principles that would help to achieve a degree of consistency with regard to the production of such assessments, a comprehensive description of the precise LVIA methodology is provided in Appendix 13.2. The key steps of the methodology are, however, set out below.

13.2.74 In line with paragraph 1.15 of GLVIA3 this LVIA distinguishes between 'impact' (defined as the action being taken), and 'effect' (defined as the change resulting from that impact upon the sensitivity of a receptor).

13.2.75 The assessment includes a combination of objective and subjective judgements. To avoid making assumptions regarding people's expected responses, subjective judgements are avoided where possible, focussing instead upon what objectively would be experienced.

## Establishing Baseline Conditions

13.2.76 The establishment of the baseline environment has entailed:

- The gathering and understanding of published information on the landscape (and townscape) character, nature and value of the site and its surrounds.
- Determination of the area over which those parts of the proposed Development that are considered likely to bring about significant effects upon landscape character and visual amenity receptors will be visible - through the preparation of the ZTV.
- Visits to the site and publicly accessible areas across the study area (i.e. publicly accessible open spaces, PRow and highways) at different times of year and at different times of the day to ground-truth the ZTV and to identify suitably fine-grained landscape and (townscape) characteristics.
- Determination of the different groups of people who may experience views of the proposed Development (the visual receptors) and the nature of their existing views, visual experience and their visual amenity.
- The collection of photographs from locations that are representative of the identified visual receptors.
- Determination of landscape receptors (and their characteristics) from a combination of analysis of published sources, research and field work.
- Input into the planning of the proposed Development as part of an iterative design process to ensure likely adverse effects are identified and where possible avoided,



reduced, abated and/or compensated for with mitigation that are embedded into the scheme.

## Forecasting the Future Baseline

13.2.77 Given the anticipated scale and nature of the works required to construct the proposed Development and the time taken to do so (up to approximately four years) the LVIA considers the effects that would occur at a number of points in time. These are:

- Assessment Scenario 1: during the peak of construction (anticipated to be in 2023);
- Assessment Scenario 2: first opening year of the proposed Development (anticipated to be 2026); and
- Assessment Scenario 3: 15 years after this (2041) – when it is reasonably expected that any structural planting that is delivered as part of the proposed Development is likely to have properly established.

13.2.78 The baseline described in the LVIA for each scenario is that which currently exists on the site and in its surrounds at the present time. It is acknowledged, however, that given the length of time which would elapse before the proposed Development is completed, the baseline conditions of these areas may change during that period, irrespective of the proposed Development occurring. As such, a future baseline for each of these points in time has, where possible, been considered. This consideration includes, for example, the likely completion of other development currently under construction within the CBC and the increasing maturity of vegetation surrounding the site.

## Defining the Sensitivity of resource

13.2.79 This has involved the identification of landscape character receptors (areas of identifiable character distinct from each other) and visual amenity receptors (i.e. potential viewers and/or viewing groups) upon which an assessment of the effects of the proposed Development can be made.

13.2.80 The 'value' of both the landscape character and visual amenity receptors, and their 'susceptibility' to the type of change that the proposed Development may bring about has been determined based upon the definitions set out in Section 2.2 of Appendix 13.2. The combination of a receptor's value and susceptibility then determines their 'sensitivity'.

## Nature of the Impact

13.2.81 This involves determination of the nature of the impact likely to occur (termed in GLVIA3 as the magnitude of change) to both landscape character and visual receptors in accordance with the descriptions set out in Appendix 13.2, and with the mitigation measures embedded into the proposed Development.

13.2.82 The determination includes a judgement of the likely extent and size/scale of the change and consideration of whether the nature of the impact is likely to be beneficial or adverse (taking into account the full range of embedded mitigation measures). It also includes a consideration of whether the impact is direct or indirect, and permanent or temporary.

13.2.83 Consideration of the nature of the impact upon visual amenity uses a worst-case scenario of clear winter views, and takes into consideration impact after dark, as well as during daylight hours.

13.2.84 Photo-wire visualisations (that accord to LI Guidance Type 3) which show the extent and massing of the station buildings have been produced for each collected viewpoint.

13.2.85 As the precise form, appearance and materiality of the proposed buildings and structures will not form part of the TWAO's deemed planning request (and instead would be 'reserved' for subsequent approval by planning conditions set out in the Request for Deemed Planning), this level of visualisation was considered acceptable to GCSP in consultation with them during the preparation of this assessment.

## Assessing Significance

13.2.86 An assessment of whether a likely significant effect would occur to any receptor is made by considering the predicted nature of the impact (referred to as the magnitude of change) upon it together with its pre-determined sensitivity.

13.2.87 The criteria shown in Table 13-5 and Table 13-6 are indicative only. In all cases, a narrative commentary is provided as part of this assessment, to describe and justify the levels ascribed to each landscape receptor whether they adhere to the criteria or to criteria between these.

13.2.88 While the methodology is designed to be robust and transparent, reasoned professional judgement is ultimately applied to determine the significance of each effect. In line with the GLVIA3, no numerical or formal weighting system has been applied during this process.

Table 13-5 Landscape Effects Significance Criteria

Landscape Effect	Indicative Criteria
Major Beneficial	<p>Typically, the landscape resource has a high sensitivity with the proposals representing a high beneficial magnitude of change and/or the proposed changes would:</p> <ul style="list-style-type: none"> <li>- enhance the character (including value) of the landscape;</li> <li>- enhance the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development;</li> <li>- enable a sense of place to be enhanced.</li> </ul>
Moderate Beneficial	<p>Typically, the landscape resource has a medium sensitivity with the proposals representing a medium beneficial magnitude of change and/or the proposed changes would:</p> <ul style="list-style-type: none"> <li>- enhance the character (including value) of the landscape;</li> <li>- enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development;</li> <li>- enable a sense of place to be restored.</li> </ul>
Minor Beneficial	<p>Typically, the landscape resource has a low sensitivity with the proposals representing a low beneficial magnitude of change and/or the proposed changes would:</p> <ul style="list-style-type: none"> <li>- complement the character (including value) of the landscape;</li> <li>- maintain or enhance characteristic features or elements;</li> <li>- enable some sense of place to be restored.</li> </ul>
Negligible / Neutral	<p>Typically, the proposed changes would (on balance) maintain the character (including value) of the landscape and would:</p> <ul style="list-style-type: none"> <li>- be in keeping with landscape character and blend in with characteristic features and elements;</li> <li>- Enable a sense of place to be maintained.</li> </ul>
Minor Adverse	<p>Typically, the landscape resource has a low sensitivity with the proposal representing a low adverse magnitude of change and/or the proposed changes would:</p> <ul style="list-style-type: none"> <li>- not quite fit the character (including value) of the landscape;</li> <li>- be a variance with characteristic features and elements;</li> <li>- detract from sense of place.</li> </ul>

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Landscape Effect	Indicative Criteria
Moderate Adverse	Typically, the landscape resource has a medium sensitivity with the proposals representing a medium adverse magnitude of change and/or the proposed changes would: <ul style="list-style-type: none"> <li>- conflict with the character (including value) of the landscape;</li> <li>- have an adverse effect on characteristic features or elements;</li> <li>- diminish a sense of place.</li> </ul>
Major Adverse	Typically, the landscape resource has a high sensitivity with the proposals representing a high adverse magnitude of change and/or the proposed changes would: <ul style="list-style-type: none"> <li>- be at variance with the character (including value) of the landscape;</li> <li>- degrade or diminish the integrity of a range of characteristic features and elements or cause them to be lost;</li> <li>- change a sense of place.</li> </ul>

Table 13-6 Visual Effects Significance Criteria

Visual Effect (indicative)	Description
Major Beneficial	Typically, the visual receptor is of high sensitivity with the proposals representing a high magnitude of change and/or the proposals would result in a major improvement in the view.
Moderate Beneficial	Typically, the visual receptor is of medium sensitivity with the proposals representing a medium magnitude of change and/or the proposals would result in a clear improvement in the view.
Minor Beneficial	Typically, the visual receptor is of low sensitivity with the proposals representing a low magnitude of change and/or the proposals would result in a slight improvement in the view.
Negligible / Neutral	Typically, the proposed changes would be in keeping with, and would maintain, the existing view or where (on balance) the proposed changes would maintain the quality of the view (which may include adverse effects which are offset by beneficial effects for the same receptor) or due to distance from the receptor, the proposed change would be barely perceptible to the naked eye.
Minor Adverse	Typically, the visual receptor is of low sensitivity with the proposals representing a low magnitude of change and/or the proposals would result in a slight deterioration in the view.
Moderate Adverse	Typically, the visual receptor is of medium sensitivity with the proposals representing a medium magnitude of change and/or the proposals would result in a clear deterioration in the view.
Major Adverse	Typically, the visual receptor is of high sensitivity with the proposals representing a high magnitude of change and/or the proposals would result in a major deterioration in the view.

13.2.89 Intermediate conditions may be described, such as ‘Moderate-Major’ (where, for example, the criteria for Moderate may be exceeded but not qualify as Major).

13.2.90 Major effects are those that are likely to be considered ‘significant’, especially if they are long term, permanent and/or not reversible. Minor or Negligible effects are those that are likely to be considered as ‘not significant’. Where the significance of the effect is considered to be ‘moderate’ reasoned professional judgement is used to determine whether or not this is ‘significant’, and a justification for this given.

13.2.91 In some instances, adverse effects may be offset by other considerations, for example, through the mitigation proposals. The resulting effect is no longer adverse, but neither is it, on balance, beneficial. Where this occurs the alignment of the effect would be classified as 'neutral'.

## Cumulative Effects

13.2.92 Whilst the non-cumulative part of this assessment has addressed the effects of introducing the proposed Development into a baseline scenario where other existing development (and development under construction) is present, the cumulative part of this assessment is concerned with the effects of the proposed Development based upon two further cumulative baseline scenarios:

- Other existing development (including development under construction) along with other development that has planning consent;
- The first baseline, along with other potentially major schemes that have 'allocation' within a development plan or are considered reasonably foreseeable.

## Limitations and Assumptions

### Limitations

13.2.93 On the basis of: the desk-based assessments, ZTV and field survey work undertaken; the reasoned professional judgement of the assessment team; and feedback received from consultees, effects on receptors outside the visual envelope of the proposed Development and beyond 4km from the location of the site have been scoped out as it is judged that significant landscape and visual effects will not occur to them.

13.2.94 The issue of potential harm to the CamGB is addressed within the 'Consideration of Green Belt Issues Report' and the 'Planning Statement' that accompanies the TWAO application that this ES supports, and therefore consideration of this matter does not form part of this LVIA.

### Assumptions

13.2.95 Where distances are given in the assessment, these are approximate distances (rounded to the nearest 10m) between the nearest part of the site and the nearest part of the receptor in question, unless explicitly stated otherwise. Distances to residential properties are given to the dwelling itself and not the boundary of any associated garden or residential community open space.

## 13.3 Baseline

### Existing Baseline

#### Desktop & Field Work

13.3.1 Desktop work has included research into the study area's existing topography, hydrology, soil profile, vegetative cover, land use, historical and cultural associations, settlement patterns and built form vernacular, accessibility and recreational usage.

13.3.2 Field survey work in preparation for this assessment was carried out in both winter and summer months, in differing weather conditions and both during daylight hours and after dark. It included: visits to the site, to known viewpoints, and places of public recreation; walking of PRow and public highways; and travel around the study area and across a wider area to consider potential effects on landscape character and on views.

#### The Site and the Study Area

13.3.3 As shown on Figure 13.1 of Appendix 13.1, the site is located across the south part of the city of Cambridge and also into the open countryside beyond this. The proposed Development stretches from Hills Road in the north to Shepreth Branch Junction in the south and straddles both sides of the London to Kings Lyn railway line.

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- 13.3.4 The northernmost section of the site, between Hills Road and Long Road is confined to the existing railway corridor. Between Long Road and Addenbrooke's Bridge the site begins to broaden out to accommodate the proposed track widening (and construction access alongside this) necessary for the creation of a new station with four platform faces. To the immediate east of this part the site is bounded by areas of built form and open space associated with research and educational establishments. To the west lies a mixture of large areas of open space (in the form of education establishment playing fields and publicly accessible open spaces) - the 'green corridor' referred to in local planning policy, and the occasional built-up area.
- 13.3.5 Between the Addenbrooke's Bridge and halfway to Nine Wells Bridge the site broadens out considerably further from the extent of existing track in order to accommodate the area required for the proposed station and its forecourts. Between this point and south of Nine Wells Bridge the site narrows again to accommodate only what is required for track widening. To the immediate east of the site at this point are the emerging tall office and research buildings of the CBC and their curtilage of car parks, open space and vegetative and drainage attenuation strips.
- 13.3.6 Immediately south of Nine Wells Bridge the site broadens again to take in areas required both for temporary construction compounds and for permanent drainage attenuation ponds, agricultural field access bridge, utility unit compounds and soft landscape works. The land to the east is currently arable farmland, but also includes pathways, and areas of planting and drainage attenuation associated with the CBC/Nine Wells Bridge. To the west of the railway the site would take in an existing area of scrubland between the embankment of Nine Wells Bridge and Hobson's Brook.
- 13.3.7 Apart from a minor degree of track widening immediately south of Nine Wells Bridge the site from this point to Shepreth Branch Junction is predominantly confined to the existing railway corridor, a temporary construction access strip / haul route along its western edge, and areas for construction site compounds and access. Beyond the site boundary to the east is an existing PRow / cycle route (the Genome Way, Part of National Cycle Network Route 11 (NCN Route 11)). Beyond this lies arable farmland as well as the wooded area of Nine Wells Local Nature Reserve.
- 13.3.8 The site and its immediate surrounds are generally flat, apart from the substantial embankments which form the crossings over the railway at either end of Hobson's Park, and some artificial but more minor landforms elsewhere within the park on which planting, wildflower meadows and paths have been created.
- 13.3.9 To the east of the southern part of the site is the natural landform of White Hill. This forms part of the foothills of the higher Gog Magog Downs approximately 1.7km to the south east.

### Landscape Designations

- 13.3.10 There are no statutory designations relevant to the LVIA within the study area.
- 13.3.11 An assessment of the likely harm to the openness and purpose of the CamGB are addressed within 'The Consideration of Green Belt Matters Report' that accompanies the TWAO application that this ES supports. The report concludes that the proposed introduction of the station within the CamGB would:
- be relatively small in physical extent compared to the size of the GB sub-areas that the development's components are located in;
  - be experienced over a short distance relative to the overall approach into the city through this part of the GB;
  - not compete with, or conflict in terms of intervisibility, setting, or importance with the historic core that the GB seeks to protect;
  - be well related to its location within the GB – being associated with the existing railway and by being a necessary part of the neighbourhood around it that have been identified in the CIGBBS;

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- prevent the sense of ‘sprawl’ through the GB by purposefully positioning built form in areas of existing confinement, and by bolstered these with additional new site-appropriate planting;
- help retain the rural setting of the GB at the city’s edge by positioning the station and its associated infrastructure at a point where there is limited intervisibility between the two;
- maintains the intrinsic openness of the valued GB green corridor between the city’s edge and the historic core;
- bring about less traffic on Nine Wells Bridge as a result of people using the station to access the CBC rather than cars and taxis;
- retain the critical separation between Cambridge and its surrounding necklace of villages within the GB;
- strengthen and enhancing the setting of and mosaic of habitats along Hobson’s Brook; and
- help create a softer, green edge to the city when viewed from the southern areas of the GB.

## Landscape Character

13.3.12 Published character assessments, supplemented by fieldwork, have informed the identification of the landscape character baseline.

13.3.13 A summary of the relevant descriptions of the landscape context of the study area, contained within the published character assessments is set out below.

13.3.14 The published character assessments form a linked set of assessment ‘levels’. The relationship between the landscape character areas/types across these levels that are found within the study area is demonstrated in

13.3.15 Table 13-7 and graphically shown on Figure 13.3 and Figure 13.4.

Table 13-7 Landscape character areas/types

LCA Level	National Character Areas	Regional Landscape Types	Local Landscape Types / Character Areas	
Source:	<i>Natural England</i> <b>National Character Map of England (2015)</b>	<i>Landscape East</i> <b>Landscape Character Typology for the East of England (2010)</b>	<i>Cambridge City Council</i> <b>Landscape Character Assessment (2003)</b>	<i>Cambridge City Council &amp; South Cambridge District Council</i> <b>Inner Green Belt Study (2015)</b>
Landscape Character Areas within the Study Area	NCA no. 87: ‘East Anglian Chalk’,	Lowland Village Farmlands	River Corridor (Hobson’s Brook)	Townscape Area 6A- Trumpington Road & Hills Road
		Chalk Hills and Scarps		Landscape Area 4B- Granta Valley
	NCA no. 88: ‘Bedfordshire & Cambridgeshire Claylands’			Landscape Area 3B- Gog Magog Hills



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LCA Level	National Character Areas	Regional Landscape Types	Local Landscape Types / Character Areas	
		Lowland Village Chalklands	Rural Lowland Mosaic (Southern Fringe)	

National Landscape Character Map of England Figure 13.3 of Appendix 13.1

13.3.16 As shown on Figure 13.3 in Appendix 13.1, the site and its surrounds lie predominantly within NCA no. 87: '*East Anglian Chalk*', at its edge with NCA no. 88. '*Bedfordshire & Cambridgeshire Claylands*'. The study area only includes land within NCA no. 87.

13.3.17 The '*Character Area Profile*' published by NE for NCA no.87 lists the area's key characteristics. Those that are relevant to this LVIA and to an understanding of the baseline of the study area are set out below:

- nutrient-poor, shallow soils over a rolling chalk bedrock, mainly under arable farming,
- a hydrological character of gentle river valleys flowing north west, punctuated by chalk springs, modified water courses, culverts and enhanced habitat,
- sparse tree cover,
- traditional building materials of grey or yellowish brick and 'clunch' (building chalk) with some earlier survival of timber frame, and
- prominent major roads and railways.

Regional Landscape Character Assessments Figure 13.3 of Appendix 13.1

13.3.18 Landscape East have published a landscape typology for the east of England region (Ref.13.6). As shown on Figure 13.3 of Appendix 13.1 the '*Landscape Types*' (LT) that cover the study area are: '*Lowland Village Farmlands*', '*Chalk Hills and Scarps*' and '*Lowland Village Chalklands*'. Those aspects of this publication that are relevant to this LVIA and to an understanding of the baseline of the study area are set out below.

13.3.19 The '*Lowland Village Farmlands*' LT within the study area covers Hobson's Park, the remaining areas of the green corridor and areas either side of the railway south of Nine Wells Bridge. The typology is described as:

- Physical environment: 'generally low lying, gently rolling topography' formed from a 'mixture of soil types including both productive sandy and clayey brown soils', and 'often drained by small streams and ditches which are visually indistinct'.
- Vegetation & Land Use: 'a productive, intensively farmed agricultural landscape, with patches of wet woodland, reedbed and wet grassland along river valleys' and 'groups of trees, often around farmsteads and occasional small plantations'. 'Arable land use predominates with some areas of pasture and orchards'.
- Historic and built environment: 'A landscape dominated by the late enclosure of common fields'. 'All fieldscapes have experienced significant modification during the 20th century'. 'Medium/large scale, regular field pattern, defined by well-trimmed hedgerows'. 'A dense, largely nucleated, rural settlement pattern composed of small towns, villages and outlying farmsteads. Larger towns often exert an urbanising influence on this landscape.' 'Main building materials include Gault clay, brick, clay tile, render and thatch.'
- Perceptual Qualities: 'Sparse woodland cover giving rise to open character and extensive views', and 'major transport infrastructure means that this is often a busy, rural landscape'.

13.3.20 The scheme-related landscape objectives for this LT include:

- restoring and reinstating 'riparian features and vegetation including willow pollards, wet woodland and specimen native black poplar.'

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- 'adding new hedgerow features using indigenous species mixes' and with 'hedgerow trees of appropriate locally native species'.
- restoring and enhancing ponds.
- enhancing 'ditches through clearance and planting where appropriate and provide improved opportunities for storm water retention'.

13.3.21 The '*Chalk Hills and Scarps*' landscape type within the study area covers White Hill, approximately 250m to the east of the railway line, and the landforms extending up and over Magog Down. The typology is described as:

- Physical environment: 'Comprises an elevated rolling chalk landscape exhibiting a rounded, rolling 'downland' topography,'. 'Shallow calcareous soils over chalk bedrock, with some heavier soils over deposits of boulder clay'.
- Vegetation & Land Use: 'Lowland mixed woodland (often ancient comprising ash/beech/hazel) is also a predominant habitat type'. 'Predominately arable land use, with permanent pasture and woodland on steeper slopes'
- Historic and built environment: 'A medium to large scale, regular field pattern defined by single-species hedgerows'. 'Low density settlement, .... a scattering of large farms of the late enclosure period. General absence of settlement on steeper scarp slopes. Urban development associated with larger towns impinges on this landscape.'
- Perceptual Qualities: 'A simple, open landscape, affording long distance, panoramic views'. 'A rural landscape which can feel empty and unpopulated in places'.

13.3.22 The scheme-related landscape objectives for this (LT) include:

- recognising and conserving 'the visual relationship with Lowland Village Chalklands'.

13.3.23 The '*Lowland Village Chalklands*' landscape type within the study area covers area to the east of the railway (including parts of the site), between the CBC and White Hill, and stretching to the Babraham Road Park-and-Ride. The typology is described as:

- Physical environment: 'Low lying, gently rolling topography'. 'Calcareous brown soils over chalk'.
- Vegetation & Land Use: 'A productive agricultural landscape of moderate relief, favouring arable agriculture'. 'Limited woodland cover.'
- Historic and built environment: 'Medium to large sized fields enclosed by hawthorn hedges. Field structure is a mix of rectilinear & sinuous patterns'. 'larger towns, such as Cambridge, ... contribute to an urbanising influence'.
- Perceptual Qualities: 'An open landscape with long distance views'. 'A settled landscape yet one where tranquillity can readily be perceived'.

13.3.24 The scheme-related landscape objectives for this (LT) include:

- conserving 'the open undulating chalk landscape with its expansive views protecting the landscape from inappropriate land uses, structures and built development which would conflict with openness'.
- conserving and restoring 'existing linear shelter belt plantations, copses, and existing gappy clipped hedges by restocking to provide habitat connectivity and to emphasise the natural topography while still retaining the open character overall'.
- Recognising and conserving 'the visual foreground relationship to the prominent slopes with LT Chalk Hills and Scarps'.
- Enhancing and extending 'areas of chalk grassland including roadside verges and field margins'.
- maintaining 'distinctiveness of river corridors from adjacent arable land'



### Local Landscape Character Assessments

#### *Cambridge Landscape Character Assessment (Figure 13.4 of Appendix 13.1)*

- 13.3.25 CCiC prepared the Cambridge Landscape Character Assessment (CLCA) in 2003 (Ref. 13.11). Its intention was to 'understand and identify the key resources – the 'Defining Character' - which make up and are essential to the spirit of Cambridge'. The CLCA indicates that these resources are 'areas or features which are so important to the Cambridge environment and setting they should remain undeveloped'.
- 13.3.26 Since its publication almost 20 years ago, however, considerable new development has occurred in the northern half of the study area and its surrounds – i.e. at Clay Farm and the CBC.
- 13.3.27 As such, whilst certain sections of the CLCA are useful in providing an understanding of the underlying landscape of the study area, others are clearly outdated and are disregarded for the purpose of this assessment. Those aspects of this document that are relevant to an understanding of the study area are set out below.
- 13.3.28 As shown on Figure 13.4 of Appendix 13.1 the '*River Corridor (Hobson's Brook)*' CLCA character area stretches from the Botanic Gardens in the centre of the city to Nine Wells, and to Cambridge - Camping and Caravanning Club Site.
- 13.3.29 The character area is described as a 'defining Character of Cambridge', its important features are listed as: the 'historic association of Hobson's Conduit for the supply of water to Cambridge as early as 1610'; 'walks'; 'trees and wildlife corridor'; the 'City Wildlife Sites'; and 'green spaces'.
- 13.3.30 The '*Rural Lowland Mosaic (Southern Fringe)*' character area as shown in Figure 13.4 of Appendix 13.1 stretches from Long Road across the entirety of Hobson's Park, southwards over Addenbrooke's Road to a line approximately drawn between the Cambridge - Camping and Caravanning Club Site and Babraham Road Park & Ride.
- 13.3.31 The character area is described as a defining Character of Cambridge, in terms of the setting of 'the urban edge within context of a framework of an increasingly elevated hinterland'. The CLCA describes the area as 'generally flat land bisected with footways and cycleways'. The CLCA notes the 'dominance of Addenbrooke's Hospital buildings'.

#### *Cambridge Inner Green Belt Boundary Study (Figure 13.4 of Appendix 13.1)*

- 13.3.32 CCiC in partnership with SCDC prepared the CIGBBS in 2015 (Ref. 13.12). Whilst the focus of the study was to assess the importance of 19 different 'sectors' of land around Cambridge to the purposes of the CamGB, it also prepared baseline studies and analysis upon the landscape and townscape character of these sectors and their surrounds.
- 13.3.33 The studies included consideration of matters such as the 'physical form and scale of the city, its historic development, its relationship to its hinterland, townscape and landscape character, the experience of approaching the city, and how the city is perceived from the surrounding landscape' (Paragraph 3.2.6).
- 13.3.34 As shown on Figure 13.4 of Appendix 13.1 the northern part of the study area covers the CIGBBS townscape character area: '*6A Trumpington Road and Hills Road*'. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:
- Predominantly a built-up area
  - Varied townscape types including '21st Century Mixed Use Development', '1900-1945 Suburban Housing', 'Large Scale Commercial Industrial and Service Development' and 'Bespoke Houses, Colleges and University Buildings'
  - Contains a number of schools and colleges with associated playing fields.
  - On-going modern developments at Trumpington Meadows, Glebe Farm and Clay Farm, and expansion of Addenbrooke's Hospital

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- ‘provides an open rural setting to the approach along the railway line from London’.
- 13.3.35 CIGBBS landscape character area ‘*4B Granta Valley*’ (Figure 13.6 of Appendix 13.1) incorporates the whole of the Hobson’s Park ‘green corridor’ into Cambridge and then stretches southwards to cover the villages of Great Shelford, Little Shelford, Hauxton, and Stapleford. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:
  - ‘Low-lying, gentle topography’.
  - the ‘wooded appearance and relatively built-up and suburban character of its villages’.
  - Woodland here imparts a ‘relatively enclosed character, increases the ‘greenness’ of the landscape setting, and screens views’.
- 13.3.36 CIGBBS landscape character area ‘*3B Gog Magog Chalk Hills*’ (Figure 13.6 of Appendix 13.1) covers the south-east hinterland of the city, stretching as far in as White Hill near to the site boundary. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:
  - A ‘distinctive chalk ridge, which forms an area of high ground to the south-east of Cambridge’.
  - An ‘open elevated landscape with a strong sense of time-depth’.
  - ‘Recreation also contributes to character of the area’.
  - There are ‘several elevated views to Cambridge, which give this landscape character a strong sense of place. The southern edge to Cambridge, with its ongoing development, is strongly apparent in these views’.
- 13.3.37 In addition to the character assessment, the CIGBBS divides the 19 sectors (which they assess the importance of to the purposes of the CamGB) into ‘*sub-areas*’ as it was considered that that division of ‘sectors’ did ‘not reflect variations in land use, character or context, which occur in the majority’ of these.
- 13.3.38 As shown on Figure 13.4 of Appendix 13.1 the proposed Development spans across sub-areas 9.1, 9.2 and 10.2 and is near to sub-area 10.3. The descriptions of these sub-areas within the CIGBBS that are relevant to this LVIA and to an understanding of the baseline of the study area are set out below.
- 13.3.39 CIGBBS Sub-area 9.1 covers the area south of Addenbrooke’s Road, west of the railway line, north of Great Shelford, and east of the ribbon development along the A1301. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:
  - The area is ‘relatively flat ... and forms part of the lower lying bowl in which Cambridge is located, before it rises up to the Gog Magog Hills’.
  - Hobson’s Brook and its vegetated corridor are ‘notable elements’.
  - Arable land use retains the ‘rural character’, however there are urban edges such as a mobile home park and a notable retail unit to the west.
  - Despite the ribbon of development along the A1301 Cambridge Road to the south west, ‘there is still a sense of separation between Great Shelford and Cambridge that is important to retain’.
  - The area plays a ‘limited role in the rural setting of Great Shelford’.
  - The area is important to the ‘setting of the city when approached from the south’, and the rail approach is ‘mainly green and rural’.
  - There are no defined ‘key views in the vicinity’.
  - The development at CBC and Clay Farm ‘has been designed to create a strong, long-term edge to Cambridge’ but it imparts a ‘harder, more urban edge’, which will become ‘softer’ as planting associated with these matures.

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13.3.40 CIGBBS Sub-area 9.2 covers the entirety of the 'green corridor' north of Addenbrooke's Road until the northern end of the CamGB at the Clare College, Clare Hall and Peterhouse Sports Ground. It lies west of the railway line, and east of the Clay Farm neighbourhood and east of Hobson's Brook. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:

- Key transport routes run across and along the edge of the sub-area such as Long Road, Addenbrooke's Road the CGB and the London-Kings Lynn railway.
- Area in a 'state of change' due to the ongoing developments at Clay Farm and the CBC.
- The 49 hectare permanent open space contains 'new wetlands / balancing ponds, allotments recreation and sports pitches'.
- There are 'no key views in the vicinity'.
- Whilst this area is 'not as distinctive as the green corridor created by the River Cam corridor it provides the 'setting' for an important approach into the city along the railway line'.
- Hobson's Brook and its vegetated corridor are 'notable elements'.

13.3.41 CIGBBS Sub-area 10.2 covers the area immediately south of the CBC, west of Babraham Road, north of Granhams Road and east of the railway line. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:

- The area is important to the 'setting of the city when approached from the south', and the rail approach is 'mainly green and rural'
- Whilst there are no defined 'key views' here it is part of the '*first view of the city*' on the approach from the south east along Babraham Road where it passes over the Gog Magog Hills, and the sub-area makes a '*significant contribution to the rural character*' of this approach and in other '*elevated views from the south-east*'.
- The northern and eastern parts are 'relatively flat and part of the bowl landform in which Cambridge is located. The central, western and southern parts are on the Gog Magog foothills'.
- The CBC is 'very visible' and presents 'hard urban edge at present', which will become a 'softer green edge' as planting associated with this matures.
- The 'open countryside' of this sub-area is key in maintaining the current sense of separation between Great Shelford and Cambridge, and this area forms part the rural setting of Great Shelford.

13.3.42 CIGBBS Sub-area 10.3 encompasses the landform of White Hill and is surrounded by sub-area 10.2 to the north, east and west. Granhams Road provides its southern boundary. The characteristics of this area that are relevant to this LVIA and to an understanding of the baseline of the study area are:

- White Hill provides a 'prominent area of landform in relatively close proximity to the edge of Cambridge, forming the westernmost extent of the Gog Magog foothills', which are an 'important feature of the setting of Cambridge' and the 'major component of the sense of place associated with the areas south east' of the city.
- It contains smaller fields than the rest of sector 10 but contains tree belts such as including Nine Wells at its northern edge. The wooded hilltop makes this area 'particularly distinctive'.
- The 'landform and vegetation' of White Hill, are key in maintaining the current sense of separation between Great Shelford and Cambridge, and this area form parts of the rural setting of Great Shelford.

13.3.43 Given the 'state of change' the CIGBBS recognised that parts of the study area were in at the time of its publication in 2015, it is necessary to identify, from the fieldwork undertaken for this LVIA, any changes to the descriptions above that are important in understanding the current baseline condition.

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13.3.44 In addition, it is important to highlight the particular physical elements, finer grained perceptual qualities and more intimate characteristics of the site and its surrounds that contribute to the overall character of the place, and upon which the proposed Development may have a significant effect, that publications such as the CLCA and the CIGBBS were too broad in scale to record.

13.3.45 Therefore, using the sub-division of the study area as set out in the CIGBBS (being the most up-to-date character assessment publication) the observations set out below are considered important to the understanding of the baseline condition related to the proposed Development.

13.3.46 Sub-areas 10.2 and 10.3 have been conjoined for the purpose of the assessment, as despite the proposed Development not physically being located within sub-area 10.3 it lies close by and shares many characteristics with sub-area 10.2 – which does contain part of the proposed Development.

13.3.47 In addition, as there is no CIGBBS sector or sub-area for the parts of the CBC that the proposed Development occupies, townscape character area: '6A Trumpington Road and Hills Road' is used.

13.3.48 The up-to-date characteristics of Townscape Area 6A are noted as:

- An area of late 20<sup>th</sup> century and early 21<sup>st</sup> century healthcare and campus buildings built upon a fragmented geometric grid running loosely north-south and east-west.
- Current buildings range in height above ground level (AGL) from the approximately 20m high Astra Zeneca (AZ) Research & Development and Headquarters building (R&DHQ), the approximately 25m high AZ Energy and Data Centre (32m to the top of the chimneys), to the approximately 30m high Medical Research Council's Laboratory of Molecular Biology (LMB), and the approximately 65m (AGL) Addenbrooke's Hospital chimney.
- Established 25m wide strategic 'no-build' gaps between the CBC buildings to the west of the FCA.
- Buildings vary enormously in style, shape, roofscape, cladding material, and colour. From the dull silver sides and funnel-like chimneys of the LMB, and the angled glass fins on the sides of the AZ's R&DHQ, to the vivid blue cladding of the oval shaped Papworth Hospital and the Corten steel box of the University of Cambridge's Anne McLaren Building (AMB). However most use some form of glass and metal panelling to accentuate vertical forms on the buildings' façade.
- The character of the streetscape, such as along Francis Crick Avenue (FCA), between the buildings is typically campus-like and intensely managed - with clipped hedgerows, tree lines and avenues, as well as formalised and soft-engineered drainage ditches, wayfinding, and traffic signage/control elements.
- The Green and The Gardens to the east of FCA contrast with the built form and streetscape by being traffic-free publicly accessible open spaces for recreation.
- Sporadic belts and lines of immature, and occasional mature trees bound the CBC's edge with the railway. More mature belts exist along the edge of the educational establishments north of the CBC.
- Lighting sources that influence the character of the area at night include the task and security lighting of the offices and laboratories of the CBC buildings, the task and security lighting of the CBC construction sites, the street lighting of, and vehicles on the CBC road network.
- Construction activity, the presence of cranes, hoardings and temporary cabins, and the movement of machinery and workers are a familiar part of the area's character, and have been for the last 10-11 years since the initial construction of the LMB.

13.3.49 The up-to-date characteristics of Sub-Area 9.1 are noted as:

- A fieldscape dominated by one single open large arable field from Hobson's Brook to More's Meadow.

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- The structure, embankments and immediate environs of Nine Wells Bridge clearly define the change in character from the rural edge of the city to the parkland 'green corridor' to the north.
- The hard-engineered structural components (i.e. the broadness of the bridge deck, the height of the concrete abutments, soffit and supports) and embankment-form of Nine Wells Bridge are detracting elements in views to the north from this area.
- The environs of the bridge contain 'urban-edge' characteristics such as maintenance vehicle tracks severance of land into uncharacteristically small awkward shapes, and areas of unmanaged grassland.
- Scrubby margins exist along the edges with the railway, Hobson's Brook, around More's Meadow, Great Shelford and the rear of the ribbon development along the A1301.
- The existing infrastructure and activity of the railway combine to influence the character of the place. This includes the train movement and noise, plus the overhead line equipment (OLE) and its stanchions, boundary chainlink fencing, the Global System for Mobile Communications- Railway (GSM-R) mast, cabins and compound, the level crossings and their signage, the pedestrian footbridge and signals.
- Lighting sources that influence the character of the area at night include the task and security lighting of the offices and laboratories of the CBC buildings, the task and security lighting of the CBC and Clay Farm construction sites, the street lighting of, and vehicles upon Addenbrooke's Road and Nine Wells Bridge.
- The construction activity within the CBC, within the emerging Clay Farm neighbourhood and within the green corridor itself (including the presence of cranes, hoardings and temporary cabins, and the movement of machinery and workers) are a familiar part of views northwards from this area, and have been for the last 10-11 years since the initial construction of the LMB.

13.3.50 The up-to-date characteristics of Sub-Area 9.2 are noted as:

- The space is enclosed by the visually domineering buildings of the CBC to the east, by the more visually restrained form of Clay Farm to the west, and by the heavily engineered form of the railway overbridge structures and embankments to the north and south of Hobson's Park.
- Hobson's Park has an open and informal character with broad areas of wildflower grassland, long snaking crushed stone paths, naturalised immature vegetative edges along its the east and west edges.
- Increasingly formal areas of recreation are located north of Hobson's Park, beyond Addenbrooke's Bridge and the CGB spur to the CBC. The Active Recreation Area (ARA) as shown in Figure 13.6 of Appendix 13.1 immediately north of the spur contains paths, timber bridges, native planting, a 3m high conical grassed viewing mound, and (to the west of the CGB) a skate park and informal grassed recreation space. Further north from this is the artificially surfaced and floodlit pitches of St Mary's School Playing Fields.
- Whilst the broadness of Hobson's Park invokes a mild sense of remoteness and tranquillity in its centre, the designed nature of the park and the frequent movement of public transport (along the railway and the CGB), cyclists using NCN Route 11 (Figure 13.5 and Figure 13.6 of Appendix 13.1), and private vehicles (along Addenbrooke's Road), and the constant visual reminder of built form in every direction creates a predominantly suburban character to the space.
- The materiality of the timber bird hides, timber bridges and mix of weatherboarding and brick of Clay Farm's eastern façade contrasts sharply with the clean, geometric lines and man-made materials of the CBC buildings visible immediately to the east.
- Whilst the original topography of this area is generally flat and low-lying, the embankments of Addenbrooke's Bridge and Nine Wells Bridge are notable parts of the



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area's character and combine to separate the park quite distinctly from the surrounding character areas.

- The gently mounded low landforms along the east of the park parallel with the railway partially support blocks and belts of immature native trees and shrubs (planted between 2014-2017 as part of the S106 agreement connected with the outline planning approval of the CBC) dominated by hawthorn, holly and hornbeam. These slightly reduce, but do not diminish, the abrupt change in character between the park and the CBC.
- Lighting sources that influence the character of the area at night include the task and security lighting of the offices and laboratories of the CBC buildings, the task and security lighting of the CBC and Clay Farm construction sites, residential street and domestic property lighting of Clay Farm, the sport pitch floodlighting of St Mary's playing fields, the lighting of the CGB and its spur over Addenbrooke's Bridge, the street lighting of and vehicles upon Addenbrooke's Road and Nine Wells Bridge.
- The construction activity within the CBC, within the emerging Clay Farm neighbourhood and within the green corridor itself (including the presence of cranes, hoardings and temporary cabins, and the movement of machinery and workers) are a familiar part of views in all directions from this area and have been for the last 10-11 years since the initial construction of the LMB.

13.3.51 The up-to-date characteristics of Sub-Area: 10.2 & 10.3 are noted as:

- The scale, colour, materiality, form and varying roofscape of the broad cluster of CBC buildings are detracting elements on the skyline of views northward from the north and central parts of this area.
- In addition, the clear concrete vertical and horizontal forms of Nine Wells Bridge appear as part of the CBC's cluster of built form from this area and are also visually detrimental to its character.
- The environs of the bridge contain 'urban-edge' characteristics such as maintenance vehicle tracks, severance of land into uncharacteristically small awkward shapes, and areas of unmanaged grassland.
- There are occasional dense belts of trees/scrub separating fields.
- Scrubby margins exist along the edges with the railway, the CBC and Hobson's Brook.
- The existing infrastructure and activity of the railway combines to influence the character of the place. This includes train movement and noise, plus the OLE and its stanchions, boundary chainlink fencing, the GSM-R mast, cabinets and compound, the level crossings and their signage, the pedestrian footbridge and signals.
- Lighting sources that influence the character of the area at night include the task and security lighting of the offices and laboratories of the CBC buildings, the task and security lighting of the CBC construction sites, residential street and domestic property lighting of Clay Farm, the street lighting of and vehicles upon Addenbrooke's Road and Nine Wells Bridge.
- The construction activity within the CBC, within the emerging Clay Farm neighborhood and within the green corridor itself (including the presence of cranes, hoardings and temporary cabins, and the movement of machinery and workers) are a familiar part of views northwards from this area, and have been for the last 10-11 years since the initial construction of the LMB.

## Future Baseline

13.3.52 The baseline described earlier in this assessment is that which currently exists within the study area. It is acknowledged, however, that given the length of time which would elapse before the proposed Development is begun (2023) and completed (2025), the baseline conditions of these areas are likely to change during that period, irrespective of the proposed Development occurring.

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13.3.53 The key changes that are a consideration to this assessment are listed and described below:

- Completion of the St Mary's School sports pavilion, north of the CGB spur to the CBC, and within the CamGB and green corridor, in 2021 (CCiC planning reference 16/1884/FUL).
- The completion and the opening to the public of the ARA in 2021/2 (including the skate park / NEAP (CCiC planning reference 15/1829/REM) viewing mound and walkways) – this will increase the volume of activity within the green corridor area.
- Completion of the new Heart and Lung Research Institute, between the new Papworth Hospital Building and FCA (CCiC planning reference 16/1523/REM) in 2022.
- Completion of the Clay Farm neighbourhood to the west and north-west of Hobson's Park by the mid 2020's.

13.3.54 As such, it is with the completion of these schemes in place that the assessment of effects on landscape character and visual amenity has been undertaken.

### Cumulative Assessment

13.3.55 In addition to the 'future baseline', it is also possible that other 'committed' schemes, that either have been granted planning permission but are not yet under construction, have an allocation in local plans, or are considered reasonably feasible will also be in place at the time of the proposed Development's assessment scenarios.

13.3.56 **Error! Reference source not found.** provides a description of those developments that meet these criteria and have been included in the LVIA cumulative assessment, and the rationale for this.

Table 13-8 Committed schemes list

ID no., LPA, Reference No. & Status	Scheme name and description, and timescales of construction.	Reason for inclusion in cumulative assessment
<p>ID47</p> <p>CCiC</p> <p><b>06/0796/OUT</b></p> <p>(amended by Section 73 approval 17/2258/S73)</p> <p>Granted Permission: 10/2009</p>	<p><b>CBC</b></p> <p>Campus-wide masterplan for 215,000sqm floorspace of D1 and B1 activity class buildings.</p> <p>Reserved matter applications are ongoing but have not been lodged for every masterplan plot.</p> <p>The timing of the construction of the full masterplan scheme is uncertain as reserved matter applications for all of the plots have not been submitted to CCiC. Therefore, for the purpose of the LVIA, completion is assumed to be 2040.</p>	<p>The initial outline application for the CBC includes permission for further buildings, similar in mass and form to those currently built along FCA and Dame Mary Archer Way, on most of the current empty plots that are visible within the Campus.</p> <p>The proposed buildings along the southern edge of the Campus, once constructed, are likely to feature within representative views to the proposed Development from the south of the CBC.</p>
<p>ID2</p> <p>CCiC</p> <p><b>16/1078/OUT</b> (pursuant to outline approval 06/0796/OUT)</p> <p>Granted Permission: 08/2016</p>	<p><b>Plot 9, FCA</b></p> <p>Outline application with all matters reserved for up to 14,193sqm of biomedical and biotech research and development (Use Class B1(b)) 6-7 storey building, approximately 30m AGL; landscaping; car and cycle parking areas and all other associated infrastructure.</p> <p>The timing of construction is uncertain as no reserved matters application has been submitted to</p>	<p>The proposed building, once constructed is likely to feature within representative views to the proposed Development from the west of the site.</p>

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	CCiC. Therefore, for the purpose of the LVIA, completion is assumed to be 2030.	
ID32 CCiC <b>14/1633/REM</b> Granted Permission: 02/2015 (pursuant to outline approval 16/1078/OUT)	AZ campus comprising: - <b>R&amp;DHQ</b> (building shell, east of FCA and LMB completed) <b>The South Plot</b> (west of FCA and south of LMB): - R&D Enabling Building (not begun), - Support Building and Energy Centre (completed) - Associated car, motorbike and cycle parking (partially completed) - Hard and soft landscaping (partially completed) - Internal roads, supporting facilities and ancillary infrastructure (partially completed)	
ID3 CCiC <b>19/1070/REM</b> Granted Permission: 01/2020 (pursuant to outline approval 16/1078/OUT)	Revised application for the <b>AZ South Plot</b> comprising: - R&D Enabling Building, - Amenities Hub Building, - Multi Storey Car Park & external works. The timing of construction is uncertain as a new reserved matter application (20/05027/REM) has been submitted to CCiC. Therefore, for the purpose of the LVIA, completion is assumed to be 2030.	The cluster of AZ buildings (whether part of the 2015 approved scheme or the pending approval) would, once complete, feature within representative views to the proposed Development from the west of the site, alongside the AZ campus buildings that have already been constructed and would take the place of the current construction-related portacabins currently visible on this plot.
ID45 CCiC <b>20/05027/REM</b> Awaiting decision 04/2020 (pursuant to outline approval 16/1078/OUT)	- 'South Office Building' (previously the Enabling Building) approximately 30m AGL, located on the corner of FCA and the site of proposed eastern station building. - 'The Hive' (previously the Amenities Hub) approximately 19m AGL, south of the existing Energy and Data Centre. - Travel Hub (previously the multi-storey car park) approximately 22m AGL. - External works. The timing of construction is uncertain as a new reserved matter application (20/05027/REM) has been submitted to CCiC. Therefore, for the purpose of the LVIA, completion is assumed to be 2030.	
ID8 CCiC	<b>1000 Discovery Drive</b> , Dame Mary Archer Way, CBC	The proposed building along the current southern edge of the



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<p><b>16/0176/OUT &amp; 20/03950/REM</b> (pursuant to outline approval 06/0796/OUT)</p> <p>Granted Permission 01/2021</p>	<p>Five-storey mixed use laboratory and office building and associated plant, internal roads, car parking, cycle parking, landscaping and public open space.</p> <p>The timing of construction is uncertain as permission has only recently been granted. Therefore, for the purpose of the LVIA, completion is assumed to be 2030.</p>	<p>Campus, once constructed is likely to feature within representative views to the proposed Development from the south of the CBC.</p>
<p>ID48</p> <p>SCDC</p> <p><b>Allocation within SCDC Local Plan 2030</b></p>	<p><b>CBC Future Phase 3 Expansion</b></p> <p>Buildings of a similar mass, height and density to those emerging in the CBC 2<sup>nd</sup> Phase area.</p> <p>The timing of construction of the scheme is uncertain as no formal application has been lodged for this. Therefore, for the purpose of the LVIA, completion is assumed to be 2050.</p>	<p>The proposed buildings along the current southern edge of the Campus, once constructed are likely to feature within representative views to the proposed Development from the south of the CBC.</p>
<p>ID 16</p> <p>SCDC</p> <p><b>S/4279/19/FL</b></p> <p>Granted Permission 01/2021</p>	<p>Land Adjacent to More's Meadow Great Shelford CB22 5LS</p> <p>21 dwellings (alms houses) the relocation of existing allotments and public open space provision together with associated landscaping and infrastructure.</p> <p>The relocation of the allotments and open space provision is partially complete. The timing of construction of the alms houses is uncertain as construction work has not begun on site. Therefore, for the purpose of the LVIA, completion is assumed to be mid 2020's.</p>	<p>The proposed buildings along the northern edge of Great Shelford, once constructed are likely to feature within views to the proposed Development.</p>
<p>ID 37</p>	<p><b>Cambridge South East Transport Scheme (CSET)</b> proposal which includes land located immediately to the east of the proposed new station site, access along FCA, and a new guided busway track from the southern edge of the CBC to Granhams Road at Great Shelford parallel with the railway.</p> <p>The timing of construction of the scheme is uncertain as no formal application has been lodged for this. Therefore, for the purpose of the LVIA, completion is assumed to be 2025.</p>	<p>The proposed structures, once constructed are likely to feature within representative views to the proposed Development.</p>

13.3.57 Given that the initial outline approval for the CBC granted permission for buildings of a similar mass, form density and height as those currently built (such as the AZ R&D/HQ, ABCAM, and the Anne McLaren buildings) and which are now coming forward as part of reserved matter applications, the developments listed above that would take place within the CBC for the

purpose of the cumulative part of the LVIA, been grouped together into the same set and termed as ‘CBC development’.

## Receptors Potentially Affected

13.3.58 In line with GLVIA3 (paragraph 6.2) only those receptors upon which significant effects are possible are to be taken forward in the assessment. The following section identifies which landscape character receptors and visual receptors fall into this category, and so will be included in the assessment.

### Landscape Character Receptors

13.3.59 In accordance with GLVIA3, the selection of landscape character receptors, when in the form of ‘character areas’, should use those character publications that are most up-to date, relevant (in their purpose), and detailed. As such, this assessment uses the areas identified within the CIGBBS (prepared in 2015) upon which to base the character assessment, rather than those in the CLCA (prepared in 2003).

13.3.60 Given, however, the ‘*state of change*’ the CIGBBS recognised that parts of this LVIA’s study area were in, at the time of its publication, it is important that the characteristics of those areas upon which the impact of the proposed Development will be assessed reflect the current baseline conditions. As such, those areas listed in Table 13-9 (which are considered to have the potential to experience significant effects arising from the proposed Development and so are included in the assessment of character effects) include the findings from the LVIA’s fieldwork, as described in paragraphs 13.3.48 to 13.3.51.

Table 13-9 Landscape Character receptors included in the assessment

Receptor – character area	Key Characteristics
CIGBBS Sub-area 9.1	<p>Physical environment:</p> <ul style="list-style-type: none"> <li>A predominantly flat, broad area with few landform changes, at the base of the adjacent White Hill ridge.</li> </ul> <p>Vegetation &amp; Land Use:</p> <ul style="list-style-type: none"> <li>A single large arable field dominates the area and provides a moderate rural feel.</li> <li>Sporadic scrubby vegetation at the margins of the field where it abuts the railway and Hobson’s Brook.</li> <li>Denser tree and scrub vegetation (some of it semi-native in nature) is found along the western and southern edges of the area, where it abuts the rear of the A1301 ribbon conurbation and Great Shelford.</li> </ul> <p>Historic and built environment:</p> <ul style="list-style-type: none"> <li>The very little built form present within the area is associated with the infrastructure of the railway (vertical OLE stanchions and horizontal wires, telecommunication masts and cabinets, fencing, and footbridge).</li> </ul> <p>Perceptual Qualities:</p> <ul style="list-style-type: none"> <li>Whilst the level broadness of the area provides long views and a moderate degree of remoteness and openness to the area, there is a clear sense of enclosure created by the embankments and structure of Nine Wells Bridge to the north, by the landform of White Hill to its east and by the scrubby vegetation and occasionally visible built form along its southern and west sides.</li> <li>The visual presence of railway infrastructure (and the movement upon it), the urbanising effect of the visually domineering CBC buildings and Nine-Wells Bridge / Addenbrooke’s Road (during the day and the night) to the north, and the occasional glimpsed built form along its western edge</li> </ul>

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Receptor – character area	Key Characteristics
	<p>(including a caravan / camp site, and a large garden centre) notably increases urban-edge nature of the area.</p> <ul style="list-style-type: none"> <li>• The scale, form and materiality of the heavily engineered Nine Wells Bridge, and the nearby CBC buildings, visible from this area, creates an abrupt change in character at its northern end.</li> <li>• Almost continuous construction activity in adjacent areas decreases the modest degree of tranquillity.</li> </ul>
CIGBBS Sub-area 9.2	<p>Physical environment:</p> <ul style="list-style-type: none"> <li>• A predominantly flat, low-lying area with a number of notable artificial east-west landforms and occasional gentle mounding associated with transport routes and the new development in adjacent areas - contrasting with the levelled areas of playing fields and sports pitches.</li> </ul> <p>Vegetation &amp; Land Use:</p> <ul style="list-style-type: none"> <li>• Mixture of tree lines surrounding playing field and pitches, scrubby margins to water courses and blocks of native trees and shrubs along the transport routes that criss-cross the area – becoming more informal in nature to the south.</li> <li>• Substantial areas of recreation throughout, which have increasing informality to the south of the area.</li> <li>• Movement routes, tracks and pathways abound.</li> </ul> <p>Historic and built environment:</p> <ul style="list-style-type: none"> <li>• Existing built form in the area manifests itself through the recurring presence of the railway, the CGB, roads and pathways, recreational uses and their associated infrastructure (bridges, embankments, signage, surfacing, fencing, lighting and furniture)</li> <li>• The materiality of the built environment generally decreases in formality to the south (with greater use of timber and stone), albeit built form in adjacent areas (i.e. the CBC and Clay Farm, in townscape character area 4B) prevents this in full.</li> <li>• Established 25m wide strategic gaps between the CBC buildings to the immediate east of the railway.</li> </ul> <p>Perceptual Qualities:</p> <ul style="list-style-type: none"> <li>• The clear sense of enclosure created by the raised crossings over the railway, tree belts and blocks, by the façade of Clay Farm's east side and by the visually domineering built form of the CBC accentuates the area's form as a green corridor into Cambridge.</li> <li>• The visual presence (both during the day and night) of the railway and busway infrastructure (and the movement upon them), the heavily engineered form of Addenbrooke's Bridge and Nine Wells Bridge (and the traffic upon these), the visually domineering CBC buildings, and visible ribbon of the Clay Farm neighbourhood's eastern façade, the activity of sports pitches and playing fields, and the lighting from all these activities at night combine to notably raise the suburban nature of the area, despite its location adjacent to the city's edge.</li> <li>• Almost continuous construction activity in adjacent areas, movement of the public transport routes and vehicular roads decreases the modest degree of tranquillity found in the southern part of the area – Hobson's Park.</li> </ul>

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Receptor – character area	Key Characteristics
CIGBBS Sub-areas 10.2 & 10.3	<p><i>(these two sub-area have been conjoined for the purpose of the assessment, as despite the Development not physically being located within sub-area 10.3 it lies close by and shares may characteristic with sub-area 10.2 – which does contain part of the Development).</i></p> <p>Physical environment:</p> <ul style="list-style-type: none"> <li>• An area of gently rolling landform – part of the foothills of the Gog Magog Downs, with White Hill a notable ridge.</li> </ul> <p>Vegetation &amp; Land Use:</p> <ul style="list-style-type: none"> <li>• Large arable fieldscape with parcels separated by the occasional dense belts of trees/scrub. Notable tree blocks include Nine Wells and those upon the ridge of White Hill.</li> </ul> <p>Historic and built environment:</p> <ul style="list-style-type: none"> <li>• The very little built form present within the area is associated with the infrastructure of the railway (vertical OLE stanchions and horizontal wires, telecommunication masts and cabinets, fencing, and footbridge) and the farmstead of White Hill Farm.</li> </ul> <p>Perceptual Qualities:</p> <ul style="list-style-type: none"> <li>• The scale, form, materiality and colour of the CBC buildings, visible from this area, creates an abrupt change in character at its northern end.</li> <li>• Views to the south and east are generally long and rural in character, but those to the north are ended abruptly by the façade of the CBC.</li> <li>• The visual presence of railway infrastructure (and the movement upon it), the urbanising effect of the visually domineering CBC buildings and Nine-Wells Bridge / Addenbrooke's Road (during the day and the night) to the north, notably increases urban-edge nature of the area.</li> <li>• The scale, form and materiality of the heavily engineered Nine Wells Bridge, and the nearby CBC buildings, visible from this area, create an abrupt change in character at its northern end.</li> <li>• Almost continuous construction activity in adjacent areas decreases the modest degree of tranquillity in the north of this area.</li> </ul>

13.3.61 CIGBBS townscape character area 4.6 (shown on Figure 13.4 in Appendix 13.1) is not considered likely to experience significant effects to its overall character and key characteristics as a result of the proposed Development and so has not been included within the assessment of character effects.

13.3.62 The site of the station buildings within the CBC does not show remarkable representativeness of the characteristics of the character area, and the existing tree and scrub vegetation there does not contribute to the integration of nearby buildings into adjoining areas of the CBC or the adjacent green corridor.

13.3.63 Construction activity, in the form of cranes, hoardings and temporary cabins, and the movement of machinery and workers are a familiar part of the area's character and have been for the last 10-11 years. Therefore, further activity arising from the construction phase of the proposed Development would not bring about a noticeable change in the character of the area surrounding it.

13.3.64 The CBC surrounding the site contains buildings of a similar (and larger) proportion to those in the proposed Development, and the broad variety in existing building styles, shapes, roofscapes, materiality and colour of the CBC buildings makes the integration of the station buildings possible with little adverse impact upon the area's character.

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- 13.3.65 The impact of the new station forecourt and its access is not likely to differ in form and character to that already of FCA with which it will join. Further to this, the sensitivity of the area to the likely station and forecourt lighting is considered to be low on account of the high illuminance emitted by the existing building and public realm light sources within the CBC.
- 13.3.66 As such the addition of the new built form of the proposed Development is not considered to have a marked impact on the character of the CBC, and so is not likely to experience significant effects, and so character area 4.6 has not been included in the in the assessment of character effects. This is the only one that is scoped out.

## Visual Receptors

- 13.3.67 Desk-top and fieldwork undertaken during the assessment process (throughout different seasons through 2020 and 2021 and during daylight hours as well as after dark) has provided a thorough understanding of the visual context of study area. The likely visual receptors to the proposed Development that have been identified from this process are set out below.

Users of Long Distance Footpaths

- 13.3.68 Figure 13.5 of Appendix 13.1 shows the course of the European Long Distance Route E2 into Cambridge from the south of the city. The path follows the Roman Road and Wort's Causeway on its approach to the city from the south-east, and then tracks along parts of Hills Road and Long Road before following Hobson's Brook and Vicar's Brook into the city centre.
- 13.3.69 As shown in the ZTV upon Figure 13.2 of Appendix 13.1 clear views to the proposed Development from Route E2 are considered unlikely given the degree of intervening vegetation and existing buildings. Notably, when users of the path are heading towards Cambridge upon the more elevated stretches of Wort's Causeway and their views are generally aligned with the station building part of the proposed Development, field boundary vegetation in the mid-ground, and the existing buildings of the CBC in the distance obscure clear views to the site.
- 13.3.70 In addition, when Route E2 crosses over the railway at Long Road, the height of the bridge parapets and the density of vegetation parallel with the road and the railway is sufficient to prevent clear views to the scheme. It is considered, therefore, that there is unlikely to be significant visual effects upon receptors using Route E2 as a result of the proposed Development. The route is therefore scoped out of the assessment.

Users of NCN Route 11

- 13.3.71 Figure 13.5 and Figure 13.6 of Appendix 13.1 show the course of NCN Route 11 into Cambridge from the south of the city. The path (also known as the Genome Path, and permissive cycleway PPA/0155) emerges from Great Shelford immediately parallel with the London Liverpool Street to Cambridge railway line and follows this as far as Nine Wells Bridge. Here it joins FCA before using the CGB spur to cross the railway. It then runs parallel to the CGB as far as Hills Road near Cambridge Station.
- 13.3.72 As shown in the ZTV upon Figure 13.2 of Appendix 13.1 clear views to the key areas of the proposed Development's proposed built form from NCN Route 11 when heading north would be possible as soon as the path emerges from the built-up area of Great Shelford and would continue along its length until Cambridge Station. When heading south the same degree of visibility would be possible. As such, users of NCN Route 11 have the potential to experience significant effects arising from the proposed Development and this receptor group is scoped into the visual assessment.

Users of PRoW

- 13.3.73 Figure 13.5 and Figure 13.6 of Appendix 13.1 show the location of PRoWs through the southern half of Cambridge. The ZTV upon Figure 13.2 of Appendix 13.1, and fieldwork to ground-truth this, demonstrates that only users upon a small number of these would have clear views to the key areas of the proposed Development's built form. Of these, those whose users have the potential to experience significant effects, and so are scoped into the visual assessment, are:

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- No. 198/1 which crosses through More's Meadow and over the existing railway footbridge on the southern fringe of Great Shelford.
- The very western end of no. 198/2, where it emerges, near to Nine Wells Nature Reserve, from an east-west tree belt.
- The very eastern end of no. 39/46 where it emerges from the built-up area of Clay Farm and onto the CGB.
- The upper, central sections of no. 212/3 within Magog Down where it has glimpsed views across the skyline of Cambridge.

13.3.74 The users of the following PRoW in the study area are unlikely to experience significant effects, and so are scoped out of the visual assessment:

- No 39/8. Whilst it would be possible for users of this PRoW to gain sight of the upper sections of the proposed station buildings such views would be short, snatched, glimpses through the hedge vegetation along the west edge of the path, and through the roofscape of the existing CBC buildings. As such the proposed Development would not have a marked impact on their visual experience and users are not likely to experience significant effects.
- No. 39/42. Users are on the far side of the embankment and the dense tree belts along Long Road so would not experience views to the proposed Development.
- No. 39/47. Despite being located within the application boundary the nature of the change to users of this route is expected to be very small given that the road whose footway accommodates the PRoW is already within the built-up area of the CBC, and as such the addition of construction activity associated with the proposed Development would be scarcely appreciated. During the operational phase, only when users are at the very northern 150m of the PRoW would the proposed Development be clearly visible. The nature of the change to users of it is expected here is small given that the PRoW is already within the built-up area of the CBC, and as such the addition of the new built form of the station buildings would not have a marked impact on their visual experience and users are not likely to experience significant effects.
- No. 39/115. Users are on the far side of the dense conurbation of Clay Farm so would not experience views to the proposed Development.
- No. 39/117. Users are on the far side of the dense conurbation of Clay Farm and the dense tree belt that follows the CGB to the Trumpington Park and Ride car park so would not experience views to the proposed Development.
- No. 39/118 and 119. Users are on the far side of the dense tree belt that follows the CGB to the Trumpington Park and Ride car park so would not experience views to the proposed Development.

Users of Permissive Footpaths, Bridleways, Cycleways and other publicly accessible routes:

13.3.75 Figure 13.5 and Figure 13.6 of Appendix 13.1 show the location of permissive routes and other publicly accessible paths (whose routes have not been mentioned already) whose users have the potential to experience significant effects so are scoped into the visual assessment. These are:

- Permissive footpath no. PPA/0073 which passes through the Clay Farm Community Garden, east-west across Hobson's Park and then south along the park maintenance track, under Nine Wells Bridge until Hobson's Brook.
- Permissive Cycleway no. PPA/0155 which shares its route with NCN Route 11 between Great Shelford and Nine Wells Bridge and then turns east along the southern edge of the CBC.
- Permissive Bridleway no. PPA/0123 which runs along the east edge of the White Hill landform from Granhams Road to Nine Wells Nature Reserve and then to Nine Wells Bridge.

Users of publicly accessible Open Spaces

13.3.76 Figure 13.4 of Appendix 13.1 shows the location of publicly accessible open spaces within the study area whose users have the potential to experience significant effects and so are scoped into the visual assessment. These are:

- Hobson's Park
- Nine Wells Nature Reserve
- More's Meadow
- Magog Down

13.3.77 The users of the following publicly accessible open spaces in the study area are unlikely to experience significant effects so are scoped out of the visual assessment:

- The Green and The Gardens, within the CBC: Despite being located at the edge of the site boundary, the nature of the change to users of this area is expected to be small, given that the open space is surrounded by the built-up area of the CBC, and as such the addition of construction activity associated with the proposed Development, and additional built form during the operational phase, would not have a marked impact on their visual experience. As such users are not likely to experience significant effects.
- Clay Farm public open spaces. Due to the activities that occur within them (play and community gardening), the distance from the nearest proposed building (over 400m), the alignment of their opening onto Hobson's Park (generally east-west), and the current presence of the CBC buildings on the skyline of views across Hobson's Park the construction and operational phases of the proposed Development would not have a marked change on the visual experience of the users of three small publicly accessible open spaces (the Clay Farm Community Garden and Stallan Close Play Area) along the east edge of the Clay Farm neighbourhood. As such users are not likely to experience significant effects.
- The Active Recreation Area: Due to the activities that currently occur within the ARA (skate boarding and kickabout play), the visual severance brought about by the embankments of Addenbrooke's Bridge between this area and the area of Hobson's Park where the built form of the station buildings would be visible, and the presence of the CBC buildings on the skyline of views east the construction and operational phases of the proposed Development would not have a marked change on the visual experience of the users of this space. As such users are not likely to experience significant effects.

Users of Sports Grounds and Playing Fields

13.3.78 As peoples' use of the outdoor sport pitches within the study area, such as those of St Mary's School Playing Fields to the north of the ARA, the Long Road Sixth Form College to the north of the LMB, and the Clare College, Clare Hall and Peterhouse Sports Ground do not depend upon appreciation of views of the landscape, and because these spaces are generally separated from the site by existing tree belts, and users already experience glimpses of built form between these, the construction and operational phases of the proposed Development would not have a marked change on the visual experience of the users of these spaces. As such users are not likely to experience significant effects so are scoped out of the visual assessment.

Users of Public Highways and other Vehicular Routes

13.3.79 The ZTV shown on Figure 13.2 of Appendix 13.1 shows the location of those public highways whose vehicular users are likely to have views of the proposed Development. The fieldwork to ground-truth the ZTV, revealed that in reality only users upon a small number of these roads would have clear views to the key areas of the proposed Development's built form. These are users of FCA and Addenbrooke's Road.

13.3.80 The users of other highways i.e. Dame Mary Archer Way, Robinson Way, Granhams Road, Hinton Road, Haverhill Road, Babraham Road would not experience clear views on account of their alignment away from the proposed Development, intervening vegetation (in particular



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roadside hedgerows and tree belts) and their distance from the site and so are scoped out of the visual assessment.

- 13.3.81 The nature of the change to users of FCA is expected to be very small given that the road is already within the built-up area of the CBC, and as such the addition of construction activity associated with the proposed Development would be scarcely appreciated. During the operational phase, only when users are at the very northern 150m of FCA would the proposed Development be clearly visible. As such the addition of the new built form of the station buildings would not have a marked impact on users' visual experience and as such they are not likely to experience significant effects and so is scoped out of the visual assessment.
- 13.3.82 Likewise, the nature of the change to vehicular users of Addenbrooke's Road is expected to be small given that the road is generally aligned east-west, has few sustained long views to the location of the proposed Development's built form (on account of the embankment vegetation and high parapets upon Nine Wells Bridge), and their familiarity with the existing built form of the Clay Farm neighbourhood and the CBC. This therefore scoped out of the visual assessment.

#### Users of the Railway and the CGB

- 13.3.83 The ZTV upon Figure 13.2 of Appendix 13.1 shows the lengths of the railway, on its approach to Cambridge from the south, and CGB on its way south from the city centre that are likely to have views of the proposed Development.
- 13.3.84 The fieldwork to ground-truth the ZTV, revealed that in reality users of these routes would only appreciate the likely changes brought about by the proposed Development for very short proportions of their journey times given the speeds they are travelling, and intervening lineside vegetation and landform. In addition, users of both modes of travel are already familiar with public transport infrastructure as part of their visual experience. For these reasons the addition of the new built form of the station buildings, and elements such as track widening, would not have a marked impact on such users. Therefore, they are not likely to experience significant effects.
- 13.3.85 Given however the value placed upon the rail approach to Cambridge that was highlighted in the CIGBBS, this user group has been scoped into the assessment of visual effects.

#### People in their Homes

- 13.3.86 The ZTV upon Figure 13.2 of Appendix 13.1 reveals that there are very few areas of residential property that would experience a view of the key built form of the proposed Development. Of these, the one place where it is considered that people in their homes have the potential to experience significant effects is the properties along the eastern edge of the Clay Farm neighbourhood between Addenbrooke's Road and the CGB spur. This receptor has been scoped into the assessment of visual effects.

#### People in their Places of Work

- 13.3.87 The ZTV on Figure 13.2 of Appendix 13.1 shows the areas of employment that would experience a view of the key built form of the proposed Development. The closest of these are the laboratories and offices that exist upon the west side of the CBC. The susceptibility of this area is considered low, as detailed in Table 3 of Appendix 13.2, as it is a workplace. Further, as views from the current campus buildings already contain an array of construction activity and completed built form close by, the construction and operational phases of the proposed Development would not have a marked change on the visual experience of the users of these areas. As such, users are not likely to experience significant visual effects. This user group has been scoped out of the assessment of visual effects.

#### Visual Receptors to be Included in the Assessment of Visual Effects

*Following the analysis set out above, the visual receptors that are included in the assessment of visual effects are shown in*



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## 13.3.88 Table 13-10 below and in Appendix 13.1 Figures 13.5 and 13.6.

Table 13-10 Visual Receptors included in the assessment

Receptor
Users of National Cycle Route 11,
Users of PRow 39/46, 39/47, 198/1, 198/2, and 212/3
Users of permissive paths 0073, 0156 and 0123
Users of the publicly accessible open spaces of Hobson Park, More's Meadow, Magog Down and Nine Wells Nature Reserve
Users of the railway on its approach to Cambridge
Residents of Clay Farm neighbourhood

## 13.4 Design and Mitigation

13.4.1 The proposed Development is described in detail in Chapter 4 – ‘*The Site and the Proposed Development*’ of this ES.

13.4.2 Those components of the proposed Development that are considered to have the potential to bring about significant effects to landscape character and visual amenity receptors, and which are therefore **scoped into** the assessment are:

- Construction works relating to the proposals.
- New ‘station buildings’ comprising:
  - a building on either side of the railway housing the station concourse, ticketing facilities and passenger amenities;
  - a connecting overbridge bridge with lifts between them;
  - two bay platforms and one island platform, creating four platforms in total;
  - platform canopies providing cover to passengers;
  - a secondary covered footbridge at the platforms’ southern end (providing, in an emergency, a secondary means of escape for passengers);
  - covered areas providing 1000 bicycle parking spaces on both sides of the railway;
- Level access for pedestrians and cyclists to the western station building involving: a new segregated cyclist and pedestrian path across Hobson’s Park to a widened crossing over the CGB - where it meets PRow 39/46 (and where a station-related wayfinding totem would be placed), a further improved pedestrian and cyclist path connection to the CGB spur upon Addenbrooke’s Bridge off of this new path, and connection to the existing pedestrian path that leads south-west from the location of the proposed western station building within the park.
- Access for emergency and maintenance vehicles to the western station building (through the repurposing and occasional re-aligning of the existing park maintenance track off Addenbrooke’s Road).
- Access for pedestrians, cyclists, taxis, private vehicle drop-off, disabled driver and motorcycle parking, and emergency and maintenance vehicles via a station forecourt leading to the eastern station building off FCA.

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- Track-widening works within Hobson's Park both north and south of the station to allow for accommodation of the four-platform station.
- A RSC south of Nine Wells Bridge containing an electrical substation, a small single-storey building housing signalling, electrical supply and telecommunications equipment, space for maintenance vehicle parking and material lay-down, all contained within a fenced enclosure.
- Creation of an area of publicly accessible space south of Hobson's Brook, termed as the 'exchange land' (as it provides compensation for the loss of open space resulting from the proposed track widening, and the proposed station buildings, forecourt, pathways and associated infrastructure within Hobson's Park),
- Works at Shepreth Branch Junction involving the closure of an agricultural track crossing point, the creation of a small railway maintenance area to the east of the existing footbridge, the slight movement of the existing GSM-R mast and compound, and minor safety works to the existing footbridge.

13.4.3 The proposed Development includes other works which are considered to not have the potential to bring about significant effects to landscape character and visual amenity receptors, and which are therefore **scoped out** of the assessment. These are:

- A new agricultural field accommodation bridge over Hobson's Brook south of Nine Wells Bridge. This would be simple and discrete in form and conventional nature such that it would not be visually apparent away from its immediate surrounds.
- Minor track alterations between Addenbrooke's Bridge and Hills Road Bridge within the existing railway estate.
- Minor track widening north of Addenbrooke's Bridge and south of Nine Wells Bridge. This would involve a minor increase to the horizontal extent of the existing track and ballast generally within the existing railway estate.
- Minor track alignment and associated line running improvement works at Shepreth Branch Junction to improve line speed.

### Components of the Deemed Planning Request

13.4.4 This assessment is based on level of detail available at the request for deemed planning stage. The documents contained within the deemed planning request and which have informed this assessment (in respect of proposed Development detail, and information relevant to the embedded design and mitigation measures which would act to prevent and/or reduce adverse effects through the construction and operation of the proposed Development) are set out below.

#### Parameter Plans for 'access and movement', 'land use and landscape' and 'heights'

13.4.5 The Parameter Plans identify those elements of the proposed Development which are to be controlled as part of the deemed planning request. They set boundaries within which details of future discharge of condition applications must be prepared. With regards to this LVIA the Parameter Plans demonstrate:

- *Heights*: the proposed maximum vertical and horizontal / lateral extents of the station buildings, the proposed finished floor heights Above Ordnance Datum (AOD).
- *Land-use & Landscape*: the different land-uses proposed for different areas of the site and the location of key infrastructure (including green and blue infrastructure).
- *Access & Movement*: the accessibility to and within the site for vehicles (private, public transport, emergency and maintenance), cycles and pedestrians and how they fit into the surrounding network.

13.4.6 This assessment has considered these factors to be in place within the proposed Development when evaluating its effects upon landscape character and visual amenity.

#### Design & Access Statement (DAS) & the Design Principles

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13.4.7 In addition to explaining the evolutionary process of the proposed Development's design and how consultation has informed the proposals, the DAS contains a 'design principles' document, setting out the key elements of the proposed Development's built form that future discharge of condition applications should adhere to. This assessment has considered these factors to be in place within the proposed Development when evaluating its effects upon landscape character and visual amenity.

13.4.8 The DAS then uses illustrative designs (including visualisations) and precedent images for these elements (including indications of building form, landscape design and materiality) to indicated design intent in terms of scale and appearance and demonstrate ways the scheme could be delivered in line with these design principles.

#### Deemed Planning Drawings

13.4.9 The Deemed Planning Drawings for approval as part of the deemed planning request, show the maximum extents of the proposed cycle / pedestrian path across Hobson's Park, and in block plan form, the maximum extents in terms of footprint, massing and height AOD of the proposed station buildings. This assessment has considered these factors to be in place within the proposed Development when evaluating its effects upon landscape character and visual amenity.

13.4.10 These drawings also show illustrative layouts of the proposed station buildings, forecourts, structures and approaches that could be delivered in line with the design principles.

#### Indicative Landscape Plans

13.4.11 Beyond that shown on the Land Use and Landscape Parameter Plan, further landscape details would be included within any future discharge of condition application.

13.4.12 Indicative Landscape Plans (ILPs), however, have been prepared in support of the deemed planning request, and to inform the discharge of condition process, to show at this stage how the envisioned integration of the proposed Development into its surroundings, and mitigation of effects, could be delivered in line with the design principles and parameter plans. The drawings show at an initial level:

- existing vegetation to be removed or retained,
- new areas of species rich / wildflower grassland,
- key areas of tree, hedge, shrub and riparian planting,
- areas of potential biodiverse green roof
- SuDS areas
- habitat enhancements
- surfacing, and
- areas of key landform change.

13.4.13 The landscape scheme submitted as part of the discharge of condition application will be developed in consultation with the local planning authority and relevant landowners and occupiers, utilising the landscaping principles identified on the ILPs.

## **Mitigation of Effects**

13.4.14 The embedded design and further mitigation measures which would act to prevent and/or reduce significant adverse effects upon landscape character and visual amenity through the construction and operation of the scheme (that are set out in the deemed planning request documents described above, or which would be secured through the future discharge of a deemed planning condition are set out below.

13.4.15 Most measures have transpired as part of an iterative design process with other members of the proposed Development design team to ensure that likely adverse effects were identified and where possible avoided, reduced, abated, or compensated for.

## Construction Approach and Mitigation of Construction Effects

- 13.4.16 A qualitative assessment of the impacts on landscape character and visual amenity resulting from the construction of the proposed Development has been undertaken. This has considered the types of construction activities involved, the geographic scale, extent and duration of activities and their proximity to receptors, with the following embedded design and mitigation measures in place.
- 13.4.17 To avoid or prevent significant adverse effects occurring, or to reduce their significance upon landscape character and visual amenity receptors during the construction period an outline Code of Construction Practice (CoCP) Part A has been submitted as part of the application submission. Further detail will follow in CoCP Part B to be prepared by the works contractor, which will be approved by the local planning authority via deemed planning condition. The best practice measures that would be incorporated into this which are particular to this assessment are listed below. The Design Principle codes, which these measures, where appropriate, align to, are indicated in brackets:

### Site-Wide Measures

1. Avoidance of excessive temporary land take during construction to allow for the retention of as much of the existing native tree, scrub and hedge vegetation and grassland as possible to reduce adverse effects upon sensitive elements that contribute to local landscape character (3.7A & 3.8A).
2. Avoidance of excessive temporary land take within Hobson's Park during construction to allow retention of as much of the existing open space and path network as possible to reduce adverse effects upon the visual amenity of park users (3.7A & 3.8A).
3. Avoidance of excessive temporary land take during construction by using existing maintenance tracks as haul / construction access routes to reduce adverse effects upon sensitive elements, such as trees, scrub, hedgerow and grassland that contribute to local landscape character (3.7A, 3.8A & 3.3E).
4. Appropriate designs of construction-fencing and hoarding surrounding construction areas to reduce their impact on the amenity of nearby sensitive visual amenity receptors such as users of publicly accessible open space, PRow and other publicly accessible routes;
5. Measures to limit construction site lighting to that required for the activity, its extent and its duration only (meeting health and safety requirements), including horizontal cut-off optics and zero floodlight tilt angles to prevent light spill, and avoiding the location and direction of lighting near to and towards existing residential properties where possible (3.9Q).
6. Reduction of the adverse visual effects upon users of publicly accessible areas and routes by restricting temporary material stockpile heights to a maximum of 4m from pre-construction ground levels.
7. Location of material stockpiles, construction related parking and other visually obtrusive non-location specific activities away from sensitive receptors.
8. The careful lifting, temporary heeling in, protection and management of those areas of existing immature native tree and shrub planting within Hobson's Park, the ARA and the site of the proposed RSC, that which would be displaced by the construction and operation of the proposed Development, in readiness for either replating in the same location or nearby upon completion of construction.
9. Protection of remaining tree and shrub vegetation which would be under threat from damage during construction with temporary fencing to BS5837:2012 so avoid adverse effects upon sensitive elements that contribute to landscape character.
10. Reinstatement of tree and shrub planting, hedge vegetation, grass seeding that would be displaced by the proposed Development (and which cannot be lifted, stored and replanted, or which fails to thrive after being lifted, stored and replanted) with new replacement planting/seeding that is equivalent to the species mix, density and initial plant sizes of that which is lost, located near to their previous positions, as shown on the Land Use & Landscape Parameter Plan.

## Scheme Design and Mitigation of Operational Effects

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13.4.18 A qualitative assessment of the impacts on landscape character and visual amenity resulting from the operation of the proposed Development has been undertaken. This has considered the types of operational activities involved, the geographic scale, extent and duration of activities and their proximity to receptors, with the following site-wide and area-specific embedded design and further mitigation measures in place - which would be secured through the deemed planning conditions and which are set out in the documents that are contained within the TWAO deemed planning request set out in paragraph 13.1.3. The Design Principle code, which these measures, where appropriate, align to, are indicated in brackets.

Site-Wide Measures*Landform*

13.4.19 Whilst the proposed Development requires no major changes to the existing landform, the impacts of minor earthworks have been considered with the following embedded design and further mitigation measures (which would be secured through the deemed planning conditions) in place:

1. Where earthworks are required, these have been designed so that they appropriately integrate into the surrounding landscape (3.7B, 3.7C & 3.7D), e.g.:
  - a. The grading of earth to accommodate of step-free passenger access to the station from Hobson's Park would adopt a similar gradient as found upon the existing artificial landforms along the park's eastern edge.
  - b. The vertical cross-profile of proposed surface and storm water assets (such as swales, storm water basins and ponds) would be gently trapezoid (with marginal planting shelves where necessary) and display with naturalised horizontal edges.

*Vegetation*

13.4.20 The impacts of the works regarding new vegetation across the site have been considered with the following embedded design and further mitigation measure in place (and secured through the deemed planning condition on landscaping): Parameter plan (as indicatively shown on the ILPs

1. The selection of species and species mixes for new planting would favour a predominance that are native to the UK, indigenous to the area, are already thriving on site and within the surrounding area, contain pollinator varieties, are reasonably adaptable to climate change and resilient to the relatively high water table.

*Lighting*

13.4.21 Design Principle 3.9Q, which states that 'lighting will be the minimum necessary to provide safe conditions and will be in accordance with relevant guidance set out in the ILP-GNROL.

13.4.22 In line with this guidance document the impacts of the proposed Development at night have been considered with the following embedded design and further mitigation measures in place, which would be secured through the deemed planning conditions:

1. Lighting would be positioned and directed only to where it is required, so as to minimise glare, light spillage and sky glow from the scheme, by avoiding lighting near or above the horizontal and utilising low light pollution lanterns with flat glass lenses, horizontally mounted asymmetric luminaires / floodlights and full horizontal cut off optics / luminaires, where possible, i.e., no direct upward light.
2. The lighting scheme would seek to comply with the lighting levels, uniformity and other parameters of current and relevant lighting standards set out in the ILP-GNROL in terms of adherence to the criteria for Environmental Zone E3 (Suburban) for the eastern station buildings and to Environmental Zone E2 (Rural) for all other areas.
3. Where possible and appropriate, the lighting scheme would use timed lighting units and part-night light switching-off at quiet times, or a curfew which extinguishes all non-essential lighting after an agreed time, to ensure safety but to minimise night disturbance.

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4. Where possible and appropriate physical barriers e.g., proposed built form, existing areas of vegetation or new structural planting would be used to obscure or reduce the effects of installed artificial light sources on adjacent areas.
5. The illumination of proposed station-awareness and directional signage should adhere to the Institution of Lighting Professionals 'Professional Lighting Guide 05: The brightness of illuminated advertisements' particularly in respect of levels of upward lighting where downward-only lighting cannot be fully used.
6. The use of a greater number of lanterns mounted at lower heights to allow closer control of the external lighting would be considered (particularly along the pedestrian and cyclist access route across Hobson's Park). The use of these would, however, be balanced with consideration of the resultant adverse effect of a greater number of lighting poles, and the increased potential from glare for lights at a lower level.
7. The range of lamp colour temperatures already found in and around the various parts of the site are to be used as a guide when planning the lighting for the proposed Development in order to provide some continuity in colour temperature across the wider area.

Area-specific mitigation*Integration with Hobson's Park and the Green Corridor*

13.4.23 The impacts of the proposed Development upon receptors within and around Hobson's Park and the remaining areas of the green corridor have been considered with the following embedded design and further mitigation measures in place which would be secured through the deemed planning conditions (The Parameter Plan and/or Design Principle codes, which these measures, where appropriate, align to, are indicated in brackets):

1. Placement of the station buildings' built form as far away from the city's rural southern edge as feasibly possible (All Parameter Plans and 3.1E).
2. Clustering of the station buildings near to the varied roofscapes and building forms of the CBC near to Addenbrooke's Bridge (All Parameter Plans and 3.1E).
3. Avoidance of harm to the established 25m wide strategic gaps between the CBC buildings to the east of the railway, by locating the largest parts of the proposed built form away from these (3.7M).
4. Creation of a building that is visual legibility as an identifiable community asset for all areas of this newly developing part of Cambridge, rather than simply an extension to the CBC (3.1A, 3.3A, 3.3B, 3.3C & 3.7K).
5. Planning of a station design that assists with the creation of a suitable 'gateway' between Hobson's Park and the CBC - as identified in the 'Southern Fringe Area Development Framework', 2006 (Ref. 13.5), as shown in Figure 13-6 of Appendix 13.1 (3.1A & 3.7F).
6. 'The external form and roofscape of the station buildings would reflect the semi-naturalised character and landform of Hobson's Park, and the wider green corridor (including potential areas of green biodiverse roof), rather than the more formal, geometric style of the townscape within the CBC (whilst there is no confirmed indication, at the current design stage, of how this would be achieved, initial exploratory studies, such as those carried out in preparation of the visualisations contained in the DAS and the illustrative design upon the Deemed Planning Drawings, show the feasibility of building with such form) (3.7L & 3.7N).
7. Use of external cladding and external works materials for the station buildings' that are sympathetic with the natural materials that characterise Hobson's Park and the edge of the Clay Farm residential area (3.7L & 3.7R), such as the timber of the hides surrounding the bird reserve and the ARA's board walks, and weatherboarding and brick of Clay Farm's eastern façade, and the use of low lighting bollards, bonded gravel surfacing and minimal signage in the design of the cross-park shared pedestrian / cyclist path that provides access to the western station building.



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8. The gradation of the landform between the park and the station entrance (3.7B, 3.7C & 3.7D) to avoid the need for visually uncharacteristic steps and ramps within the park, and at a gradient to match that of the existing park landforms.
9. Retention of as much of the native tree and shrub block in north-east corner of Hobson's Park (Land Use & Landscape Parameter Plan and 3.7I & 3.8A), given that this is the most mature of those along the eastern edge of the park, despite the fact that this may mean short section of steep landform between it and the surrounding landform leading to the station entrance.
10. Bolstering of the existing belts of native tree and shrub planting with new habitat (Land Use & Landscape Parameter Plan and 3.7P & 3.7Q) that is similar to these in form, density and species mix.
11. Creation of an enhanced riparian environment to the North Ditch between the Station and the Addenbrooke's Bridge embankment (Land Use & Landscape Parameter Plan and 3.7J & 3.7P).
12. Creation of swales along the western edge of the railway for accommodation of SuDS-storm water / surface water drainage (Land Use & Landscape Parameter Plan and 3.7Q & 3.7P).
13. Planting of a native species hedgerow between the proposed covered cycle area and the secondary footbridge to visually integrate the proposed platform retaining wall and railing into its landscape setting and to deter graffiti (Land Use & Landscape Parameter Plan and 3.7P).
14. Planting of a native species hedgerow around the edges of the secondary footbridge to deter graffiti (Land Use & Landscape Parameter Plan and 3.7P).
15. Planting of a native species hedgerow between the secondary footbridge and the Nine Wells Bridge to visually integrate the railway boundary fencing into its landscape setting (Land Use & Landscape Parameter Plan and 3.7P).

*Integration with the Countryside beyond the City's Edge*

13.4.24 The impacts of the proposed Development upon receptors south of Nine Wells Bridge and Addenbrooke's Road have been considered with the following embedded design and further mitigation measures in place.

1. Setting back of the RSC from the edge of the triangular plot to allow the establishment of native tree and shrub vegetation planting between it and adjoining land, and the creation of suitable riparian habitat along Hobson' Brook (Land Use & Landscape Parameter Plan and 3.9P).
2. Creation of an area of native tree and shrub planting (including new and compensatory hedgerow) and species rich grassland upon the western half of the site of Compound CC1 (east of the railway, and south of Addenbrookes Road and Nine Wells Bridge) upon completion of the works (Land Use & Landscape Parameter Plan).
3. Creation of an new publicly accessible open space of grassland, scattered scrub/tree copses, ponds and riparian habitat on the 'exchange land' south of Hobson's Brook (Land Use & Landscape Parameter Plan and 3.9P).
4. The planting of a native hedgerow around the new location of the GSM-R mast and compound, and the new railway maintenance area. Secured through the future discharge of a deemed planning condition.

*Interface with CBC*

13.4.25 The impacts of the proposed Development upon receptors within the CBC have been considered with the following embedded design and further mitigation measures in place.

1. Retention and/or replacement of the belts of tree planting along the railway edge of those completed CBC developments west of FCA (Land Use & Landscape Parameter Plan and 3.8A).

2. Location of the largest parts of the station-buildings' built form away from the established 25m open gaps between CBC buildings to the west of FCA, that are a key part of the CBC masterplan (3.7M).
3. Continuation of the roofscape for the station building to the west of the railway that, like the station building to the east reflects the semi-naturalised character and landform of Hobson's Park and emphasises the landscape context through the potential use of a planted / landscaped roof (3.7L).
4. Orientation and alignment of key parts of the station buildings and their external areas with the block and street pattern of the CBC (3.1D).
5. Employing a material palette for the station buildings to the east of the railway that draws upon that of the emerging CBC – for example by using a mixture of glass and metal panelling which is used to accentuate vertical forms on the buildings' façade (3.1B, 3.1C, & 3.7R).
6. Creation of a station forecourt that is in keeping with the character with other areas of the CBC's public realm (3.1D 3.7G & 3.7R) - including an avenue of semi-mature trees, boundary hedging (Land Use & Landscape Parameter Plan), a SuDS feature such as a rain garden (3.9I), and high quality surfacing / external furniture.
7. Planning of a station design that assists with the creation of a suitable 'gateway' between the CBC and Hobson's Park - as identified in the 'Southern Fringe Area Development Framework', 2006 (Ref. 13.5), as shown in Figure 13-06 of Appendix 13.1 (3.1A & 3.7F).

## 13.5 Assessment of Residual and Cumulative Effects

### Introduction

- 13.5.1 This section considers the likely effects of the proposed Development on landscape character, visual amenity both singularly and cumulatively.

### Residual Effects from Construction (AS1)

#### Landscape Character

- 13.5.2 The detailed landscape character impact assessment set out in Appendix 13.3 has considered the impact of the proposed Development and the significance of the resultant effects on the key characteristics and overall character of those receptors identified in Section 13.3 of this assessment during the construction phase of the proposed Development.

#### Character Area 9.1

- 13.5.3 Characteristics such as the strong rural nature of the area would alter as a result of the imposition of construction site compounds, haul routes and activity for the 2-3 years of construction, but this would be temporary, reversible and predominantly only affect the very northern and southern edges of the CA.
- 13.5.4 The impacts would be reduced with the proposed mitigation measures, listed in 13.4.17, in place such as considerate construction practices, lighting controls, and the reinstatement of displaced vegetation. These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor.
- 13.5.5 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / Minor Adverse effect on this receptor of Moderate sensitivity, and therefore **Not Significant**.

#### Character Area 9.2

- 13.5.6 Characteristics such as the green-corridor into the city, the increasing informality of land parcels within it as they near the city's edge, and the small degree of tranquillity experienced



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within Hobson's Park, would alter, as a result of the imposition of construction site compounds, haul routes and activity for the 2-3 years of construction, but this would be temporary, reversible and predominantly only affect the southern half of the CA i.e. Hobson's Park.

- 13.5.7 The impacts would be reduced with the proposed mitigation measures, listed in 13.4.17, in place such as considerate construction practices (such as appropriate hoarding around construction activity sites and directing and angling construction lighting away from the park) and the reinstatement of displaced vegetation. These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.
- 13.5.8 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / Minor Adverse effect on this receptor of Moderate sensitivity, and therefore **Not Significant**.

Character Areas 10.2 & 10.3

- 13.5.9 Characteristics such as the strong rural nature of the area, scarcity of built form and the occasional dense belts of trees/scrub separating fields, would alter as a result of the imposition of construction site compounds, haul routes and activity for the 2-3 years of construction, but this would be temporary, reversible and predominantly only affect the very northern part of the CA where the landscape is already influenced by the visual presence of the CBC buildings and the infrastructure of Nine Wells Bridge and Addenbrooke's Road, and their lighting sources at night.
- 13.5.10 The impacts would be reduced with the proposed mitigation measures, listed in 13.4.17, in place such as considerate construction practices (such as appropriate hoarding around key areas of harmful construction activity, by directing and angling construction lighting away from the open countryside, and limits on material stockpile height), and by reinstatement of displaced vegetation upon completion of the works. These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.
- 13.5.11 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / minor adverse effect on this receptor of moderate / high sensitivity, and therefore **Not Significant**.

## Visual assessment

## National Cycle Network - Route 11

- 13.5.12 The detailed visual amenity impact assessment set out in Appendix 13.3 shows that there would be an adverse impact to the visual amenity of users of NCN Route 11 (and users of permissive paths 0155 and 0170 which follow its course) during the construction of the proposed Development.
- 13.5.13 The impacts would, however, only be felt by those users of the path whilst within the site and its immediate surrounds. The visual screening properties afforded to users of the path by the built-up area of Great Shelford to the south of the site and by the tree belts and landforms of the green corridor limit the extent of the impact upon users to a stretch from Granham's Road to Long Road - approximately 3.30km in length.
- 13.5.14 Whilst the construction activity would bring about a perceptible change to the visual experience for users of NCN Route 11 (in particular when approaching the built-up edge of Cambridge near Nine Wells Nature Reserve – see Figure 13.16 in Appendix 13.1 where the proposed construction compounds CC1 and CC2 and the haul route would be visible in the view), this would be short-term and reversible. In addition, the impact would be tempered considerably by receptors' visual familiarity with long-term-construction activity, public transport infrastructure and multiple lighting sources, and by the construction-phase mitigation measures listed in section 13.4.17. These mitigation measures would be

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incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.

- 13.5.15 Accounting for the mitigation measures proposed the assessment concludes that there was likely to be, at worst, a Moderate /Minor Adverse effect on this receptor of Moderate / Low sensitivity, and therefore **Not Significant**.

## Public Rights of Way and Permissive Paths

- 13.5.16 The detailed visual amenity impact assessment set out in Appendix 13.3 shows that there would be adverse impacts upon the visual amenity of users of PRoWs and permissive paths through the study area during the construction phase of the proposed Development.
- 13.5.17 As shown in Figures 13.5 and 13.6 in Appendix 13.1, the visual enclosure afforded to users of most PRoWs and permissive paths by the: built-up areas of Cambridge and its surrounding conurbations; the density and height of tree belts and vegetated field boundaries; and distinct landforms (such as those supporting other transport routes over the railway) combine with the low lying nature of the area to limit the extent of the impact upon users to generally within 300-400m of the key areas of construction activity.
- 13.5.18 This is particularly evident in the case of users of PRoWs 39/46 (that links into the unclassified paths within Hobson's Park, permissive path 0073 (that bisects the park east-west), PRoW 198/2 (that becomes part of permissive path 0123, PRoW 39/47 and permissive path 0170 along FCA, and PRoW 198/1 that emerges from the built-up area along the A1301 Cambridge Road.
- 13.5.19 The one exception is for users of PRoW 212/3 who are approximately 3.4km away from the small area of construction activity that they would gain a short glimpse of, as they cross over Magog Down.
- 13.5.20 Whilst the construction activity would bring about a perceptible change to the visual experience for users of the PRoWs and permissive paths listed above, this would be both short-term and reversible. In addition, the impact would be tempered considerably by receptors' visual familiarity with long-term-construction activity, public transport infrastructure, and lighting sources at night, and by the construction-phase mitigation measures listed in section 13.4.17 (such as appropriate hoarding around construction activity sites and directing and angling construction lighting away from these publicly accessible areas). These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.
- 13.5.21 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate / Minor Adverse effect on these receptors of moderate sensitivity, and therefore **Not Significant**.

## Publicly Accessible Open Spaces

- 13.5.22 The detailed visual amenity impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of users of the publicly accessible open spaces of Hobson Park, More's Meadow, Magog Down and Nine Wells Nature Reserve during the construction phase of the proposed Development.
- 13.5.23 As shown in Figures 13.5 and 13.6 in Appendix 13.1, the visual enclosure afforded to users of most publicly accessible open spaces by the: built-up areas of Cambridge and its surrounding conurbations; the density and height of tree belts and vegetated field boundaries; and distinct landforms (such as those supporting other transport routes over the railway), combine with the low lying nature of the area to limit the extent of the impact upon users to generally within 300-400m of the key areas of construction activity. The one exception is for users of Magog Down who are approximately 3.4km away from the site.

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- 13.5.24 Whilst the construction activity would bring about a perceptible change to the visual experience for users of the publicly accessible open spaces listed above, this would be both short-term and reversible. In addition, the impact would be tempered considerably by receptors' visual familiarity with long-term-construction activity, public transport infrastructure and lighting sources at night, and by the construction-phase mitigation measures listed in section 13.4.17 (such as appropriate hoarding around construction activity sites, restrictions on stockpile heights, considerate placement on non-work site specific activities such as cabins or parking, and directing and angling construction lighting away from publicly accessible areas). These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.
- 13.5.25 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate / Minor Adverse effect on these receptors of Moderate sensitivity (Moderate / High in the case of users of Magog Down), and therefore **Not Significant**.

## Railway Line on its Approach to Cambridge

- 13.5.26 The detailed visual amenity impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of users of the railway line on its approach to Cambridge during the construction phase of the proposed Development.
- 13.5.27 As shown in Figure 13.5 in Appendix 13.1, the railway is recognised within the CIGBBS as having a 'green / treed' approach as compared to the 'suburban' approach other vehicle users experience on surrounding key roads into Cambridge. Figure 13.5 in Appendix 13.3 also shows that the CIGBBS recognised that the views from the part of the study area through which the railway's 'green / treed' approach is located have a 'mixed foreground' containing a 'mixed urban edge'. This is supported by the fieldwork for this LVIA which, as shown on Figure 13.17 of Appendix 13.3, demonstrates that users of the railway experience a mixture of broad open views, occasionally enclosed by immature tree and scrub vegetation, but always with a mixed urban edge.
- 13.5.28 As such, whilst the construction activity would bring about a perceptible change to the visual experience for users of the railway through the study area, this would be both short-term and reversible. The impact would be considerably further tempered by receptors' visual familiarity with long-term-construction activity in this area, public transport infrastructure and lighting sources at night, and by the construction-phase mitigation measures listed in section 13.4.17. These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.
- 13.5.29 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate / Minor Adverse effect on these receptors of Moderate / Low sensitivity, and therefore **Not Significant**.

## Residents of Clay Farm

- 13.5.30 The detailed visual amenity impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of residents of the Clay Farm neighbourhood during the construction phase of the proposed Development.
- 13.5.31 As shown on Figure 13.2 of Appendix 13.1 visibility of the proposed built form of the station buildings is only likely to penetrate into the first block of the neighbourhood - back from its edge with Hobson's Park, and from the few public open spaces that exist between these (i.e. the Clay Farm Community Garden and the Stallan Close Play Area). The extent of the visual impact of the construction work is likely to be similar to this.
- 13.5.32 Whilst the construction activity would bring about a perceptible change to the visual experience of users of the residents of this area of Clay Farm, this would be both short-term and reversible. In addition, the impact would be considerably further tempered by intervening vegetation along Hobson's Brook and within the park, by receptors' visual familiarity with

long-term-construction activity, public transport infrastructure and lighting sources at night, by the focus that users of the Clay Farm open spaces have on their activities (i.e. play and gardening), and by the construction-phase mitigation measures listed in section 13.4.17 (such as appropriate hoarding around construction activity sites, restrictions on stockpile heights, considerate placement of non-work site specific activities such as cabins or parking, and directing and angling construction lighting away from publicly accessible areas). These mitigation measures would be incorporated into CoCP Part A (see Appendix 2.4) with further detail provided in CoCP Part B to be prepared by the contractor and secured by deemed planning condition.

- 13.5.33 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate / Minor Adverse effect on these receptors of Moderate sensitivity, and therefore **Not Significant**.

## Residual Effects from Operation (AS2 & AS3)

### Landscape Character

- 13.5.34 The detailed landscape character impact assessment set out in Appendix 13.3 has considered the impact of the proposed Development and the significance of the resultant effects on the key characteristics and overall character of those receptors identified in Section 3 of this assessment during the operational phase of the proposed Development.

#### Character Area 9.1

- 13.5.35 The positioning of the RSC close to an area already markedly influenced by the built-up edge of the city, and behind proposed areas of native tree and shrub planting, would substantially limit the impact this has on the CA as a whole.
- 13.5.36 This planting and the proposed broader area of native planting and habitat creation on the 'exchange land' to the south of Hobson's Brook, near to the RSC, would have beneficial landscape impacts to the CA as a whole. These would soften views to the hard-engineered Nine Wells Bridge structure and to the built-up edge of the CBC, and would provide landscape structure to the CA and improvements to the watercourse.
- 13.5.37 The minor track widening works just south of Nine Wells Bridge and the minor track alignment and associated line running improvement works at Shepreth Branch Junction would be sufficiently small in scale and extent that none of the characteristics of the CA would be more than minorly impacted.
- 13.5.38 Therefore, the CA's characteristics of a strong rural nature, broad open area and dispersed settlement, would in generally remain intact, and the underlying make-up and balance of the CA's overall character would be preserved.
- 13.5.39 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / Minor Adverse effect on this receptor of Moderate sensitivity, both upon completion of the scheme and 15 years after this, and therefore **Not Significant**.

#### Character Area 9.2

- 13.5.40 Whilst the characteristics of: a green-corridor into the city, an increasing informality of land parcels within it as they near the city's edge, and the small degree of tranquillity experienced within Hobson's Park would to a moderate/small degree be adversely impacted by the imposition of the station buildings and its associated activity. The measures embedded into the design would, however, mitigate this to a level whereby the proposed Development does not alter the balance of the CA's overall character.
- 13.5.41 These measures, listed in paragraphs 13.4.19 to 13.4.25 include: the purposeful siting of the station buildings and their integration within the existing layout and habitat within the park, the intent of the 'design principles' (set out in the DAS) to create a building that responds to its parkland/green corridor setting in terms of form and materiality, compensatory structural planting and new habitat, and lighting controls. These mitigation measures would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.

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- 13.5.42 In the longer term the station would, as a result, become part of the valued character of the space – providing an improved transition between the informality and low-lying nature of Hobson's Park (and the other areas of the green corridor) and the harsher vertical edge of the CBC buildings.
- 13.5.43 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / Minor Adverse effect on this receptor of Moderate sensitivity, and therefore **Not Significant**.

Character Areas 10.2 & 10.3

- 13.5.44 The general low vertical form and small geographic extent of the proposed track widening and line speed improvement works at Shepreth Branch Junction in this CA would have an unremarkable adverse change to the CA's overall character. The change brought about by the addition of the railway maintenance area and the relocation of the GSM-R mast and compound would be minor on account of their small size relative to the CA and because of their location alongside existing elements of railway infrastructure. In addition, the proposed native hedgerow that would be planted around them would help to integrate these elements into their semi-rural setting.
- 13.5.45 The proposed planting of construction compound CC1's north-west corner upon completion of the works with native tree and shrub planting, would bring about a notable beneficial change. Its location between the built-up edge of the city and the rural area surrounding Nine Wells Nature Reserve would reduce the detrimental influence that the heavily-engineered form of Nine Wells Bridge and its embankments, the traffic and lighting of Addenbrooke's Road, and the visually arresting CBC buildings currently have upon the scenic quality and perceptual characteristics of this part of the CA.
- 13.5.46 These mitigation measures are detailed in paragraphs 13.4.19 to 13.4.25 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.47 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / Minor Beneficial effect on this receptor of Moderate / High sensitivity, and therefore **Not Significant**.

## Visual assessment

## Users of National Cycle Network Route 11

- 13.5.48 The detailed impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of users of NCN Route 11 (and users of permissive paths 0155 and 0170 which follow its course through the site and its immediate surrounds) during the operation of the proposed Development.
- 13.5.49 The impacts would, however, only be felt by those users on the NCN Route 11 whilst within the site and its immediate surrounds. The visual screening properties afforded to users of the path by the built-up area of Great Shelford to the south of the site and by the tree belts and landforms of the green corridor limit the extent of the impacts upon users to the stretch from Granhams Road to Long Road - approximately 3.30km in length.
- 13.5.50 Whilst the sight of the station buildings, their activity and lighting would become distinct and recognisable elements to users upon certain sections of NCN Route 11 (in particular when crossing Addenbrooke's Bridge – see Figures 13.9 and 13.13 in Appendix 13.1 where the proposed station buildings and forecourts would be most visible), this would be tempered considerably by receptors' familiarity with built form, lighting and movement activity in the views surrounding the CBC, and by the embedded mitigation measures listed in section 13.4, particularly those related to the form and materiality of the proposed buildings and associated infrastructure, the visual integration of the scheme into its setting within Hobson's Park and the CBC with retained, compensatory and new tree and shrub planting and habitat, lighting controls, such that awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience.

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- 13.5.51 The change in visual experience for users of NCN Route 11 along its stretch between Great Shelford and Nine Wells Bridge during the operation of the proposed Development would be less profound. Users would only have slight perception of the station buildings through the small visual window created by the bridge on their views northwards. The RSC building, whilst visible, would be visually separated from users by the railway and a new belt of native tree and shrub planting. The small nature of the line speed / safety improvement works at Shepreth Branch Junction would bring about little change to users' current visual experience, and the planting of a native hedgerow around the proposed railway maintenance area and the slightly relocated GSM-R mast compound would mitigate the visual effect of these.
- 13.5.52 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the 'exchange land' south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to users' visual experience by helping to soften the currently stark and visually arresting views to the CBC buildings and Nine Wells Bridge. These mitigation measures would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.53 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be, at worst, a Moderate / Minor adverse effect on this receptor of Moderate / Low sensitivity, and therefore **Not Significant**.

## Public Rights of Way and Permissive Paths

- 13.5.54 The detailed impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of users of certain PRoWs and permissive paths through the study area during the operational phase of the proposed Development.
- 13.5.55 As shown in Figures 13.5 and 13.6 in Appendix 13.1, the visual enclosure afforded to users of most PRoWs and permissive paths by the built-up areas of Cambridge and its surrounding conurbations, by the density and height of tree belts and vegetated field boundaries, and by distinct landforms (such as those supporting transport routes over the railway), combine with the low lying nature of the area to limit the extent of impacts upon users to generally within 300-400m of the key areas of the proposed Development's operational activity.
- 13.5.56 This is evident in the case of users of PRoW 39/46 (that links into the unclassified paths within Hobson's Park), permissive path 0073 (that bisects the park east-west), PRoW 198/2 (that becomes part of permissive path 0123), PRoW 39/47 and permissive path 0170 along FCA, and PRoW 198/1 (that emerges from the built-up area along the A1301 Cambridge Road).
- 13.5.57 The one exception is users of PRoW 212/3 who are approximately 3.4km away. Users of this path, as they cross Magog Down, would only have sight a small part of the proposed secondary footbridge. As shown in Viewpoint 6 on Figure 13.21 of Appendix 13.1 (the position of which is located on slightly higher elevation from the PRoW within Magog Down), only a narrow band of this structure would be visible amongst the existing built-up area of the CBC, and as such their visual experience would not discernibly change.
- 13.5.58 In contrast, the station buildings, their activity and lighting would become distinct and recognisable elements to users upon certain sections of PRoWs 39/46 and 39/47, and permissive paths 0073 (in particular when within or near to Hobson's Park – see Figures 13.9 and 13.13 in Appendix 13.1 where proposed station buildings and forecourts would be most visible). This would, however, be moderated considerably by receptors' familiarity with built form, lighting and movement activity in the views surrounding the CBC, and by the embedded mitigation measures listed in section 13.4, particularly those related to the form and materiality of the proposed buildings and associated infrastructure, the visual integration of the scheme into its setting within Hobson's Park and the CBC with retained, compensatory and new tree and shrub planting and habitat, and lighting controls, such that awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience.
- 13.5.59 The change in visual experience for users of PRoW and permissive paths between Great Shelford and Nine Wells Bridge (including PRoWs 198/1 and 198/2 and permissive paths

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0123, 0156) during the operation of the proposed Development would be less profound. Users would only have slight perception of the station buildings through the small visual window created by the bridge on users' views northwards, the RSC building, whilst visible, would be visually separated from users by the railway and a new belt of native tree and shrub planting.

- 13.5.60 The small nature of the line speed / safety improvement works at Shepreth Branch Junction would bring about little overall change to users' current visual experience. The planting of a native hedgerow around the proposed railway maintenance area and the slightly relocated GSM-R mast compound would mitigate the visual effect of these upon users of the permissive path and PRoW as the pass alongside or near to them.
- 13.5.61 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the area south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to users' visual experience by helping to soften the currently stark and visually arresting views to the CBC buildings and Nine Wells Bridge. These mitigation measures that are detailed at paragraph 13.4.24 would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.62 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a moderate adverse effect on these receptors of Moderate sensitivity (Moderate / High sensitivity in the case of users of PRoW 212/3). As, however, awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience the effect was considered to be **Not Significant**.

## Publicly Accessible Open Spaces

- 13.5.63 The detailed impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of users of Hobson Park, More's Meadow, Nine Wells Nature Reserve and Magog Down during the operational phase of the proposed Development.
- 13.5.64 As shown in Figures 13.5 and 13.6 in Appendix 13.1, the visual enclosure afforded to users of most publicly accessible open spaces by the built-up areas of Cambridge and its surrounding conurbations, by the density and height of tree belts and vegetated field boundaries, and by distinct landforms (such as those supporting other transport routes over the railway), combine with the low lying nature of the area to limit the extent of the impact upon users to generally within 300-400m of the key areas of operational activity. The one exception is for users of Magog Down who are approximately 3.4km away from the site.
- 13.5.65 Views of the station buildings and their activity would become distinct and recognisable elements to users within Hobson's Park – see Figures 13.9 and 13.13 in Appendix 13.1. This would, however, be moderated considerably by receptors' familiarity with built form, movement activity and lighting sources at night, and by the embedded mitigation measures listed in section 13.4. In particular those related to: the considerate location of the station buildings away from the attractive views to the open countryside to the south of the park; the form and materiality of the proposed buildings and associated infrastructure (including the stations cycle/pedestrian east-west access path and associated wayfinding); the visual integration of the scheme into its setting within with retained, compensatory and new tree and shrub planting and habitat; and lighting controls, such that awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience. These mitigation measures would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.66 The change in visual experience for users of Nine Wells Nature Reserve and More's Meadow during the operation of the proposed Development would be less profound. Users would only have slight perception of the station buildings through the small visual window created by Nine Wells Bridge on users' views northwards, and the RSC building, whilst just perceptible, would be visually separated from users by the railway and a new belt of native tree and shrub planting. The small nature of the line speed / safety improvement works at Shepreth Branch Junction, as detailed at 13.4.2, would bring about little overall change to users' current visual experience. The planting of a native hedgerow around the proposed

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railway maintenance area and the slightly relocated GSM-R mast compound would mitigate the visual effect of these upon users of the More's Meadow. These mitigation measures would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.

- 13.5.67 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the area south of Hobson's Brook and Addenbrooke's Road, as detailed at 13.4.24, would actually bring about beneficial change to users' visual experience by helping to soften the currently stark and visually arresting views to the CBC buildings and Nine Wells Bridge. These mitigation measures would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.68 Users of Magog Down, would only have sight of the proposed secondary footbridge part of the entire scheme. As shown on Figure 13.21 of Appendix 13.1 only a narrow band of this would be visible amongst the existing built-up area of the CBC, and as such their visual experience would not discernibly change.
- 13.5.69 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate Adverse effect on these receptors of moderate sensitivity (moderate / high in the case of users of PRoW 212/3). As awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience the effect was considered to be **Not Significant**. These mitigation measures are detailed in paragraphs 13.4.19 to 13.4.25 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.

### Railway Line on its Approach to Cambridge

- 13.5.70 The detailed impact assessment set out in Appendix 13.3 shows that there would be an adverse impact to the visual amenity of users of London to Cambridge railway through the study area during the operation of the proposed Development.
- 13.5.71 As shown in Figure 13.5 in Appendix 13.1, the railway is recognised within the CIGBBS as having a 'green / treed' approach as compared to the 'suburban' approach users experience on surrounding key roads into Cambridge. Figure 13.5 in Appendix 13.1 also shows that the CIGBBS recognised that the views from the part of the study area through which the railway's 'green / treed' approach is located have a 'mixed foreground' containing a 'mixed urban edge'. This is supported by the fieldwork for this LVIA which, as shown on Figure 13.17 of Appendix 13-1, demonstrates that users of the railway experience a mixture of broad open views, occasionally enclosed by immature tree and scrub vegetation, but always with a mixed urban edge.
- 13.5.72 Whilst the sight of the station buildings and their activity would certainly become distinct and recognisable elements to users of the railway when north of Nine Wells Bridge this would be tempered considerably by receptors' familiarity with public transport infrastructure and with the built form of area (i.e. the CBC and the Clay Farm neighbourhood), such that awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience.
- 13.5.73 The change in visual experience for users of between Great Shelford and Nine Wells Bridge during the operation of the proposed Development would be less profound. Users would only have sight of the RSC building and the line speed / safety improvement works at Shepreth Branch Junction for a very short time. As such these would bring about a very small overall change to users' current visual experience.
- 13.5.74 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the 'exchange land' south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to users' visual experience of users' by helping to soften the currently stark and visually arresting views to the CBC buildings and Nine Wells Bridge and support the 'green / treed' approach. These mitigation measures are detailed in paragraphs 13.4.18 to 13.4.24 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.



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- 13.5.75 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be, at worst, a Minor Adverse effect on this receptor of Moderate / Low sensitivity, and therefore **Not Significant**.

## Residents of Clay Farm

- 13.5.76 The detailed visual amenity impact assessment set out in Appendix 13.3 shows that there would be adverse impacts to the visual amenity of residents of the Clay Farm neighbourhood during the operational phase of the proposed Development.
- 13.5.77 As shown on Figure 13.2 of Appendix 13.1 likely visibility of the proposed built form of the station buildings is only likely to penetrate into the first block of the neighbourhood back from its edge with Hobson's Park and from the few public open spaces that exist between these (i.e. the Clay Farm Community Garden and the Stallan Close Play Area).
- 13.5.78 Whilst the operational activity would bring about a perceptible change to the visual experience of residents of this area of the Clay Farm neighbourhood, the impact would, however, be moderated considerably by receptors' familiarity with built form, movement activity and lighting sources at night, and by the embedded mitigation measures listed in section 13.4. In particular those related to: the considerate location of the station buildings away from the attractive views to the open countryside to the south of Hobson's Park; the form and materiality of the proposed buildings and associated infrastructure; the visual integration of the scheme into its setting within with retained, compensatory and new tree and shrub planting and habitat; and lighting controls, such that awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience. These mitigation measures would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.79 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate adverse effect on these receptors of Moderate sensitivity. As awareness of the proposed Development would not affect or alter the balance of the users' overall visual experience the effect was considered to be **Not Significant**.

## Cumulative Effects

## Landscape Character assessment

- 13.5.80 The detailed landscape character impact assessment set out in Tables 13-2, 13-4 and 13-6 Appendix 13.3 has considered the impact and significance of additional and combined effects on the landscape character receptors during the construction and operational phase of the proposed Development with other development committed in planning and other potentially major schemes that have 'allocation' within a development plan or are considered reasonably foreseeable.

Character Area 9.1

- 13.5.81 The other developments that in conjunction with the proposed Development were considered may bring about significant impacts to CA 9.1 were other CBC buildings, CSET and new housing at More's Meadow.
- 13.5.82 Whilst there would be a notably greater level of anticipated construction work being undertaken within the CA during AS1 on these schemes in addition to the proposed Development compared to that of the proposed Development alone, most of the CA's characteristics would remain largely unaltered. The impact would be tempered by the facts that: CSET's construction is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; the proposed housing is largely separated from the CA by existing structural vegetation, and because activity within the adjacent CBC, which is visible from this CA, has over the last 10 years has become part of the area's character.
- 13.5.83 During the proposed Development's operational phase the increase in the quantity of built form arising from the new housing, and the increase in the activity arising from the operation

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of CSET in combination with the proposed Development would slightly detract from a few of the CA's characteristics.

- 13.5.84 The change to these characteristics would, however, be moderated by the fact that: the More's Meadow housing would be located alongside existing areas of built form and is mostly separated from the rest of the CA by existing tree and scrub vegetation; the housing and CSET, is reasonably anticipated to contain, or would only be permitted on condition of measures to mitigate the adverse impacts of its operation such as planting around parts of its boundary/course; and the CSET activity would take place within the existing general corridor which already contains the public transport infrastructure and movement of the railway.
- 13.5.85 Therefore, the CA's characteristics would in generally remain intact, and the underlying make-up and balance of its character would be preserved.
- 13.5.86 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate Adverse cumulative effect on this receptor of Moderate sensitivity, during the proposed Development's construction, and a Moderate / Minor adverse cumulative effect both upon completion of the scheme and 15 years after this, and this is considered **Not Significant**.

Character Area 9.2

- 13.5.87 The other development that in conjunction with the proposed Development were considered may bring about significant effects to CA 9.2 was other CBC buildings.
- 13.5.88 Whilst there would be a greater level of anticipated construction work being undertaken within the CA during AS1 on these schemes in addition to the proposed Development compared to that of the proposed Development alone, most of the CA's characteristics would remain largely unaltered. The impact would be tempered by the facts that: the construction of the CBC buildings is reasonably anticipated to only be permitted on condition of similar measures to mitigate their adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible from this CA, has over the last 10 years has become part of the area's character.
- 13.5.89 During the proposed Development's operational phase the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form. In addition, a similar set of mitigation measures to those provided by the existing CBC buildings would be implemented.
- 13.5.90 Therefore, the combined change would only affect a few of the CA's characteristics across a small degree of the geographic area. The changes would be felt less keenly with time as the existing and proposed vegetation (that is associated with both the proposed Development and the cumulative schemes) establishes and matures.
- 13.5.91 Overall, the underlying make-up and balance of the CA's overall character would be preserved.
- 13.5.92 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a Moderate / Minor Adverse cumulative effect on this receptor of Moderate sensitivity, during the proposed Development's construction, at the time of its completion and 15 years after this, and therefore is **Not Significant**.

Character Areas 10.2 & 10.3

- 13.5.93 The other developments that in conjunction with the proposed Development were considered may bring about significant effects to CA 10.2 and 10.3 were CSET and other CBC buildings.
- 13.5.94 Whilst there would be a greater level of anticipated construction work being undertaken within the CA during AS1 on these schemes in addition to the proposed Development compared to that of the proposed Development alone, most of the CA's characteristics would remain largely unaltered. The impact would be tempered by the facts that: the construction of

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the CBC buildings and CSET is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible from this CA, has over the last 10 years has become part of the area's character.

- 13.5.95 During the proposed Development's operational phase, whilst most of the CA's characteristics would remain largely unaltered, the increase in the quantity of built form arising the CBC buildings and the increase in the quantity of built form and activity arising from CSET in combination with the proposed Development would slightly diminish the characteristics of a scarcity of built form, and a strong degree of rurality. The change to these characteristics would, however, be moderated by the fact that the CSET activity: would take place within the general existing corridor which already contains the public transport infrastructure and movement of the railway; would predominantly only introduce areas of hard trackway with very few vertical elements; and reasonably anticipated to contain, or would only be permitted on condition of measures to mitigate the adverse impacts of its operation such as beneficial new planting and habitat. In addition, the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form.
- 13.5.96 Therefore, the combined change would only affect a few of the CA's characteristics across a small degree of the geographic area. The changes would be felt less keenly with time as the existing and proposed vegetation (that is associated with both the proposed Development and the cumulative schemes) establishes and matures.
- 13.5.97 Overall, the underlying make-up and balance of the CA's overall character would be preserved.
- 13.5.98 Accounting for the mitigation measures proposed the assessment concludes that there is likely to be a moderate / minor adverse cumulative effect on this receptor of moderate sensitivity, during the proposed Development's construction, at the time of its completion and 15 years after this, and therefore **Not Significant**.

## Visual Amenity assessment

- 13.5.99 The detailed visual impact assessment set out in Appendix 13.3 has considered the impact and significance of additional and combined effects on the visual receptors during the construction and operational phase of the proposed Development with other development committed in planning and other potentially major schemes that have 'allocation' within a development plan or are considered reasonably foreseeable.

## Users of National Cycle Route 11

- 13.5.100 The other developments that in conjunction with the proposed Development were considered may bring about significant effects to users of NCN Route 11 (and users of permissive paths 0155, 0170 which follow its course through the site and its immediate surrounds) were CSET and other CBC buildings.
- 13.5.101 Whilst there would be an awareness of the greater level of anticipated construction work being undertaken on these schemes in addition to the proposed Development, compared to that of the proposed Development alone, by users upon certain sections of NCN Route 11 during AS1, it would be short-term, reversible and would not affect or alter the balance of the users' overall visual experience.
- 13.5.102 The impact would be tempered by the facts that: the construction of the CBC buildings and CSET is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible to users on this route, has over the last 10 years has become part of the paths visual experience.
- 13.5.103 During the proposed Development's operational phase the visible increase in the quantity of built form arising the CBC buildings and the increase in the quantity of built form and activity

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arising from CSET in combination with the proposed Development would be recognisable. The change would, however, be moderated by the fact that the CSET activity: would take place within the general existing corridor which already contains the public transport infrastructure and movement of the railway; would predominantly only introduce areas of hard trackway with very few vertical elements; and reasonably anticipated to contain, or would only be permitted on condition of measures to mitigate the adverse impacts of its operation such as beneficial new planting and habitat. In addition, the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form.

- 13.5.104 The proposed native tree and shrub planting on parts of construction compounds CC1 and CC2 and the area south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to the visual experience of users of NCN Route 11, when near to the Nine Wells Nature Reserve, by helping to soften the potentially stark and visually arresting views to the cumulative CBC buildings and to the CSET infrastructure. These mitigation measures are detailed in paragraphs 13.4.19 to 13.4.25 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.105 Therefore, whilst there would be awareness of a greater amount of built form and activity in certain views from NCN Route 11 the combined impact would not significantly alter the overall balance of users' overall visual experience. When nearing the city's edge from the south upon NCN Route 11 the proposed Development's planting, south of Nine Wells Bridge, would bring about a beneficial change to user's visual experience in this area helping to soften the potentially stark and visually arresting views to the cumulative CBC buildings and to the CSET infrastructure.
- 13.5.106 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate Adverse cumulative effect on this receptor of Moderate / Low sensitivity, during the proposed Development's construction and at the time of its completion. This would reduce to a Moderate / Minor Adverse effect 15 years after this. All effects would be **Not Significant**.

## Public Rights of Way and Permissive Paths

- 13.5.107 The other developments that in conjunction with the proposed Development were considered may bring about significant effects to users of PRoWs and permissive paths were other CBC buildings, CSET and new housing at More's Meadow.
- 13.5.108 Whilst there would be an awareness of the greater level of anticipated construction work being undertaken on these schemes in addition to the proposed Development, compared to that of the proposed Development alone, by users upon certain sections of the PRoW and permissive paths during AS1, it would be short-term, reversible and would not affect or alter the balance of the users' overall visual experience.
- 13.5.109 The impact would be tempered by the facts that: the construction of the other developments is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible to users on this route, has over the last 10 years has become part of the paths' visual experience. In addition, the proposed housing at Mores's Meadow is largely separated from the PRoW / permissive path network by existing structural vegetation.
- 13.5.110 During the proposed Development's operational phase, the visible increase in the quantity of built form arising the CBC building and from More's Meadow housing, and the increase in the quantity of built form and activity arising from CSET in combination with the proposed Development would be recognisable.
- 13.5.111 The change would, however, be moderated by the fact that the More's Meadow housing would be located alongside existing areas of built form and is mostly separated from the PRoW / permissive path network by existing tree and scrub vegetation; the CSET activity would take place within the general existing corridor which already contains the public

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transport infrastructure and movement of the railway (plus it would predominantly only introduce areas of hard trackway with very few vertical elements, and it is reasonably anticipated to contain, or would only be permitted on condition of measures to mitigate the adverse impacts of its operation such as beneficial new planting and habitat); and because the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form in views from the PRoW / permissive path network.

- 13.5.112 Therefore, whilst there would be awareness of a greater amount of built form and activity in certain views from the PRoW / permissive path network the combined impact would not significantly alter the overall balance of users' overall visual experience.
- 13.5.113 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the area south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to users' visual experience by helping to soften the potentially stark and visually arresting views to the cumulative CBC buildings and to the CSET infrastructure. These mitigation measures are detailed at in paragraphs 13.4.19 to 13.4.25 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.114 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a moderate adverse cumulative effect on these receptors of moderate / low sensitivity (moderate / high in the case of users of PRoW 212/3), during the proposed Development's construction and at the time of its completion. This would reduce to an at worst moderate / minor adverse effect 15 years after this. All effects would be **Not Significant**.

## Publicly Accessible Open Spaces

- 13.5.115 The other developments that in conjunction with the proposed Development were considered may bring about significant effects to users of publicly accessible open spaces were other CBC buildings, CSET and new housing at More's Meadow.
- 13.5.116 Whilst there would be an awareness of the greater level of anticipated construction work being undertaken on these schemes in addition to the proposed Development, compared to that of the proposed Development alone, by users within certain areas of these publicly accessible open spaces during AS1, it would be short-term, reversible and would not affect or alter the balance of the users' overall visual experience.
- 13.5.117 The impact would be tempered by the facts that: the construction of the other developments is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible to users, has over the last 10 years has become part of their visual experience. In addition, the proposed housing at Mores's Meadow is largely separated from the open space there by existing structural vegetation. In the case of Magog Down, sight of the proposed Development's construction activities, at the distances it is experienced from, would be very small and would merge with that of the cumulative development to the point where they are indistinguishable from each other.
- 13.5.118 During the proposed Development's operational phase the visible increase in the quantity of built form arising the CBC building and from More's Meadow housing, and the increase in the quantity of built form and activity arising from CSET in combination with the proposed Development would be recognisable.
- 13.5.119 The change would, however, be moderated by the fact that the More's Meadow housing would be located alongside existing areas of built form and is mostly separated from the open space there by existing tree and scrub vegetation; the CSET activity would take place within the general existing corridor which already contains the public transport infrastructure and movement of the railway (plus it would predominantly only introduce areas of hard trackway with very few vertical elements, and it is reasonably anticipated to contain, or would only be permitted on condition of measures to mitigate the adverse impacts of its operation

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such as beneficial new planting and habitat); and because the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form in views from the open spaces.

- 13.5.120 In the case of Magog Down, sight of the proposed Development's operational form, at the distances it is experienced from, would be very small and would merge with that of the cumulative development to the point where they are indistinguishable from each other
- 13.5.121 Therefore, whilst there would be awareness of a greater amount of built form and activity in certain views from the publicly accessible open spaces the combined impact would not significantly alter the overall balance of users' overall visual experience.
- 13.5.122 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the area south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to the visual experience of users of Nine Wells Nature Reserve by helping to soften the potentially stark and visually arresting views to the cumulative CBC buildings and to the CSET infrastructure. These mitigation measures are detailed in paragraphs 13.4.19 to 13.4.25 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.123 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate Adverse cumulative effect on these receptors of Moderate sensitivity (Moderate / High in the case of users of Magog Down), during the proposed Development's construction and at the time of its completion. This would reduce to an at worst Moderate / Minor Adverse effect 15 years after this. All effects would be **Not Significant**.

## Railway Line on its Approach to Cambridge

- 13.5.124 The other developments that in conjunction with the proposed Development were considered may bring about significant effects to users of the railway were other CBC buildings, CSET and new housing at More's Meadow.
- 13.5.125 Whilst there would be an awareness of the greater level of anticipated construction work being undertaken on these schemes in addition to the proposed Development, compared to that of the proposed Development alone, by users of the railway during AS1, it would be short-term, reversible and would not affect or alter the balance of the users' overall visual experience.
- 13.5.126 The impact would be tempered by the facts that: the construction of the other developments is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible to users, has over the last 10 years has become part of their visual experience. In addition, the proposed housing at Mores's Meadow is largely separated from the open space there by existing structural vegetation.
- 13.5.127 During the proposed Development's operational phase the visible increase in the quantity of built form arising the CBC building and from More's Meadow housing, and the increase in the quantity of built form and activity arising from CSET in combination with the proposed Development would be recognisable.
- 13.5.128 The change would, however, be moderated by the fact that the More's Meadow housing would be located alongside existing areas of built form and is mostly separated from the open space there by existing tree and scrub vegetation; the CSET activity would take place within the general existing corridor which already contains the public transport infrastructure and movement of the railway (plus it would predominantly only introduce areas of hard trackway with very few vertical elements, and it is reasonably anticipated to contain, or would only be permitted on condition of measures to mitigate the adverse impacts of its operation such as beneficial new planting and habitat); and because the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form in views from this.

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- 13.5.129 Therefore, whilst there would be awareness of a greater amount of built form and activity in certain views experienced by users of the railway on their approach to Cambridge the combined impact would not significantly alter the overall balance of users' overall visual experience.
- 13.5.130 The proposed native tree and shrub planting of parts of construction compounds CC1 and CC2 and the area south of Hobson's Brook and Addenbrooke's Road, would actually bring about beneficial change to the visual experience by helping to soften the potentially stark and visually arresting views to the cumulative CBC buildings and to the CSET infrastructure. These mitigation measures are detailed in paragraphs 13.4.19 to 13.4.25 and would be incorporated into the detailed design to be approved by the Local Planning Authority under the deemed planning conditions.
- 13.5.131 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Minor / Moderate Adverse cumulative effect on these receptors of moderate / low sensitivity during the proposed Development's construction and at the time of its completion. This would reduce to an at worst Minor Adverse effect 15 years after this. All effects would be **Not Significant**.

## Residents of Clay Farm

- 13.5.132 The other development that in conjunction with the proposed Development were considered may bring about significant effects to the residents of Clay Farm were other CBC buildings.
- 13.5.133 Whilst there would be an awareness of the greater level of anticipated construction work being undertaken on these schemes in addition to the proposed Development, compared to that of the proposed Development alone, by those residents at the very eastern edge of Clay Farm during AS1, it would be short-term, reversible and would not affect or alter the balance of the users' overall visual experience.
- 13.5.134 The impact would be further tempered by the facts that: the construction of the other developments is reasonably anticipated to only be permitted on condition of similar measures to mitigate its adverse impacts that the proposed Development would, such as hoarding, lighting controls and considerate working practices; and because activity within the adjacent CBC, which is visible to users, has over the last 10 years has become part of their visual experience.
- 13.5.135 During the proposed Development's operational phase the visible increase in the quantity of built form arising the CBC building in combination with the proposed Development would be recognisable.
- 13.5.136 The change would, however, be moderated by the fact that the further completed CBC buildings in combination with the proposed Development are not anticipated to bring about a marked change to the current skyline of CBC built form in views from the open spaces.
- 13.5.137 Therefore, whilst there would be awareness of a greater amount of built form and activity in certain views from the eastern edge of Clay Farm the combined impact would not significantly alter the overall balance of users' overall visual experience.
- 13.5.138 Accounting for the mitigation measures proposed the assessment concludes that there is, at worst, likely to be a Moderate / Minor adverse cumulative effect on these receptors of Moderate sensitivity during the proposed Development's construction, a Moderate Adverse effect at the time of its completion, and a moderate / minor adverse effect 15 years after this. All effects would be **Not Significant**.

## 13.6 Assessment Summary

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13.6.1 Table 13-11 sets out a summary of the potential significant effects on each identified receptor, whether these effects are during construction or operation stages of the proposed Development, the measures put in place to mitigate such effect, and the residual effect significance.

Table 13-11 Assessment Summary

Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
Landscape Character Receptors				
Character Area 9.1	Direct and indirect effects upon the key characteristics, and the overall character of this CA arising from the proposed Development's construction works.	C	<u>Mitigation measures described in 13.4.17:</u> 1, 3, 4, 5, 6, 7, 9, 10	<b>AS1</b> = Moderate / Minor, Adverse  <b>NOT SIGNIFICANT</b>
	Direct and indirect effects upon the key characteristics, and the overall character of this CA arising from the proposed Development's operational phase.	O	<u>Site-Wide Measures described in 13.4.19</u> <i>Landform: 1a, 1b</i> <i>Vegetation: 1</i> <i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i> <u>Area-specific mitigation</u> <i>Integration with the Countryside beyond</i>	<b>AS2</b> = Moderate / Minor, Adverse  <b>NOT SIGNIFICANT</b>  <b>AS3</b> = Moderate / Minor, adverse:  <b>NOT SIGNIFICANT</b>



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Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
			<i>the City's Edge as described in 13.4.24:</i> 1, 2, 3	
Character Area 9.2	Direct and indirect effects upon the key characteristics, and the overall character of this CA arising from the proposed Development's construction works.	C	<u>Mitigation measures described in 13.4.17:</u> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	<b>AS1</b> = Moderate / Minor, Adverse <b>NOT SIGNIFICANT</b>
	Direct and indirect effects upon the key characteristics, and the overall character of this CA arising from the proposed Development's operational phase.	O	<u>Site-Wide Measures</u> <i>Landform: 1a, 1b</i> <i>Vegetation: 1</i> <i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i> <u>Area-specific mitigation</u> <i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i> <i>1, 2, 3, 4, Error! Reference source not found., 5, 6, 7, 7, 8, 9, 10, 11, 12, 13</i>	<b>AS2</b> = Moderate / Minor, Adverse: <b>NOT SIGNIFICANT</b> <b>AS3</b> = Moderate / Minor, Adverse: <b>NOT SIGNIFICANT</b>
Character Areas 10.2 & 10.3	Direct and indirect effects upon the key characteristics, and the overall character of this CA arising from the proposed Development's construction works.	C	<u>Mitigation measures described in 13.4.17:</u> 1, 3, 4, 5, 6, 7, 9, 10	<b>AS1</b> = Moderate / Minor, Adverse <b>NOT SIGNIFICANT</b>
	Direct and indirect effects upon the key characteristics,	O	<u>Site-Wide Measures</u> <i>Landform: 1a, 1b</i>	<b>AS2</b> = Moderate /

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Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
	and the overall character of this CA arising from the proposed Development's operational phase.		<p><i>Vegetation: 1</i></p> <p><i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i></p> <p><u>Area-specific mitigation</u></p> <p><i>Integration with the Countryside beyond the City's Edge as described in 13.4.24:</i></p> <p>1, 2, 3</p>	<p>Minor, Beneficial:</p> <p><b>NOT SIGNIFICANT</b></p> <p><b>AS3</b> = Moderate / Minor, Beneficial:</p> <p><b>NOT SIGNIFICANT</b></p>
<b>Visual Amenity Receptors</b>				
Users of National Cycle Route 11,	Effects to the visual amenity of users.	C	<p><u>Mitigation measures described in 13.4.17:</u></p> <p>1, 2, 3, 4, 5, 6, 7, 8, 9, 10</p>	<p><b>AS1</b> = Moderate / Minor, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>
	Effects to the visual amenity of users.	O	<p><u>Site-Wide Measures</u></p> <p><i>Landform: 1a, 1b</i></p> <p><i>Vegetation: 1</i></p> <p><i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i></p>	<p><b>AS2</b> = Moderate / Minor, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p> <p><b>AS3</b> = Moderate / Minor, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>

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Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
			<u>Area-specific mitigation</u>  <i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i>  1, 2, 3, 4, <b>Error! Reference source not found.</b> , 5, 6, 7, 7, 8, 9, 10, 11, 12, 13  <i>Integration with the Countryside beyond the City's Edge as described in 13.4.24:</i>  1, 2, 3  <i>Interface with CBC as described in 13.4.25:</i>  1, 2, 3, 4, 5, 6, 7.	
Users of PRow 39/46, 39/47, 198/1, 198/2, and 212/3	Effects to the visual amenity of users.	C	<u>Mitigation measures described in 13.4.17:</u>  1, 2, 3, 4, 5, 6, 7, 8, 9, 10	<b>AS1</b> = Moderate / Minor, Adverse:  <b>NOT SIGNIFICANT</b>
	Effects to the visual amenity of users.	O	<u>Site-Wide Measures</u>  <i>Landform: 1a, 1b</i>  <i>Vegetation: 1</i>  <i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i>  <u>Area-specific mitigation</u>  <i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i>	<b>AS2</b> = Moderate, Adverse:  <b>NOT SIGNIFICANT</b>  <b>AS3</b> = Moderate, Adverse:  <b>NOT SIGNIFICANT</b>

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Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
			<p>1, 2, 3, 4, <b>Error! Reference source not found.</b>, 5, 6, 7, 7, 8, 9, 10, 11, 12, 13</p> <p><i>Integration with the Countryside beyond the City's Edge as described in 13.4.24:</i></p> <p>1, 2, 3</p> <p><i>Interface with CBC as described in 13.4.25:</i></p> <p>1, 2, 3, 4, 5, 6, 7.</p>	
Users of permissive paths 0073, 0156 and 0123	Effects to the visual amenity of users.	C	<p><u>Mitigation measures described in 13.4.17:</u></p> <p>1, 2, 3, 4, 5, 6, 7, 8, 9, 10</p>	<p><b>AS1</b> = Moderate / Minor, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>
	Effects to the visual amenity of users.	O	<p><u>Site-Wide Measures</u></p> <p><i>Landform: 1a, 1b</i></p> <p><i>Vegetation: 1</i></p> <p><i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i></p> <p><u>Area-specific mitigation</u></p> <p><i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i></p> <p>1, 2, 3, 4, <b>Error! Reference source not found.</b>, 5, 6, 7, 7, 8, 9, 10, 11, 12, 13</p> <p><i>Integration with the Countryside beyond</i></p>	<p><b>AS2</b> = Moderate, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p> <p><b>AS3</b> = Moderate, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>

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			<p><i>the City's Edge as described in 13.4.24:</i></p> <p>1, 2, 3</p> <p><i>Interface with CBC as described in 13.4.25:</i></p> <p>1, 2, 3, 4, 5, 6, 7.</p>	
	Effects to the visual amenity of users.	C	<p><u>Mitigation measures described in 13.4.17:</u></p> <p>1, 2, 3, 4, 5, 6, 7, 8, 9, 10</p>	<p><b>AS1</b> = Moderate / Minor, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>
Users of the publicly accessible open spaces of Hobson Park, More's Meadow, Magog Down and Nine Wells Nature Reserve	Effects to the visual amenity of users.	O	<p><u>Site-Wide Measures</u></p> <p><i>Landform: 1a, 1b</i></p> <p><i>Vegetation: 1</i></p> <p><i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i></p> <p><u>Area-specific mitigation</u></p> <p><i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i></p> <p>1, 2, 3, 4, <b>Error! Reference source not found., 5, 6, 7, 7, 8, 9, 10, 11, 12, 13</b></p> <p><i>Integration with the Countryside beyond the City's Edge as described in 13.4.24:</i></p> <p>1, 2, 3</p>	<p><b>AS2</b> = Moderate, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p> <p><b>AS3</b> = Moderate, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>

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Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
Users of the railway on its approach to Cambridge	Effects to the visual amenity of users.	C	<u>Mitigation measures described in 13.4.17:</u> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	<b>AS1</b> = Moderate / Minor, Adverse: <b>NOT SIGNIFICANT</b>
	Effects to the visual amenity of users.	O	<u>Site-Wide Measures</u> <i>Landform: 1a, 1b</i> <i>Vegetation: 1</i> <i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i> <u>Area-specific mitigation</u> <i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i> 1, 2, 3, 4, <b>Error! Reference source not found.</b> , 5, 6, 7, 7, 8, 9, 10, 11, 12, 13 <i>Integration with the Countryside beyond the City's Edge as described in 13.4.24:</i> 1, 2, 3	<b>AS2</b> = Minor, Adverse: <b>NOT SIGNIFICANT</b> <b>AS3</b> = Minor, Adverse: <b>NOT SIGNIFICANT</b>
Residents of Clay Farm neighbourhood	Effects to the visual amenity of users.	C	<u>Mitigation measures described in 13.4.17:</u> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	<b>AS1</b> = Moderate / Minor, Adverse: <b>NOT SIGNIFICANT</b>

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Receptor	Potential Significant Effect	Phase: (Construction (C), or Operation (O))	Mitigation Measure (links to numbered points in section 13.4)	Residual Effect Significance
	Effects to the visual amenity of users.	O	<p><u>Site-Wide Measures</u></p> <p><i>Landform: 1a, 1b</i></p> <p><i>Vegetation: 1</i></p> <p><i>Lighting: 1, Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., 5, 6, Error! Reference source not found., 7, Error! Reference source not found.</i></p> <p><u>Area-specific mitigation</u></p> <p><i>Integration with Hobson's Park and the Green Corridor as described in 13.4.23:</i></p> <p><i>1, 2, 3, 4, Error! Reference source not found., 5, 6, 7, 7, 8, 9, 10, 11, 12, 13</i></p>	<p><b>AS2</b> = Moderate, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p> <p><b>AS3</b> = Moderate, Adverse:</p> <p><b>NOT SIGNIFICANT</b></p>

13.6.2 Table 13-11 identifies that there would be no significant adverse residual effects to any of the identified landscape character or visual amenity receptors either during the proposed Development's construction or operational stages.

13.6.3 The landscape character receptors identified would generally experience an adverse moderate / minor significance of residual effect during all three assessment scenarios on account of direct and indirect effects upon some of their key characteristics, and upon their overall character. During the operational phase there would be a beneficial moderate / minor significance of effect upon the key characteristics, and upon the overall character of CA's 102 and 10.3.

13.6.4 The visual amenity receptors identified would experience a range of residual effects of significance - from moderate to minor adverse during all three assessment scenarios. All of these effects are considered to be **Not Significant**.

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- 13.6.5 Whilst there would be residual adverse effects on landscape character and visual amenity receptors, the mitigation measures put in place to reduce the significance of such effects ensure that the proposed Development would, overall, accord with the policies and guidance identified in paragraphs 13.2.3 to 13.2.54.



## 13.7 References

Reference	Title
Ref 13.1	HMSO. (2012); European Landscape Convention; <a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/236096/8413.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/236096/8413.pdf</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.2	National Planning Policy Framework, (2019) Ministry of Housing, Communities and Local Government <a href="https://www.gov.uk/government/publications/national-planning-policy-framework--2">https://www.gov.uk/government/publications/national-planning-policy-framework--2</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.3	Cambridge Local Plan, (2018) Cambridge City Council <a href="https://www.cambridge.gov.uk/local-plan-2018">https://www.cambridge.gov.uk/local-plan-2018</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.4	South Cambridgeshire Local Plan, (2018) South Cambridgeshire District Council <a href="https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/the-adopted-development-plan/south-cambridgeshire-local-plan-2018/">https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/the-adopted-development-plan/south-cambridgeshire-local-plan-2018/</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.5	Southern Fringe Area Development Framework (2006), Cambridgeshire County Council <a href="https://www.cambridge.gov.uk/media/5787/southern-fringe-area-development-framework.pdf">https://www.cambridge.gov.uk/media/5787/southern-fringe-area-development-framework.pdf</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.6	East of England Landscape Typology, (2011) Landscape East <a href="http://landscape-east.org.uk/east-england-landscape-typology">http://landscape-east.org.uk/east-england-landscape-typology</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.7	'District Design Guide Supplementary Planning Document, (2010) South Cambridgeshire District Council <a href="https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/district-design-guide-spd/">https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/district-design-guide-spd/</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.8	'Cambridgeshire Green Infrastructure Strategy' (2011), Cambridge County Council, et al <a href="https://www.cambridge.gov.uk/media/2557/green-infrastructure-strategy.pdf">https://www.cambridge.gov.uk/media/2557/green-infrastructure-strategy.pdf</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.9	National Design Guide, (2019) Ministry of Housing, Communities & Local Government <a href="https://www.gov.uk/government/publications/national-design-guide">https://www.gov.uk/government/publications/national-design-guide</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.10	Natural England, National Character Map of England <a href="https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles">https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.11	'Cambridge Landscape Character Assessment' (2003), Cambridgeshire County Council <a href="https://www.cambridge.gov.uk/media/5751/cambridge-landscape-character-assessment-2003.pdf">https://www.cambridge.gov.uk/media/5751/cambridge-landscape-character-assessment-2003.pdf</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.12	Cambridge Inner Green Belt Boundary Study (2015), Cambridgeshire County Council <a href="https://scambs.moderngov.co.uk/documents/s83223/Appendix C A. Cambridge Inner Green Belt Boundary Study_ Main Report.pdf">https://scambs.moderngov.co.uk/documents/s83223/Appendix C A. Cambridge Inner Green Belt Boundary Study_ Main Report.pdf</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.13	Network Rail (NR) publication 'Our Principles of Good Design' (2019) <a href="https://cdn.networkrail.co.uk/wp-content/uploads/2019/03/Our-principles-of-good-design.pdf">https://cdn.networkrail.co.uk/wp-content/uploads/2019/03/Our-principles-of-good-design.pdf</a> accessed on 19 <sup>th</sup> April 2021
Ref 13.14	Landscape Institute and the Institute of Environmental Assessment and Management (2013), Guidelines for Landscape and Visual Impact Assessment (Third Edition), Routledge, London

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Reference	Title
Ref 13.15	Landscape Institute, 2013: GLVIA3 Statement of Clarification 1/13 10-06-13. Landscape Institute <a href="https://www.landscapeinstitute.org/technical-resource/glvia3-clarifications/">https://www.landscapeinstitute.org/technical-resource/glvia3-clarifications/</a> ; Accessed: 19th April 2021
Ref 13.16	Landscape Institute Technical Guidance Note 06/19 Visual Representation of Development Proposals. <a href="https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf">https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf</a> accessed 19th April 2021
Ref 13.17	'Guidance on Undertaking Environmental Lighting Impact Assessments - document PLG04', (2013) Institute of Lighting Professionals <a href="https://theilp.org.uk/publication/plg04-guidance-on-undertaking-environmental-lighting-impact-assessments/">https://theilp.org.uk/publication/plg04-guidance-on-undertaking-environmental-lighting-impact-assessments/</a> accessed 19th April 2021
Ref 13.18	Guidance Notes for the Reduction of Obtrusive Light GN01, (2020) Institution of Lighting Professionals <a href="https://theilp.org.uk/publication/guidance-note-1-for-the-reduction-of-obtrusive-light-2020/">https://theilp.org.uk/publication/guidance-note-1-for-the-reduction-of-obtrusive-light-2020/</a> accessed 19th April 2021

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Environmental Statement – Volume 2: Chapter 14 – Materials and Waste



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 14 – Materials and Waste**

JUNE 2021

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## 14 Materials and Waste

### 14.1 Introduction

- 14.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction of the proposed Development with respect to Materials and Waste. The assessment incorporates relevant design and other mitigation measures that would be employed during construction of the proposed Development.
- 14.1.2 The construction of the proposed Development will require large quantities of material resources with the potential for significant adverse effects on regional/national supplies. Construction activities will also generate large quantities of construction, demolition, and excavation (CD&E) waste with the potential for significant adverse effects on regional waste management infrastructure and landfill capacity.

### Relevant Aspects of the Proposed Development

- 14.1.3 A description of the proposed Development is provided in Chapter 4. The specific aspect of the proposed Development that relates to Waste and Resource Management is the waste generated and materials consumed during CD&E. Note that for the proposed Development, operational waste has been scoped out of the assessment as the proposed Development is not expected to produce a significant volume of waste. This Chapter discusses the impact of the proposed Development on the availability of materials within the UK, but does not make reference to the impact of the transportation of materials, as these are discussed in Climate Change (Chapter 9 and 10), Transport (Chapter 17), and Air Quality (Chapter 7).

### 14.2 Assessment Methodology

#### Legislation, Policy and Guidance

##### Legislation

- 14.2.1 The following legislation is relevant to the assessment of Waste and Resource Management and has informed the assessment.
- European Union (EU) Landfill Directive (Directive 1999/31/EC on the landfill of waste) (European Commission, 1999) (Ref 14-1)
  - EU Directive on Waste (Waste Framework Directive) (Directive 2008/98/EC on waste) (Ref 14-2)
  - The Clean Neighbourhoods and Environment Act 2005 (Ref 14-3)
  - Environmental Permitting (England and Wales) Regulations 2016 (as amended) (Ref 14-4)
  - The Hazardous Waste (England and Wales) Regulations 2005 (as amended) (Ref 14-5)
  - Waste (England and Wales) Regulations 2011 (as amended) (Ref 14-6)
  - Environmental Protection Act 1990 (Part 2) (Ref 14-7)

##### Policy

- 14.2.2 The following national and regional policy relevant to waste and resource management and how this policy has been considered is presented below.
- National Planning Policy Framework (NPPF) (2019) (Ref 14-8) Chapter 2: 'Achieving sustainable development', paragraph 8(c) 'an environmental objective - to contribute to protecting and enhancing our natural, built and historic environment;... using natural resources prudently, minimising waste and pollution' and Chapter 17 'Facilitating the sustainable use of materials' paragraph 205 (b) 'ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality'.

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- National Planning Policy for Waste (2014) (Ref 14-9) – This document details waste planning policies to be used by local planning authorities for use in identifying the need for waste management facilities, identifying suitable sites and areas and determining planning applications.
- Waste Management Plan for England (2021) (Ref 14-10) – This plan provides an analysis of the current waste management system and fulfils the mandatory requirements of Article 28 of the Waste Framework Directive.
- Our Waste, Our Resources: a strategy for England (2018) (Ref 14-11) - This document sets out the UK Government's strategy on how it would preserve the stock of material resources by minimising waste, promoting resource efficiency and moving towards a circular economy, minimise the damage caused to our natural environment by reducing and managing waste safely and carefully, and dealing with waste crime. It combines actions to be taken with firm commitments for the coming years and gives a clear longer-term policy direction in line with the UK Government's 25 Year Environment Plan.
- Cambridgeshire and Peterborough Minerals and Waste Development Plan (MWDP): Core Strategy (2011) (Ref 14-12) – The Plan sets out the strategic vision and objectives and includes a suite of development control policies to guide waste development in Cambridge and Peterborough. The MWDP is currently being updated, as detailed below.
- Cambridgeshire and Peterborough Minerals and Waste Local Plan (MWLP) (Preliminary Consultation Draft), March (2019) (Ref 14-13) - The MWLP 2019 has been prepared by Cambridge and Peterborough Councils and is currently at consultation stage. It was proposed that this document would be adopted by the local councils by November 2020; the document is currently undergoing further consultation. It represents the views of the council from 2020 onwards and the direction local policies are proposed to go.
- RECAP Partnership: Waste Management Design Guide Supplementary Planning Document (2012) (Ref 14-14) - The proposed Development lies within the boundaries of Cambridgeshire County Council (CCoC). CCoC works with Peterborough City Council to form the Cambridgeshire and Peterborough Waste Partnership (RECAP). The RECAP Waste Management Design Guide provides advice on the design and provision of waste management infrastructure as part of residential and commercial developments. The RECAP Guide also includes a Toolkit Assessment to be used by developers to demonstrate how they have addressed the waste management infrastructure requirements.
- Cambridge City Council, Local Plan (2018) (Ref 14-15) - The Local Plan is a set of policies and land allocations that would guide the future of the City. Planning decisions must be taken in accordance with the Local Plan unless material considerations indicate otherwise.
- Waste Needs Assessment (2019) (Ref 14-16) - This document summarises the current and historic waste produced and the facilities for waste management within Cambridgeshire and Peterborough. It estimates the future waste produced and waste management facilities to determine whether the future waste up to 2036 can be managed or if new waste facilities would be required.
- Joint Municipal Waste Management Strategy for Cambridgeshire and Peterborough 2008-2022. (Ref 14-17) - The Joint Municipal Waste Management Strategy sets out the key aims and objectives of the Cambridgeshire and Peterborough Waste Partnership. The strategy covers the period 2008-2022 and provides an update of the first partnership strategy issued in 2002.
- South Cambridgeshire District Council, Local Plan, Adopted September 2018 (Policy CC/6, Policy SC/4, Policy HQ/1, Policy TI/8). (Ref 14-18) - The Local Plan is a set of policies and land allocations that would guide the future of South Cambridgeshire. All planning applications would be assessed against the policies in the Local Plan.

## Guidance

- 14.2.3 A number of standards and non-statutory guidelines, which provide details of assessment methodologies and mitigation techniques have been used to inform the assessment. These include:

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- Building Research Establishment (BRE) Site Methodology to Audit, Reduce and Target Waste (SMARTWaste) (Building Research Establishment, 2018) (Ref 14-19)
- Contaminated Land: Applications in Real Environments (CL:AIRE) The Definition of Waste Development Industry Code of Practice (CoP), (CL:AIRE 2011) (Ref 14-20)
- Waste Resources and Action Programme (WRAP) Site Waste Management Plan template (WRAP, 2019) (Ref 14-21)
- Design Manual for Roads and Bridges (DMRB) LA 110 Material assets and waste (formerly IAN 153/11) (Ref 14-22)
- Institute of Environmental Management and Assessment (IEMA) guide to: Materials and Waste in Environmental Impact Assessment - Guidance for a proportionate approach (Ref 14-23)
- Repealed Site Waste Management Plan (SWMP) Regulations (The Stationery Office, 2008) (Ref 14-24).

## Consultation and Scoping

14.2.4 Table 14-1 provides a summary of scoping matters raised with respect to Materials and Waste following consultation with Greater Cambridge Shared Planning (GCSP) and how they will be addressed.

Table 14-1 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
GCSP, Emma Davies, 19/6/2020	Scope of the Materials and Waste Assessment – Construction/Operation	The proposed scope of the assessment was presented with the inclusion of effects relating to materials consumption and waste arisings during the construction phase. The operation phase was proposed to be <b>scoped out</b> in its entirety along with the consideration of mineral resources in anticipation that the quantities of material resources for maintenance will be relatively small in the context of UK material demand. Emma Davies agreed with this scope, noting that the operation phase would be unlikely to generate any significant effects with respect to waste generation.

14.2.5 No consultee responses were received with the scoping opinion with regards to Materials and Waste. It was however agreed as above that the operational phase will be scoped out and the assessment will be for the construction phase only. Further details of the consultation can be found in Appendix 2.2.

## The Study Area

14.2.6 The IEMA Waste Guidance (Ref 14-23) sets out two types of study area for materials and waste:

- Development Study Area: The proposed Development site and any areas required for temporary access, site compounds, working platforms, and other enabling activities.



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- Expansive Study Area: The area in which waste would be disposed of, and materials sourced from. This covers the waste management infrastructure and remaining landfill capacity at a regional or national level, if appropriate.
- 14.2.7 The Expansive Study Area for material resources for the proposed Development covers the whole of the UK. The main construction material resources include aggregates, concrete, asphalt and steel which have national (and in some cases international) rather than local supply chains.
- 14.2.8 Construction, demolition and excavation (CD&E) waste would be disposed of regionally. The Expansive Study Area for waste therefore comprises the administrative boundary of Cambridgeshire County Council (CCoC) (the waste disposal authority).

## Methodology for Establishing Baseline Conditions

- 14.2.9 Baseline conditions have been established through desk-based research, comprising the use of key databases. These include:
- The Mineral Products Industry at a Glance (2018 Edition) (Ref 14-25)
  - The World Steel: 2018 Statistical Yearbook (Ref 14-26)
  - UK Government: Building materials and components: monthly statistics: April 2019 (Ref 14-27)
  - Waste Resources and Action Programme Net Waste tool (2019) (Ref 14-28)
  - DEFRA WasteDataFlow (2019) (14-29)
  - UK Government statistics on waste including:
    - ENV18 – Local authority collected waste: annual results tables (2019) (Ref 14-30)
    - ENV23 – UK statistics on waste (2019) (Ref 14-31)
    - UK government statistics on waste and recycling statistics (2019) (Ref 14-32)
    - Environmental Permitting Regulations (EPR) Database (2020) (Ref 14-33)
    - Remaining Landfill Capacity Database (2019) (Ref 14-34)

## Forecasting the Future Baseline

- 14.2.10 The Waste Management Plan for England 2021 (Ref 14-10) reaffirms the UK's commitment to meet its target under the Waste Framework Directive of recovering at least 70% by weight, of C&D waste (Note: this relates to construction and demolition waste, excluding excavation waste, hazardous waste and naturally occurring material falling within code 17 05 04 in Schedule 1 to the List of Wastes (England) Regulations 2005) (Ref 14-35)). This commitment has been considered in the assessment.
- 14.2.11 For material resources during the construction phase, the assessment calculates the quantity of different materials that would be used as part of the construction of the proposed Development and determines based on industry standards whether these quantities of materials would have an effect on the availability of these resources in the UK.

## Approach

- 14.2.12 The IEMA Waste Guidance (Ref 14-23) has been used to inform the assessment methodology for potential effects on material resources and waste management, along with best practice methods and professional judgement. The assessment methodology has been adapted to suit the specific waste arisings likely to be generated by the proposed Development and the unique characteristics of CCoC's waste management infrastructure.
- 14.2.13 The assessment has addressed potential impacts resulting from waste management and the use of resources associated with CD&E works phases of the proposed Development. It is anticipated that material waste likely to arise from the CD&E phases would consist of hard and inert materials, soils and stones, plastics, packaging (wooden and plastic), insulation material, miscellaneous metals, canteen and office waste.

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The framework for the assessment of CD&E waste has been derived from a combination of national, regional and local waste policies combined with professional judgement.

## Defining the Importance/Sensitivity of resource

### Waste Sensitivity

14.2.14 The assessment of effects from CD&E waste would focus on the potential direct impact of waste arisings on the existing regional waste management infrastructure. This is evaluated through the consideration of the sensitivity of waste receptors (landfill sites) and the magnitude of waste generated by the proposed Development.

14.2.15 The sensitivity of landfill sites is based on the extent to which void capacity in the Expansive Study Area for waste is projected to change over the construction period of the proposed Development. This is determined using the IEMA Waste Guidance (Ref 14-23) sensitivity criteria, set out in Table 14-2.

Table 14-2 Sensitivity criteria for waste

Negligible	Low	Medium	High	Very High
No reduction in void landfill capacity; or is expected to increase through a committed change in capacity	<1% reduction in void landfill capacity	1-5% reduction in void landfill capacity	6-10% reduction in void landfill capacity	>10% reduction in void landfill capacity or would require new capacity or infrastructure to be put in place to meet forecast demand

### Materials Sensitivity

14.2.16 The assessment of materials relates to the availability and type of resources to be used for the proposed Development. The sensitivity of the material is determined by identifying where the thresholds are met. This is determined using the sensitivity criteria from the IEMA Waste Guidance (Ref 14-23), set out in Table 14-3.

Table 14-3 Sensitivity criteria for material resources

Negligible	Low	Medium	High	Very High
Are forecast to be free from known issues regarding supply and stock, or are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials	Are forecast to be generally free from known issues regarding supply and stock and/or are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.	Are forecast to suffer from some potential issues regarding supply and stock and/or are available comprising some sustainable features and benefits compared to industry-standard materials.	Are forecast to suffer from known issues regarding supply and stock and/or comprise little sustainable features and benefits compared to industry-standard materials	Are known to be insufficient in terms of production, supply and/or stock and/or comprise no sustainable features and benefits compared to industry-standard materials.

## Methodology for Assessing Impacts

### Impact Characterisation

#### Impact Magnitude of Waste

14.2.17 The impact magnitude relating to construction waste is evaluated through the consideration of the extent to which the proposed Development would reduce landfill void capacity within the administrative boundary of CCoC. This is determined using the impact magnitude criteria set out in Table 14-4.

Table 14-4 Impact magnitude criteria for waste

No Change	Negligible	Minor	Moderate	Major
Zero waste disposal from the proposed Development.	<1% reduction in regional landfill void capacity	1-5% reduction in regional landfill void capacity	6-10% reduction in regional landfill void capacity	<10% reduction in regional landfill void capacity

#### Impact Magnitude of Material Resources

14.2.18 The methodology for assessing the magnitude of impact from materials comprises a percentage-based approach that determines the influence of materials consumption on the baseline market capacity (production, stocks or sales), in construction and/or operation, in combination with the potential to sterilise (substantially) one or more allocated mineral sites. Where applicable, an impact is justified to be substantial through the use of best professional judgement. The impact magnitude criteria are set out in Table 14-5.

Table 14-5 Impact magnitude criteria for materials.

No Change	Negligible	Minor	Moderate	Major
No materials are required	No individual material type is equal to or greater than 1% by volume of the national baseline availability.	One or more materials are between 1-5% by volume of the national baseline availability and/or the development has the potential to adversely and substantially impact access to one or more allocated mineral site, placing their future use at risk.	One or more materials are between 6-10% by volume of the national baseline availability and/or one allocated mineral site is substantially sterilised by the development rendering it inaccessible for future use.	One or more materials are >10% by volume of the national baseline availability and/or more than one allocated mineral site is substantially sterilised by the development rendering it inaccessible for future use.

### Assessing Significance

14.2.19 Effect significance is the product of receptor sensitivity and the magnitude of the potential impact of the proposed Development. For waste, this would be the projected landfill void capacity (sensitivity) and the projected reduction in landfill void capacity as a result of the proposed Development (magnitude). For materials, this is the product of the baseline market capacity and the projected reduction in supply caused by the proposed Development. Table 14-6 presents the matrix used to determine the resulting effect significance and indicates with orange shading whether effects would be considered to be Significant in terms of the EIA Regulations.

Table 14-6 Effects Significance Matrix

		Impact Magnitude				
		No change	Negligible	Minor	Moderate	Major
Receptor Sensitivity	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

## Limitations and Assumptions

### Limitations

14.2.20 The amount of waste produced during the CD&E phases would be affected by the specific types and methods of construction proposed by the works contractor(s). At the current stage of design, a definitive list of plant and equipment and associated information (such as exact specification or operation requirements of the construction equipment) is not available. However, assumptions based on industry standards and the equipment likely to be used during demolition and construction and their consumption of material resources have been made. Similarly, the quantities of materials to be used in the construction of the proposed Development has been predicted using worst-case estimates.

### Assumptions

- 14.2.21 The assessment of impacts has been carried out against the baseline conditions. Forecast data for CD&E waste generation from the proposed Development has been estimated based upon proposed land use and environmental performance indicators from the BRE since actual waste generation data is not available. Assumptions have been made regarding types and methods of construction in order to estimate volumes of waste arising from the CD&E phases.
- 14.2.22 See Appendix 14.1 (Building area schedule) and Appendix 14.2 (Areas of infrastructure) for further information on the data used to inform this assessment.
- 14.2.23 Assessment of the waste arisings and materials usage have been calculated using BRE's Smartwaste tool. With this tool, calculations have been made using 'Commercial Buildings' statistics as a proxy for station waste, resulting in a 'worst-case' estimation of the likely volumes of waste arising from the CD&E phase.
- 14.2.24 In cases where waste has been calculated as a volume, WRAP's waste conversion factors (Ref 14-28) have been applied to convert volume to weight.
- 14.2.25 Operational waste has been scoped out of the assessment under the assumption that municipal waste produced in this phase will have negligible impact on the landfill capacity in the region.

## 14.3 Baseline

### Existing Baseline

#### Construction, Demolition and Excavation Waste

14.3.1 The proposed Development will result in the production of waste arisings from CD&E activities, including damage to materials and goods, off-cuts, excavation of soils and material packaging. Table 14-7 outlines the tonnage of non-hazardous construction and demolition waste arisings in England and the recovery rates between 2010 and 2016 (most up to date information available). Current UK targets from the Waste Management Plan for England (Ref 14-10) aim to recover at least 70% of non-hazardous CD&E waste, and most recent data indicates the current recovery rate is 92%.

Table 14-7 Waste recovery rates 2010-2016

Year	Construction and demolition waste arisings (tonnes)	Recovery rate (%)
2010	53,600,000	92.2
2011	54,900,000	92.5
2012	50,500,000	92.0
2013	51,700,000	92.0
2014	55,900,000	92.4
2015	57,700,000	92.3
2016	59,600,000	92.1

14.3.2 Table 14-8 presents a non-exhaustive list of waste management facilities. This list was collated by interrogating the Environment Agency Environmental Permitting Regulations Database (Ref 14-33). Each of these could potentially accept inert and non-hazardous waste within the Expansive Study Area for waste.

Table 14-8 Waste management facilities within the Expansive Study Area.

Facility Name	Site Type	Remaining Capacity end 2018 (cubic metres)
Waterbeach Waste Management Facility	L04 - Non-Hazardous	2,331,668
Buckden Landfill Site	L04 - Non-Hazardous	2,241,366
Thornhaugh Landfill Site	L02 - Non-Hazardous Landfill with SNRHW cell	1,872,530

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Facility Name	Site Type	Remaining Capacity end 2018 (cubic metres)
March Landfill Site	L04 - Non-Hazardous	1,077,604
Willow Hall Quarry And Landfill	L05 - Inert Landfill	900,000
Eye North Eastern Landfill	L04 - Non-Hazardous	718,524
Witcham Meadlands Landfill	L04 - Non-Hazardous	647,325
Barrington Cement Works	L05 - Inert Landfill	645,000
MILTON LANDFILL	L04 - Non-Hazardous	4 39,370
Park Farm	L05 - Inert Landfill	433,416
Colne Fen Quarry	L05 - Inert Landfill	400,000
Grunty Fen Landfill Site	L04 - Non Hazardous	246,314
Cow Lane Inert Landfill	L05 - Inert Landfill	225,500
Kennett Phase 2 A	L05 - Inert Landfill	193,765
Mepal Airfield Inert Landfill	L05 - Inert Landfill	193,000
Mepal Landfill Extension	L05 - Inert Landfill	65,000
Kennett Hall Farm	L05 - Inert Landfill	50,464

14.3.3 The EA Remaining Landfill Capacity Database (Ref 14-34) indicates that the remaining inert and non-hazardous landfill capacity in CCoC totalled approximately 12,680,846m<sup>3</sup> at the end of 2018.

### Material Resources

*The main materials required for construction of the proposed Development include metals, bricks, aggregate (including sands and gravels), asphalt, slate (including roofing, cladding), concrete (including blocks, tiles, ready mixed), timber, gypsum (including plasterboard) and soils. Most of these material resources originate offsite, purchased as construction products, and some arise onsite such as excavated soils. Offsite materials will be sourced from as close to the site as possible but could potentially be sourced nationwide.*

14.3.4 Table 14-9 provides a summary of annual UK sales of the key material inputs into the proposed Development, as adapted UK Government Monthly Statistics (Ref 14-27).

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Table 14-9 Annual UK sales of construction material

Materials		Annual UK sales (tonnes)
Aggregates	Total aggregate materials	184,300,000
	Crushed rock	113,000,000
	Sand and gravel – land won	48,600,000
	Sand and gravel – marine won	14,100,000
	Recycled and secondary	70,400,000
Cementitious	Total Cementitious materials	15,000,000
	Cement	12,000,000
	Other cementitious materials (e.g. fly ash, ground clay bricks)	3,000,000
Concrete	Total Concrete materials	81,900,000
	Ready mixed concrete	56,100,000
	Concrete products	25,800,000
Asphalt		25,200,000
Industrial Lime / Limestone and gypsum		1,100,000
Steel		7,670,000
Bricks		2,025,000,000

## Future Baseline

### Waste

14.3.5 The Waste Needs Assessment prepared in 2019 (Ref 14-16) forecast that, in Cambridgeshire and Peterborough, over 26.3 million tonnes of CD&E waste would need to be managed between 2021 and 2036. This has been summarised in Table 14-10 below, which shows the predicted per annum quantities of CD&E waste at 5-year intervals.

Table 14-10 Predicted CD&amp;E waste for Cambridge and Peterborough between 2021 and 2036

	2021	2026	2031	2036
Total CD&E waste arisings (million tonnes)	1.649	1.647	1.641	1.637

- 14.3.6 The Waste Needs Assessment prepared in 2019 (Ref 14-16) has indicated that Cambridgeshire and Peterborough would see some of the highest housing growth in the country with an estimated population of 170,500 people and 77,700 households by 2021. It also estimated that by 2036 there would be approximately 510,000 tonnes of municipal waste produced by the Cambridgeshire and Peterborough area.
- 14.3.7 The Proposed Joint Municipal Waste Management Strategy for Cambridgeshire and Peterborough (Ref 14-17) was published in November 2019. This Strategy includes the remaining landfill void space data as detailed in Table 14-11 below.

Table 14-11. Remaining/deficit landfill void space

Year	Inert Landfill remaining / void space	Non-hazardous Landfill remaining / void space (m <sup>3</sup> )
2021	-9,000,000	4,192,000
2026	-12,090,000	2,124,000

- 14.3.8 This would indicate that there would be an overall deficit of remaining inert landfill space with an excess of non-hazardous landfill void space.
- 14.3.9 Further information has been obtained from the design team regarding the quantities of material resources that would be used for the proposed Development as well as the composition of waste streams that would be generated during the construction phase.

## Materials

- 14.3.10 The Mineral Products Association expects a cumulative demand for aggregates of between 3.2 and 3.8 billion tonnes over the next 15 years (Ref 14-25). A breakdown of the projected market sales volumes within the UK indicate that production of the materials to be used in the proposed Development are likely to increase over the next few years to meet demand.
- 14.3.11 Due to recent changes in the UK steel market, a reliable forecast of sales is not available. A recent study by the UK Government has indicated there is the potential to grow the market by 150% by 2030 to reach future demand, providing barriers to capacity are addressed (Ref 14-37).

## 14.4 Design and Mitigation

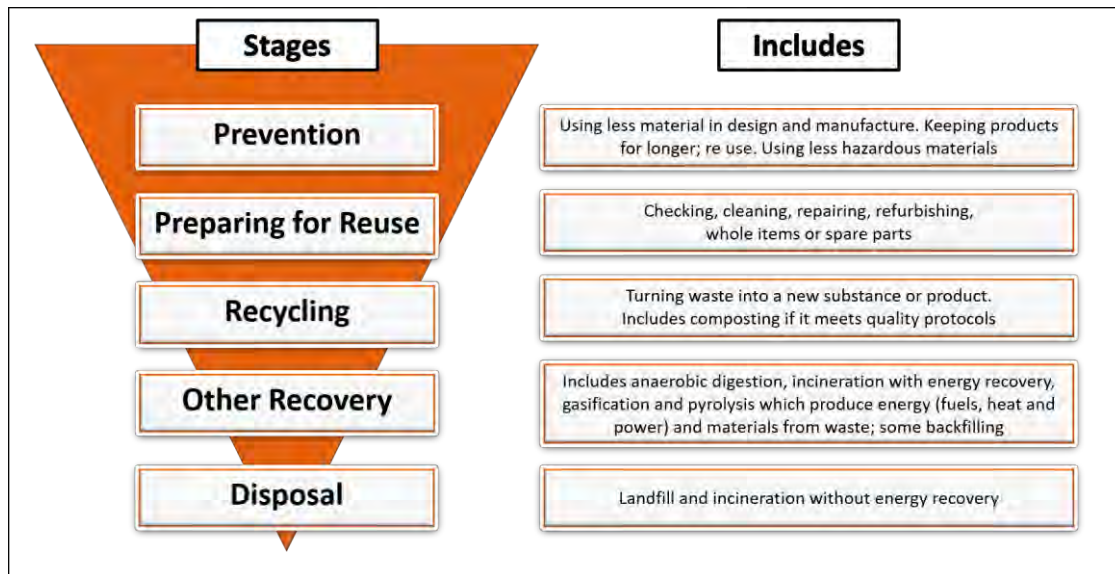
- 14.4.1 Details of the design and mitigation measures that will act to ameliorate adverse effects are summarised below.

### Design Approach

- 14.4.2 The proposed Development design would take into consideration the waste hierarchy, detailed in Figure 14-1 below, to decrease the quantities of waste arisings and minimise material consumption via designing out waste and maximising efficient use of materials.



Figure 14-1 Waste Hierarchy (adapted from DEFRA Waste Hierarchy Guidance (Ref 14-38))



14.4.3 The Waste Hierarchy is supported by the following five key principles of waste reduction and material minimisation that have been applied to the proposed Development at the early design stage:

- Design for reuse and recovery
- Off-site construction
- Materials optimisation
- Waste efficient procurement
- Deconstruction and flexibility

14.4.4 The key aspects of waste and materials minimisation that have been accounted for during scheme design and will be developed during detailed design are:

- Design complexity: Reduce the complexity of the design to standardise the construction process and reduce the quantity of material resources required (e.g. ensure that floor to ceiling heights are consistent to encourage off-site fabrication, standardising room heights to match plasterboard dimensions and standard brick dimensions, etc.)
- Specifications: Avoid over specification and minimise variation in material resources, components and joints; evaluate the reuse and recycling opportunities for the specified material resources before specification (e.g. specify windows that could be recycled in the future, etc.); and evaluate the use of materials with high recycled content (e.g. ceramic tiles, reconstituted faced stones and reconstituted slates, etc.)

14.4.5 These principles will guide the selection of the materials palette and detailed methods of construction during detailed design. However, the layout and scale of the proposed Development has been optimised to ensure efficient use of floor space.

## Construction Approach and Mitigation of Construction Effects

### Waste

14.4.6 A Site Waste Management Plan (SWMP) will be prepared and implemented at the detailed design stage to establish a methodology for measuring and auditing construction and demolition waste. A SWMP is a live document and would be updated regularly during the remainder of the project. Preparing a SWMP would facilitate the identification and implementation of waste minimisation at the detailed design stage and reuse and recycling opportunities during on site operations, reducing the quantities of construction waste sent to landfill. Waste produced onsite should be forecast and plans should be made for how to best reduce and recover the forecast waste.

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14.4.7 A CoCP sets out the standards and procedures that developers and contractors must adhere to in order to manage the potential environmental impacts of construction works. An outline Code of Construction Practice (CoCP) (Part A) has been prepared to describe the high level environmental management and mitigation requirements to be implemented for the delivery of the proposed Development. The SWMP would be incorporated into the Code of Construction Practice (CoCP) Part B documentation. The delivery of Part B will be secured via a deemed planning condition.

14.4.8 The key elements of CD&E waste management for consideration will be to:

- Allocate a person responsible for producing and implementing the SWMP. This person may also be responsible for ensuring compliance with Duty of Care regulations;
- Ensure training is tailored for personnel at each level of the waste supply chain to improve waste awareness;
- Identify target recovery rates for each waste type along with formal measurement;
- Identify the waste streams (for example, wood, brick/concrete, soils, plastics and so on) likely to be produced during construction and/or demolition, to establish the potential for reuse (on or off-site) and recycling;
- Identify the most significant opportunities to increase reuse and recycling rates (termed Waste Recovery Quick Wins) and the realistic recovery rates;
- Identify suitable waste management contractors and record appropriate licenses, permits, waste transfer notes and hazardous waste consignment notes;
- Consider appropriate site practices such as how waste materials should be segregated and the measures that should be used for raising site operatives' awareness of waste reduction, reuse and recycling; and
- Set out the method for measuring and auditing construction and demolition waste.

14.4.9 The Network Rail Contractor (NRC) should monitor waste arisings and management practices by way of implementing the measures in the CoCP Part B. Auditing and measurement should enable more effective management of waste through the setting of performance targets for recycling and segregation and monitoring subcontractors.

14.4.10 The phasing of the proposed Development allows the opportunity for the CD&E waste to be reused or recycled on-site in subsequent stages of the proposed Development.

### Promotion of Best Practice

14.4.11 As part of the encouragement of on-site best practice, the NRC would ensure that suppliers of raw materials are committed to reducing surplus packaging associated with materials deliveries. This includes the reduction of plastics, cardboard and wooden pallets. This may also involve improved procurement and consultation with preferred suppliers regarding commitments to waste minimisation, recycling and continuous improvement in environmental performance. Table 14-12 sets out the key actions to minimise waste through ordering, delivery, storage and handling.

Table 14-12 Ordering, Delivery, Storage & Handling

Ordering	Delivery	Storage	Handling
<p>Avoid:</p> <p>Over ordering – order 'just in time';</p> <p>Ordering standard lengths rather than lengths required; and</p>	<p>Avoid:</p> <p>Damage during unloading;</p> <p>Delivery to inappropriate site areas; and</p> <p>Accepting incorrect deliveries, specifications or quantities.</p>	<p>Avoid:</p> <p>Damage to materials from inadequate storage; and</p> <p>Loss, theft or vandalism through secure storage and on-site security.</p>	<p>Avoid:</p> <p>Damage or spillage through incorrect or repetitive handling.</p>

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Ordering	Delivery	Storage	Handling
Ordering for delivery at the wrong time – update the programme regularly.			

## Roles and Responsibilities

14.4.12 Responsibility for the management of waste during the construction phase of the proposed Development would be allocated to specified individuals to ensure that the project team ‘buy in’ to waste reduction and minimisation. More importantly, it would encourage the NRC to become more efficient in the use of resources, embed waste minimisation into the design and gain relevant credits for accreditation under the Building Research Establishment Environmental Assessment Method 2018 (BREEAM).

14.4.13 Table 14-13 outlines some of the roles and responsibilities which different project team members would typically have to adopt as part of the SWMP implementation process.

Table 14-13 Roles and Responsibilities during CD&E Phases

Team Member	Key Role	Main Responsibility	Other Role
Client and Developer	Promote waste minimisation; Insist on good practice from all other team members; Ensure that all hazardous wastes have been identified prior to construction; and Review strategy over time.	Promote waste minimisation; Insistence of best practice; and Exploration of innovative technologies as appropriate.	Identification of waste reduction opportunities.
Designer	Consider design options; Promote use of reclaimed elements; and Reduce bespoke elements.	Duty of care; and Reducing waste production by design.	Identification of waste reduction opportunities.
Principal contractor – Site Manager	Develop site specific Waste Strategy, implement and communicate to all parties; Monitor implementation; Work with design team; Drive segregation of waste arisings; Facilitate on-site storage compounds and treatment of segregated materials; Designation of working area for waste activities; Reduce waste being brought onto site such as packaging, etc.; Ensure appropriate waste storage and containers on-site; Keep proper records of all wastes; produced, reused and sent off-site;	Health and safety; Development of the Waste Strategy; Management of on-site processes and programmes; and Record keeping and duty of care.	Hazardous waste identification and management; and Assist in design process to reduce waste.

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Team Member	Key Role	Main Responsibility	Other Role
	Ensure appropriate off-site transport in line with local regulatory requirements; and  Identify and confirm all destinations for waste leaving the site.		
Subcontractor	Develop method statements for activities on-site; and  Liaise with Main Contractor and agree way forward.	Duty of care;  Production of method statements; and  Ensure all activities under their direct control are managed appropriately.	Assist in ensuring onsite practices are safe and will not impact the environment; and  Ensure that wastes are properly segregated.
Site workers	Question unsatisfactory practices on-site; and  Follow instructions and waste management as provided.	Duty of care; and  Ensure all activities under their direct control are managed appropriately.	Assist in ensuring onsite practices are safe and will not impact the environment; and  Ensure that wastes are properly segregated.

14.4.14 Best practice controls during the construction phase, for example segregated materials storage and re-use of inert materials for grading, will be considered and proposed as measures to be incorporated within the construction process and will be detailed in the CoCP Part B. Efforts should be made to reduce the volume of waste brought onto the site as packaging and suitable waste management contractors with appropriate licences, permits, waste transfer notes and hazardous waste consignment notes should be used.

14.4.15 With the implementation of the above approach, it is assumed that 96.7% (by volume) of construction waste will be recycled/re-used in line with Network Rail targets (Ref 14.36). The remaining 3.3% constitutes waste from the temporary canteen/office/welfare facilities onsite during construction. It is assumed that this waste would be disposed of at non-hazardous landfill sites.

### Excavation Material

14.4.16 Excavated material arising from construction would be targeted for fill and landscaping where this is feasible, and the material is suitable. Excavated materials will be carefully stored in segregated piles for subsequent reuse on the site where possible. Any surplus inert excavated materials (e.g. soils, stone, bricks, clay, rubble, rock) may be suitable for use in land reclamation projects. This would require compliance with the criteria and thresholds for an exemption or a permit under the Environmental Permitting Regulations 2010 (as amended). The CL:AIRE Definition of Waste (DoW) CoCP (Ref 14-20) may also be applicable for the reuse of this material.

14.4.17 Site levels and grading of the proposed Development are designed to attain a cut and fill balance to help minimise excavation quantities. It will also be designed to enable flexibility in the landscaping, so that it can accommodate the changes in spoil volumes that may arise when site conditions differ from those assumed during the design.

14.4.18 However, there is likely to be a large quantity (approximately 9,600m<sup>3</sup>) of excess unbulked spoil from the excavation activities required to construct the platforms and widen the track on the west of the site. Options to retain this material onsite have been explored and exhausted. It is therefore required that the excess spoil is transferred offsite. It is assumed that the material will be suitable for re-use as fill in another scheme, although a geo-environmental investigation is yet to be undertaken. A requirement has been placed on the NRC by Network Rail to divert the excess spoil to another scheme locally, where practicable. Where required,

the Network Rail recycling and re-use facilities will be used to store the spoil before it is diverted to accepting schemes.

14.4.19 See Appendix 14.3 for further information on the cut and fill balance data.

### Hazardous Waste

14.4.20 Any hazardous waste would be removed and kept separate from other CD&E waste as detailed in the CoCP Part A (Appendix 2.4), in order to avoid contaminating ‘clean’ materials. This includes any contaminated materials arising from excavation. No significant land contamination has been found to date onsite. However, should any unacceptable concentrations of contamination be found in the Ground Investigation, suitable mitigation will be implemented. Please see Chapter 12: Ground Conditions and Contamination for further details.

### Vegetation

14.4.21 In order for construction to take place, areas of vegetation would require clearance. This would be managed in accordance with the principles set out in the CoCP Part A. As a minimum all vegetation waste should be diverted from landfill, unless identified as an invasive species and no other options are available. Opportunities to work with local community groups will be explored to find alternatives to composting vegetation waste, such as the potential for replanting in community spaces. Should all alternatives be exhausted, the vegetation would be recycled into compost to minimise waste sent to landfill.

## Operational Effects

14.4.22 Operational effects have been scoped out of this assessment following consultation with GCSP in which it was agreed that the likely quantities of waste generated during the operational phase would be negligible.

## 14.5 Assessment of Residual and Cumulative Effects

14.5.1 The following section sets out the residual and cumulative effects associated with the consumption of materials and generation of waste. The residual effects take into account the implementation of the mitigation measures described in Section 14.4.

### Residual Effects from Construction

#### Materials

14.5.2 The assessment of effects from materials solely relates to the construction phase of the proposed Development. It considers potential effects on the supply and availability of material resources in the UK.

14.5.3 The likely key material inputs required for construction of the proposed Development, as calculated using BRE’s Smartwaste tool, and the associated reduction in baseline market capacity are presented in Table 14-14.

Table 14-14 Material Residual Effects

Material	Total inputs required for constructions (tonnes)	UK Sales (tonnes)	Reduction in Baseline Market Capacity (%)
Concrete	129,239	81,900,000	0.158
Bituminous Mixtures (e.g., Asphalt)	7,380	25,200,000	0.0293

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Material	Total inputs required for constructions (tonnes)	UK Sales (tonnes)	Reduction in Baseline Market Capacity (%)
Steel	6,643	7,670,000	0.0866
Bricks	766	2,025,000,000	0.0000378

14.5.4 All of the key material inputs likely to be required for construction are considered to be 'generally free from known issues regarding supply and stock' (as defined in the IEMA Guidance). As such, receptor Sensitivity is considered to be Low.

14.5.5 With each material input likely to reduce the national baseline of availability by less than 1%, the Impact Magnitude is considered to be Negligible. As such, it is deemed that the effect of the proposed Development on material resources will be Slight Adverse and **Not Significant** in terms of the EIA Regulations.

## Waste

14.5.6 The assessment of effects from CD&E determines the potential direct impact of waste arisings on regional landfill capacity.

14.5.7 Over the construction programme there would be a 28% reduction in regional non-hazardous landfill void capacity (Very High Sensitivity). The scheme would generate approximately 67m<sup>3</sup> of non-hazardous waste during the construction phase. This represents a potential 0.003% reduction (Negligible Magnitude) in regional non-hazardous landfill capacity (2,124,000m<sup>3</sup>). The resulting effect significance is Slight Adverse and **Not Significant** in terms of the EIA Regulations.

14.5.8 It is considered inappropriate to define the Sensitivity of inert landfill based on the reduction in void capacity over the construction period given that there is a forecast 12,090,000m<sup>3</sup> shortfall in capacity. Instead, the sensitivity of inert landfill capacity has been set at Very High since there is no capacity for inert waste.

14.5.9 It is assumed that all of the inert construction waste (96.7% of the total construction waste) will be re-used/re-cycled in line with Network Rail targets. As such, no construction waste would be disposed of in inert landfill with no associated reduction in void capacity which is considered to be negligible in magnitude. The resulting effect significance is Slight Adverse and **Not Significant** in terms of the EIA Regulations.

14.5.10 In terms of the excavation waste, there will be a large quantity (approximately 9,600m<sup>3</sup>) of excess spoil from the excavation activities required to construct the platforms and widen the track. Options to retain this material onsite have been exhausted so it will need to be transported offsite. Geo-environmental investigation is yet to be undertaken but it is assumed that the material will be suitable for re-use as fill material in another scheme. Network Rail has placed a requirement on the NRC to divert this excess spoil to another scheme.

14.5.11 The residual effects resulting from the transportation of waste and material resources are not included within this Chapter but are covered in Chapter 7 Air Quality, Chapter 9 Climate Change Adaptation and Chapter 17 Transport.

## Residual Effects from Operation

14.5.12 Operational effects have been scoped out of this assessment. It is not anticipated that there will be significant residual effects resulting from the operational phase of the proposed Development.



## Cumulative Effects

- 14.5.13 This section considers the cumulative effects of the proposed Development with other schemes with the potential to have an adverse effect on landfill void capacity. While some information on other committed schemes is available, the following assessment is qualitative. This is because of the lack of data available with regards to the quantities of CD&E waste and materials from other committed schemes.
- 14.5.14 This assessment considers cumulative effects with all other construction schemes (including Cambridge South East Transport ('CSET') Scheme) in the region (Cambridgeshire and Peterborough) as they would all have an effect on regional landfill capacity and baseline market capacity.

### Waste

- 14.5.15 The proposed Development would generate 67m<sup>3</sup> of waste from canteens/offices/site compounds which represents a potential 0.003% reduction in regional non-hazardous landfill void capacity. It is considered that 2,124,000m<sup>3</sup> of void landfill capacity projected at the end of the construction programme (2025) would be sufficient such that the cumulative effects within the region would be no higher than Slight Adverse and **Not Significant** in terms of the EIA Regulations.
- 14.5.16 This is supported by the Cambridgeshire and Peterborough Waste Needs Assessment which concludes that if waste management targets are achieved, the existing capacity is sufficient to accommodate the region's disposal needs (Ref. 14.16).
- 14.5.17 It is assumed that all of the inert construction waste (96.7% of the total construction waste) will be re-used/re-cycled. No construction waste would be disposed of in inert landfill with no associated reduction in void capacity. As such, no cumulative effects with other schemes on inert landfill void capacity are anticipated.

### Materials

- 14.5.18 The proposed Development is expected to reduce the national availability of key materials in the UK by less than 1% and would therefore be considered Slight Adverse and **Not Significant** in terms of the EIA Regulations. Key materials for the proposed Development are considered 'free from known issues regarding supply and stock' and are therefore expected to be minimally reduced by the impact of additional schemes in the region.
- 14.5.19 It is therefore likely that the proposed Development, when considered together with additional schemes, would have no higher than a Slight Adverse and **Not Significant** effect on waste infrastructure and materials use.

## 14.6 Assessment Summary

- 17.1.1 Table 14-15 provides assessment summary with respect to waste and material resources and how they have been addressed.

Table 14-15 Assessment Summary

Receptor	Potential Significant Effect	Phase Construction/ Operation	Mitigation Measure	Residual Effect Significance
Material resources	Reduction in national baseline availability of key materials resources	Construction	Design approach and implementation of SWMP at detailed design.	Slight Adverse – <b>Not Significant</b>
Non-hazardous landfill	Reduction in non-hazardous landfill void capacity	Construction	Incorporate waste reduction measures within the design and construction approach	Slight Adverse – <b>Not Significant</b>

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Receptor	Potential Significant Effect	Phase Construction/ Operation	Mitigation Measure	Residual Effect Significance
			of the proposed Development.	
Inert landfill	Reduction in inert landfill void capacity	Construction	<p>96.7% of the total construction waste re-used/re-cycled through implementation of SWMP and CoCP.</p> <p>Divert surplus excavation waste to another scheme for use as fill material.</p>	Slight Adverse – <b>Not Significant</b>



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Environmental Statement – Volume 2:  
Chapter 15 – Population and Human Health



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 15 – Population and Human Health**

JUNE 2021

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## 15 Population and Human Health

### 15.1 Introduction

- 15.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to population and human health.
- 15.1.2 The Chapter presents a summary of relevant legislation, policy and guidance, describes the methodologies used to assess potential effects and presents baseline conditions. This is followed by a description of the potential effects of the proposed Development during the construction and operational phases, details of mitigation measures and an assessment of residual effects.

### Relevant Aspects of the Proposed Development

- 15.1.3 A description of the proposed Development is provided in Chapter 4 of the ES. The proposed Development will include the construction of a railway station with four passenger platforms, a single-storey station building and other associated works. Elements of the proposed Development will impact the amenity of the local residents, accessibility and severance whilst contributing to supporting healthy lifestyles. Any environmental changes such as air quality or noise and vibration disturbance, changes in access to social infrastructure or a reduction in safety as a result of the proposed Development are identified, assessed and mitigation proposed in this Chapter or in other relevant chapters of the ES (e.g. Air quality 7; Noise 5; Socio-economics 16).

### 15.2 Assessment Methodology

#### Legislation, Policy and Guidance

- 15.2.1 This section provides an outline of the legislation, policy and guidance relevant to the population and human health assessment.

##### Legislation

- 15.2.2 Changes to EIA Directive 2014/52/EU came into force in May 2017. The Directive introduced new topics to the environmental assessment process including a requirement to assess population and human health. This requirement was then transposed into English law. The relevant environmental impact assessment regime for the proposed Development is in accordance with The Transport and Works (Applications and Objections procedure) (England and Wales) Rules 2006 as amended (hereafter referred to as 'the TWA Rules'). There is no legislation which specifically governs how health assessments are undertaken.

##### Policy

##### National Policy

- 15.2.3 This section provides national policy relevant to population and human health and sets out how this policy has been taken into account and the project response.

##### **National Planning Policy Framework (NPPF) 2019**

- 15.2.4 The revised NPPF (Ref 15.1) was updated on 19 February 2019 and sets out the government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous NPPF published in March 2012 and revised in July 2018.
- 15.2.5 Policy 8 '*Promoting Healthy Communities*' describes how access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and wellbeing of communities. Paragraph 204(f) states that planning policies should 'set out criteria or requirements to ensure that permitted and proposed operations do not have unacceptable adverse impacts on the natural and historic environment or human health,



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taking into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality’.

**A Green Future: Our 25 Year Plan to Improve the Environment (2019)**

- 15.2.6 This 25 Year Environment Plan (Ref 15.2) sets out government action to help the natural world regain and retain good health. The plan aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first.
- 15.2.7 Chapter 3 of the plan relates to connecting people with the environment to improve health and wellbeing. The proposed Development will improve connectivity for rail users and local communities to allow people to better access the natural environment.

**Government White Paper: Healthy Lives, Healthy People (2010)**

- 15.2.8 The Government White Paper (Ref 15.3) provides a framework for tackling the wider social determinants of health, presenting the Government’s commitment to protecting the population from serious health threats; helping people live longer, healthier and more fulfilling lives; and improving the health of the poorest, fastest. The proposed Development will improve access to services and infrastructure that will help to promote healthy lifestyles.

Regional Policy

- 15.2.9 This section provides regional policy relevant to population and human health and sets out how this policy has been taken into account and the project response.

**Cambridgeshire Health and Wellbeing Strategy (2015)**

- 15.2.10 The Health and Wellbeing Strategy (Ref 15.4) focuses on the following six priorities to improve the physical and mental health and wellbeing of Cambridgeshire residents. In particular, within each of these priorities, Cambridgeshire County Council (CCoC) will work to improve the health of the poorest, fastest. The six priorities are listed below:

1. Ensure a positive start to life for children, young people and their families.
2. Support older people to be independent, safe and well.
3. Encourage healthy lifestyles and behaviours in all actions and activities while respecting people’s personal choices.
4. Create a safe environment and help to build strong communities, wellbeing and mental health.
5. Create a sustainable environment in which communities can flourish.
6. Work together effectively.

- 15.2.11 The accessible and affordable transport links and networks provided by the proposed Development, can help ensure access to services and amenities for the community.

- 15.2.12 Transport, green spaces and the built environment can play a key role in determining and positively influencing health and wellbeing.

Local Policy

- 15.2.13 This section provides local policy relevant to population and human health and sets out how this policy has been taken into account and the project response.

**Cambridge City Local Plan (2018)**

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15.2.14 The Cambridge City Local Plan (Ref 15.5) forms part of the development plan for Cambridge. It sets out the vision, policies and proposals for the future development and land use in Cambridge to 2031. It is the main consideration in the determination of planning applications.

15.2.15 Policy 35: Protection of human health and quality of life from noise and vibration states that 'development will be permitted where it is demonstrated that:

- a. it will not lead to significant adverse effects and impacts, including cumulative effects and construction phase impacts wherever applicable, on health and quality of life/amenity from noise and vibration; and
- b. adverse noise effects/impacts can be minimised by appropriate reduction and/or mitigation measures secured through the use of conditions or planning obligations, as appropriate (prevention through high quality acoustic design is preferable to mitigation)'.

15.2.16 Relevant mitigation will be implemented during the construction phase to minimise any adverse effects on health and wellbeing factors, for example from noise and dust as detailed in Chapter 5 (Acoustics – Noise), Vibration (chapter 6) and Chapter 7 (Air Quality) respectively.

**South Cambridgeshire Local Plan (2018)**

15.2.17 The South Cambridgeshire Local Plan (Ref 15.6) sets out the planning policies and land allocations to guide the future development of the district up to 2031. It includes policies on a wide range of topics such as housing, employment, services and facilities, and the natural environment.

15.2.18 Policy HQ/1: Design Principles requires that 'All new development must be of high-quality design, with a clear vision as to the positive contribution the development will make to its local and wider context. As appropriate to the scale and nature of the development, proposals must:

*. 'Include high quality landscaping and public spaces that integrate the development with its surroundings, having a clear definition between public and private space which provide opportunities for recreation, social interaction as well as support healthy lifestyles, biodiversity, sustainable drainage and climate change mitigation'.*

15.2.19 The proposed Development will seek to embody principles of high-quality design that works with and contributes to its surroundings and helps to encourage healthy lifestyles.

15.2.20 Policy TI/2: Planning for Sustainable Travel states that 'developers will be required to demonstrate they will make adequate provision to mitigate the likely impacts (including cumulative impacts) of their proposal including environmental impacts (such as noise and pollution) and impact on amenity and health'.

15.2.21 A travel plan dealing with emissions associated with staff commuting will set out how the effects of the proposed Development on health indicators will be mitigated. Measures to minimise Greenhouse Gas emissions during construction are documented in the outline Code of Construction Practice (CoCP Part A) (Appendix 2.4).

15.2.22 Policy SC/2: Health Impact Assessment states that 'new development will have a positive impact on the health and wellbeing of new and existing residents. Planning applications for should be accompanied by a Health Impact Assessment based on the following criteria:

- a. For developments of 100 or more dwellings or 5,000m<sup>2</sup> or more floorspace a full Health Impact Assessment will be required;
- b. For developments between 20 to 100 dwellings or 1,000 to 5,000m<sup>2</sup> or more floorspace the Health Impact Assessment will take the form of an extended screening or rapid Health Impact Assessment'.

**Guidance**

15.2.23 There are no specific guidelines or requirements for assessing population and human health impacts as part of an Environmental Impact Assessment (EIA).

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- 15.2.24 A fourth edition of the ‘*Additionality Guide*’ was issued in January 2014 by the Homes and Communities Agency (HCA) (Ref. 15.7). The guide states that ‘*central to good appraisal is the need to assess whether the intervention concerned will bring additional benefits over and above what would have happened anyway in its absence*’. The document provides particular guidance in relation to issues such as extent of study area and broad approach.
- 15.2.25 The Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 as amended require a focus on significant effects as they relate to human health. The World Health Organisation (WHO) defines health as a ‘*state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*’. The range of personal, social, economic and environmental factors that influence health status are known as health determinants and include the physical environment, income levels, employment, education, social support and housing (Ref. 15.8).
- 15.2.26 Guidance that has been used to inform the preparation of this Chapter in relation to human health includes:
- NHS London Healthy Urban Development Unit (HUDU), Planning for Health: Rapid Health Impact Assessment Tool (third edition April 2017) (Ref. 15.9) which helps identify those determinants of health likely to be influenced by a specific proposal; and
  - IEMA Health in Environmental Impact Assessment – A Primer for a Proportionate Approach (June 2017) (Ref. 15.10), which is primarily a discussion document designed to outline and identify issues arising from changes to the EIA Directive 2014/52/EU that came into force in the UK in May 2017.
  - The principles contained in the Rail Safety and Standards Board (RSSB) owned Common Social Impact Framework (CSIF) are broadly integrated into this population and human health impact assessment (Ref 15.11)
  - Health Impact Assessment in spatial planning: a guide for local authority public health and planning teams (October 2020) (Ref 15.12) supports the use of Health Impact Assessment in the spatial planning process.
- 15.2.27 The 2017 EIA Regulations changes do not elaborate on how significance should be defined in relation to human health. The IEMA guidance referred to above suggests that ‘*the consideration of significant effects on population and health requires a statement on the way in which any change can be expected to manifest itself*’, enabling a description of the predicted health and wellbeing outcomes. It states that scoping of population and human health issues should be proportionate and pay specific attention to vulnerable groups.

## Consultation and Scoping

- 15.2.28 Table 15-1 provides a summary of consultee issues raised with respect to population and human health scope of the EIA and how they have been addressed.

Table 15-1 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Network Rail; Greater Cambridge Shared Planning (GCSP); Cambridge City Council (CCiC) (19/06/20)	Meeting during the Scoping stage to discuss stakeholders’ feedback on approach to Population and Human Health. Main point made was that the positive effects of active travel, pedestrian and cycle routes should be considered.	Improved pedestrian and cycle links incorporated into the scope of works as part of the proposed Development.

- 15.2.29 Table 15-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to population and human health, and the corresponding location in the ES where they are addressed.

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Table 15-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Department for Transport (DfT)	Consideration should be given for the study area to include the population profile of employees based on the Biomedical campus, and patients at Cambridge University Hospital (CUH) and the Royal Papworth Hospital who will be affected during the construction and operational phases.	Included in 'The Study Area' section below and Health section of the Baseline Conditions (paragraph 15.3.5)
GCSP	(Study Area) The study area should include the population profile of employees based on the Biomedical campus, and patients at CUH and the Royal Papworth Hospital who will be affected during the construction and operational phases.	Included in 'The Study Area' section below (para. 15.2.30).
	(Assessment Methodology) Agrees with the use of the determinants as outlined in the HUDU Health Impact Assessment Tool but would like to see Opportunities for Physical Activity included. This will seek to address aspects of active travel, pedestrian and cycle routes as outlined as a concern from stakeholder feedback. The report should highlight what mitigation will be in place to address the severance created for employees and patients who currently access the Biomedical Campus from the west to ensure that entry by foot or bicycle remains easily accessible to encourage continued uptake of active forms of travel.	Included in 'Methodology for Assessing Impacts' and 'Scheme Design and Mitigation of Operational Effects' sections (para. 15.2.34)
	(Mental Health) Due to the proximity of the development site to the Cambridge University Hospital and Royal Papworth Hospital the EIA should include the impacts on mental health, given that inpatients are often experiencing a dramatic emotional and physical upheaval and may be more sensitive to the disturbances resulting from major construction. The ongoing noise, light, vibration and dust pollution could negatively impact the health of individuals who are already emotionally very vulnerable. The ongoing impacts of construction related stress to employee mental health across the biomedical campus should also be included as part of the assessment.	Included in the Health section of 'Residual Effects from Construction' (para. 15.5.2)
	(Suicide) According to Network Rail in 2019/20 there were 283 suicides/suspected suicides on the national over ground rail network, an increase of 12 from the previous year. As a result, the assessment report should scope in how suicide prevention will be addressed and mitigated.	Included in the Health section of 'Residual Effects from Construction' (para 15.5.2)

## The Study Area

15.2.30 The spatial scope includes site, local and wider study areas. The local study area relates to the three adjacent wards (Coleridge, Queen's Edith and Trumpington). The wider study area includes the local authority spatial areas (Cambridge City Council (CCiC), South Cambridgeshire District Council (SCDC), Cambridgeshire County Council (CCoC) and the wider east of England region, where applicable. The use of these study areas is intended to capture the majority of demographic effects which may occur outside of the immediate site boundary. Baseline information is considered as appropriate at each spatial level.

15.2.31 From a health perspective, the spatial scope for the assessment of impacts on human health accords with the spatial scopes of contributing chapters of the ES (for example Air Quality (Chapter 7), Noise (Chapter 5) and Vibration (Chapter 6) and Traffic and Transport (Chapter 17)).

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15.2.32 In summary, the consideration of population and human health impacts from the proposed Development have therefore been concentrated on four spatial areas as follows:

- The **site boundaries for construction and operation** have been used to identify specific impacts, for example relating to land-take and impact on facilities;
- **Local Study Area:** Coleridge, Queen's Edith and Trumpington wards have been used to consider impacts relating to population and human health;
- **Wider Study Area:** CCiC and SCDC; and CCoC;
- **Regional/National:** The wider East of England region and national baseline.

15.2.33 Office for National Statistics (ONS) and census data sources (Nomis) will be used, to consider some of the wider impacts of the proposed Development as necessary.

## Methodology for Establishing Baseline Conditions

15.2.34 A range of data sources have been used to inform the assessment, including:

- Data available from the ONS, including 2011 Census data and annually produced population estimates; (Ref 15.13)
- CCiC/SCDC – Health and wellbeing data (Ref 15.14)
- A review of data at local authority and ward level has been reviewed in relation to health, available by the website maintained by Public Health England (Ref 15.15)
- A desk-top review of key community facilities and infrastructure within the study area to help identify potential activity changes resulting from the proposed Development.

## Forecasting the Future Baseline

15.2.35 Relevant future baseline indicators include population forecasts which are taken from CCiC's and SCDC's 2018-Based population forecasts published by the respective Council's Research Groups. This data is presented in the Future Baseline section below.

## Defining the Importance/Sensitivity of resources/receptors

15.2.36 Resources are the assets and facilities which may be affected by the proposed Development; receptors are the users or beneficiaries of those resources. Table 15-3 summarises the resources and corresponding receptors that have been considered as part of this assessment.

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Table 15-3 Population and Human Health – Resources and Receptors

Resource	Corresponding Receptor
Community infrastructure (Sixth Form colleges, Community centres and university facilities)	Users of community infrastructure
Residential properties (Settlement of Trumpington))	Local residents
Hospitals (CUH and Royal Papworth Hospital)	Hospital patients and employees
Areas of open space and recreational routes (National Cycle Network 11)	Users of open space and recreational routes

15.2.37 The sensitivity of receptors or resources have been categorised as either 'High', Medium', or 'Low' using professional judgment. The broad criteria are shown in Table 15-4.

Table 15-4 Receptor/Resource Sensitivity

Sensitivity	Criteria
High	Where a receptor has limited ability to respond to change
Medium	Where a receptor has some ability to respond to change
Low	Where a receptor is particularly responsive to change or able to cope with change with substantial effects on existing status or viability.

15.2.38 The sensitivity of relevant receptors is set out with a justification in the appropriate assessment section below.

## Methodology for Assessing Impacts

### Impact Characterisation

*The assessment of significance has been informed by the sensitivity of the receptor and the magnitude of impact as set out in*

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15.2.39 Table 15-5. For the purposes of this assessment, only moderate and major effects are considered 'significant'.

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Table 15-5 Significance Criteria

Impact Magnitude	Sensitivity of Receptor			
		High	Medium	Low
	High	Major adverse/ beneficial	Major adverse/ beneficial	Moderate adverse/ beneficial
	Medium	Moderate adverse/ beneficial	Moderate adverse/ beneficial	Minor adverse/ beneficial
	Low	Moderate adverse/ beneficial	Minor adverse/ beneficial	Negligible
	Negligible/ Neutral	Minor adverse/ beneficial	Negligible	Negligible

15.2.40 Impact magnitude has been assessed by considering the following criteria:

- The magnitude of the predicted impact;
- The geographic extent of the impact;
- The duration and reversibility of the impact; and
- The capacity of the local economy or area to absorb or adjust to the impact.

15.2.41 The approach to the assessment of population and human health impacts uses a combination of quantitative and qualitative methodologies. Specific methodologies for assessing the effects of the proposed Development are as follows.

- **Community infrastructure:** An audit of the existing community facilities in terms of location, access and use has been undertaken; and
- **Health:** The assessment uses HUDU guidance to determine relevant health determinants that may be affected by the proposed Development. Relevant determinants include access to work and training, access to community services and facilities, opportunities for physical activity (including active travel and pedestrian and cycle routes), access to open space, noise and air quality.

### Assessing Significance

15.2.42 Professional judgement has been used to define the extent and significance of effects. The terms used to define the significance of effects are as follows:

- **Adverse:** detrimental or negative impacts to a population/health resource or receptor
- **Negligible:** imperceptible impacts to a population/health resource or receptor
- **Beneficial:** advantageous or positive impact to a population/health resource or receptor

15.2.43 Where beneficial or adverse effects have been identified, these have been assessed against the following scales:

- **Minor:** slight, very short or highly localised impact. Not considered to be significant
- **Moderate:** limited impact (by extent, duration or magnitude) which may be considered significant
- **Major:** considerable impact (by extent, duration or magnitude) of more than local significance (for example a sizeable change in relation to the baseline or affecting a wide geographic area). Major impacts are considered to be significant.



## Limitations

15.2.44 Limitations of the assessment, together with assumptions used are summarised as follows:

- Baseline conditions have been established using data that is currently available;
- Professional judgement and expertise have been used to assess impacts where quantitative information or appropriate guidance is not available.
- The full implications of the Covid 19 pandemic are not fully known at this stage so this assessment does not make specific assumptions related to its impact.

## 15.3 Baseline

15.3.1 This section presents a description of the existing and future baseline for the local study area, wider study area, with comparative information for regional and national areas as relevant.

### Existing Baseline

#### Population

15.3.2 Table 15-6 illustrates the population profile for the local and wider study areas. The table shows that population growth between 2011-2019 in the local study area exceeded that of growth levels in the wider study area, the regional average for the East of England and nationally for England.

*Table 15-6 Population Growth Comparison*

Study Area	2011	2019 Population (Est)	Population Growth 2011-2019 (%)
Local Study Area	26,547	32,383	22.0
Wider Study Area	272,622	283,884	4.2
East of England	5,846,965	6,236,072	6.7
England	53,012,456	56,286,961	6.2

Source: Office for National Statistics Census Data 2011, ONS Population Estimates Mid-2019

15.3.3 The local study area has seen a significantly higher population growth since the 2011 census compared to wider study area, East of England region and England as a whole.

15.3.4 The population of the Cambridge Biomedical Campus (CBC) is considered as a significant nearby facility to the site boundary. The CBC contains a list of occupiers such as the Cambridge University Hospital and Royal Papworth Hospital.

15.3.5 According to the CBC website, Cambridge University Hospitals NHS Foundation Trust (CUH) comprises Addenbrooke's Hospital and the Rosie (maternity hospital) with around 1,000 beds and employing around 9,000 staff. Royal Papworth Hospital NHS Foundation Trust is the heart and lung hospital treating over 100,000 patients each year. The hospital is the only national centre for a range of specialist cardiothoracic services.

#### Community Infrastructure

15.3.6 Community infrastructure includes education, healthcare facilities, libraries, post offices, community centres, youth centres, parks, publicly accessible land and places of worship. Community facilities are a means of stimulating social inclusion and provide an important resource to the existing and future community.

15.3.7 The proposed Development is located to the south of Cambridge City Centre. The proposed Development is adjacent to Addenbrooke's Bridge which carries the Cambridgeshire Guided Busway and will provide a new transport choice available to patients, visitors and employees when travelling to and from the CBC. The proposed Development is adjacent to several

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Higher Education facilities such as Long Road Sixth Form College and Trumpington Community College and several University facilities such as the Anne McLaren Laboratory for Regenerative Medicine and School of Clinical Medicine and amenities and services provided in nearby Trumpington. All community infrastructure and facilities within the study area are shown on Figure 15-1 Community Infrastructure and Facilities (Appendix 15.1).

## Deprivation

- 15.3.8 The English Indices of Deprivation 2015 provide a relative measure of deprivation at small area levels (Lower Super Output Areas) across England, based on information relating to income, employment, health and disability, education, crime, barriers to housing and services and living environment, which can be combined into an overall Index of Multiple Deprivation (IMD).
- 15.3.9 Deprivation is measured across seven different areas or domains – income, employment, health, education, living environment, crime and barriers to services using a wide range of indicators. These measures are aggregated to create the IMD, which gives an indication of overall deprivation.
- 15.3.10 According to the 2015 Indices of Deprivation, levels of deprivation in the wider study area as a whole are lower than national levels, with residents living in South Cambridgeshire having the lowest level of relative overall deprivation.
- 15.3.11 The wider study area has no wards within the 10% most deprived Lower Super Output Areas (LSOAs) and 25% of all wards lie within the 10% least deprived.

## Health

- 15.3.12 This section uses data from Public Health England 'Health Profiles' that provide an overview of health factors for each local authority in England. The health profile for the wider study area identifies that:
- Life expectancies in Cambridgeshire are significantly greater than the national average;
  - Most older people are in good health, but the number of frail older people is increasing;
- 15.3.13 Local authorities are required to produce a Joint Strategic Needs Assessment (JSNA) to analyse the health and wellbeing status of their local communities. CCoC has produced various JSNA reports across a number of themes, with the most recent being produced in 2019 combining Cambridgeshire and Peterborough datasets (Ref 15.16). Key findings from this assessment include:
- The region's relative prosperity and affluence, with most health and wellbeing determinants above national averages; and
  - On a more local level, Cambridgeshire data often shows more positive results over Peterborough for the majority of health and wellbeing issues.
- 15.3.14 Life expectancy at wider study area through to national level compares similarly, as shown in Table 15-7.

*Table 15-7 Life expectancy 2017-2019*

Indicator	Wider Study Area	Cambridgeshire	East of England	England
Life expectancy - Males	81.9*	81.2	80.5	79.8
Life expectancy - Females	85.1*	84.4	83.9	83.4

\*Average of Cambridge City/South Cambridgeshire

Source: PHE, Public Health Outcomes

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15.3.15 Table 15-8 shows the reported health of residents living within the local and wider area, as taken from Census data 2011. Residents living within both local and wider study areas report greater levels of health compared to the East of England and England averages.

*Table 15-8 General Health (%)*

	Local Study Area	Wider Study Area	Cambridgeshire	East of England	England
Very Good Health	54.9	53.5	49.4	47.2	48.0
Good Health	31.1	32.9	34.7	35.2	34.0
Fair Health	10.2	10.2	11.8	12.9	11.0
Bad Health	2.9	2.7	3.2	3.6	4.3
Very Bad Health	0.8	0.7	0.9	1.0	1.3

Source: Nomis, 2011

15.3.16 Table 15-9 shows the proportion of residents experiencing long-term health problems. There is a lower proportion of residents for whom day-to-day activities are 'limited a lot' within the local study area, wider study area and county level in comparison to the East of England and England as a whole.

*Table 15-9 Long Term Health Problem or Disability (%)*

Long-term health problem or disability	Local Study Area	Wider Study Area	Cambridgeshire	East of England	England
Day-to-day activities limited a lot	6.1	5.5	6.5	7.4	8.3
Day-to-day activities limited a little	7.7	8.0	8.8	9.3	9.3
Day-to-day activities not limited	86.2	86.5	84.7	83.3	82.4

Source: Nomis, 2011

15.3.17 According to the Cambridgeshire and Peterborough JSNA (Ref 15.16) published in 2020, the prevalence rates of mental health conditions across Cambridgeshire and Peterborough as a whole are statistically significantly lower than the England averages. The recorded prevalence of schizophrenia, bipolar affective disorder and other psychoses is statistically significantly higher than the England average in CCiC.

15.3.18 The Cambridge University Hospital has a Liaison Psychiatry service that provides psychiatric treatment to patients attending general hospital and, dealing with the interface between physical and psychological; health. The hospital has a specialist of mental health professionals – doctors (psychiatrists), nurses, social and administrative staff (based at Addenbrooke's Hospital). The Department of Psychiatry, part of the Cambridgeshire and Peterborough NHS Foundation Trust that helps patients with mental health issues is located in the centre of the CBC on Keith Day Road. It is located approximately 0.5km east from the proposed Development.

## Future Baseline

15.3.19 Local and national population estimates, and forecasts have been published by the ONS, and the population forecasts up to 2036 are shown for the relevant study areas in Table 15-10 below:

*Table 15-10 CCC's 2018-Based Population Forecasts*

Study Area	2021	2026	2031	2036	Projected Population Growth (%)
Local Study Area	35,820	37,610	38,650	38,980	8.8
Wider Study Area	305,620	332,460	350,910	357,100	16.8
Cambridgeshire	685,770	743,400	778,760	794,200	15.8
England	57,030,529	58,505,617	59,789,800	60,905,479	6.8

*Source: ONS, 2020*

15.3.20 The data in Table 15-10 shows that the wider study area and Cambridgeshire is expected to experience a higher growth rate in population figures over the next 15 years.

## 15.4 Design and Mitigation

15.4.1 The design features of the proposed Development and mitigation measures that would ameliorate adverse effects relating to population and human health are set out below.

## Construction Approach and Mitigation of Construction Effects

### Residential Amenity and Safety

15.4.2 The CoCP Part A has been prepared to include the implementation of method statements to control pollution risk, dust management measures, response to environmental incidents, or traffic management and access measures (reflective of other topic mitigation measures such as air quality, noise and transport). These include the implementation of a Dust Management Plan to control emissions, avoid works during the more sensitive night-time period and choice of construction methodology to limit the noise and vibration impact and the implementation of a Construction Traffic Management Plan (CTMP) to mitigate impact of construction traffic.

### Health

15.4.3 The mitigation measures relating to noise, vibration, air quality, landscape and visual and transport (which may impact upon the local residents receptor group) are described in more detail in Chapters 5 (Acoustics – Noise), 6 (Acoustics – Vibration), 7 (Air Quality), 13 (Landscape & Visual) and 17 (Transport) respectively. These mitigation measures in combination would also help to deal with the impact of the construction works on the mental health of patients at the CBC.

15.4.4 Suicide prevention measures relevant to rail infrastructure could be implemented by working with organisations such as the Samaritans and British Transport Police and promoting the Network Rail national suicide prevention agenda. Examples include training for rail staff and the 'Small Talk Saves Lives' campaign delivered by a partnership of Network Rail and Samaritans.

## Community Infrastructure and Safety

15.4.5 Mitigation to address any issues of accessibility severance caused by the proposed Development on the employees of the CBC and patients at both CUH and Royal Papworth Hospital would be outlined in the CoCP Part A. This includes enabling continued access to facilities and to pedestrians and cyclists via temporary diversions to public rights of way. Chapter 17 Transport assesses severance as the reduced ability for pedestrians and cyclists to crossroad links. During construction, drivers will be instructed to pay special attention to pedestrians and cyclists, particularly when driving through residential areas and when undertaking turning movements at the access and egress points. They will also be instructed to give way to pedestrian and cyclists waiting to cross the road at the uncontrolled crossings. The accesses provided by the Cambridge Guided Busway and Addenbrooke's Road to the west of the site boundary would not be significantly affected by the proposed works, therefore, can serve as mitigation to enable continued accessibility to the key university and healthcare facilities for users seeking to access these facilities from the west of the proposed Development.

## Design and Mitigation of Operational Effects

15.4.6 Mitigation for the operational phase of the proposed Development that would help address any health impacts will include: habitat restoration (enabling access to nature), suicide prevention design measures as guided by 'Safe by Design' principles and guidance, consideration of measures to minimise soil and water pollution, promotion of new walking and cycling routes and additional cycle storage (measures will be included in biodiversity (Chapter 8), Transport (Chapter 17) and Water resources and flood risk (Chapter 18).

## 15.5 Assessment of Residual and Cumulative Effects

### Introduction

15.5.1 The following sections outline the residual effects once the mitigation measures described in Section 15.4 have been implemented. These effects fall under the following categories:

- Effects relating to changes in access to **community infrastructure** such as education and healthcare services. For example, road closures and walking/cycle route diversions during the construction period. Operational effects include the wider benefits of improving accessibility to the CBC and employers such as AstraZeneca, Royal Papworth Hospital and the University of Cambridge facilities within the area.
- Effects on local **residential amenity** from environmental change such as noise generated by construction activities, changes in air quality (for example dust emissions) and impacts associated with road safety as a result of the presence of construction vehicles. Operational effects primarily relate to changes in traffic movement, provision of active travel routes, visual amenity and air quality.
- Effects on residents in terms of natural surveillance and reduction in personal **safety**. These changes in accessibility and perceptions of personal safety may have a resultant impact on levels of social cohesion during the construction period. For operation, changes in levels of social cohesion enabled by the creation of a new community facility.
- Effects on general and mental **health** of local residents, construction and campus employees and hospital inpatients and increased suicide risk.

## Residual Effects from Construction

### Community Infrastructure

15.5.2 Residual effects on users of community infrastructure would include any resultant changes in access to facilities such as educational, healthcare services or other community infrastructure following the implementation of mitigation measures. The impact of this effect is dependent on

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the accessibility of users to community infrastructure via the existing and proposed road, walking and cycling networks. Land running parallel to the eastern railway boundary at the rear of the CBC between Addenbrooke's Road (Nine Wells Bridge) and Addenbrooke's Bridge carrying the Guided Busway is being used as one of the haul roads during construction. This haul road would allow patients to access the hospital and employment facilities on the CBC without disruption. The duration of the temporary diversion would be in place is estimated by the construction programme to be around 3 months, which would include time to erect hoardings scrape topsoil and construct access roads. Given the temporary and limited nature of this temporary diversion the impact is considered to be of negligible magnitude. Therefore, given the sensitivity of the receptor (users of community infrastructure) is medium the overall effect is considered to be Negligible and **Not Significant**.

## Residential Amenity

- 15.5.3 Residual effects on residential amenity include short to medium term disturbance and nuisance within the local area during the construction phase. The assessment considers the findings of other EIA chapters such as air quality, noise and vibration, and transport. From the perspective of population and human health, the air quality, noise and transport mitigation measures outlined above at paragraph 15.4.2 should help reduce amenity impacts in terms of increases in noise, air quality, vibration and traffic impacts as a result of construction activities or effects associated with construction traffic to a low level.
- 15.5.4 The main significant effect on residential amenity relates to construction noise and vibration effects. The noise (Chapter 5) and vibration (chapters 6) assessments conclude that there will be some significant amenity effects on residential receptors close to the railway line. This includes significant noise impacts on The Belvedere residential properties on Hills Road in the north of the site boundary and significant vibration impacts on residential properties around Davey Crescent, Abberley Wood and Grahams Close in the south of the site boundary. However, these impacts are expected to be short term and temporary in nature and will be mitigated through Best Practicable Means (BPM). Balancing all these factors, the magnitude of the impact is considered to be medium. Given the sensitivity of the receptor (local residents) is low because people have capacity to tolerate some temporary disturbance related to the construction process the overall effect is deemed to be Minor Adverse and **Not Significant**.

## Safety

- 15.5.5 There could be some crime and safety concerns for local residents during construction, due to an influx of new workforce. There is also a potential suicide risk related to the bridges over rail infrastructure. There may be a reduction in the natural surveillance of spaces and residents may perceive there to be a reduction in personal safety. Changes in accessibility and perceptions of personal safety may have a resultant impact on levels of social cohesion during the construction phase. However, the mitigation and construction processes proposed in the CoCP Part A and in the mitigation section above, for example training and guidance to the construction workforce on appropriate behaviour and suicide prevention measures, would help alleviate the risk of crime and safety issues and suicide and so the impact is therefore deemed to be of low impact magnitude. Given the sensitivity of receptors (local residents) is medium the overall effect is considered to be Minor Adverse and **Not Significant**.

## Health

- 15.5.6 General health effects during construction are associated with environmental change (for example changes to noise levels or air quality) and changes in levels of physical activity as a result of impacts on walking, cycling routes and open space. Given that suitable, adequate diversion routes are proposed, the level of health impact on the local residents is considered to be negligible. Given the sensitivity of the receptor (local residents and users of open space and recreational routes) is low as there are numerous alternative opportunities for exercise and recreation the overall effect is Negligible and **Not Significant**.

## Mental Health of Biomedical Campus Patients and Employees

15.5.7 There is potential for mental health impacts caused by the construction process of the proposed Development on hospital inpatients that are experiencing emotional and physical upheaval and may be more sensitive to the disturbances resulting from major construction. This impact could also affect employees working at the CBC. The ongoing noise, light, vibration and dust pollution could negatively impact the health of individuals who are already emotionally very vulnerable. However, the Department of Psychiatry, where most of the inpatients are located, is around 0.5km east of the proposed Development site. As with most hospital buildings it is assumed to be well insulated, with appropriate screening for patients so that noise, light and dust impacts are likely to be minimal. Also, the CBC and its surrounding area has been subject to significant and extensive levels of construction disruption over a long period of time, so the proposed Development is unlikely to cause a noticeably additional effect likely to cause distress to most patients, apart for potentially the limited number that are very long term residents. Based on this assessment the impact magnitude is considered to be negligible. The sensitivity of receptors (patients with mental health issues and CBC employees) is considered to be high so on balance the effect is considered to be Minor Adverse and **Not Significant**.

## Residual Effects from Operation

### Community Infrastructure

15.5.8 Once operational, accessibility to community infrastructure including open space, recreation facilities, education and healthcare should improve as a result of the new station. Although rail is one of numerous travel modes that might be used by people to access facilities and is largely restricted to people who live within walking distance of other stations on the line, the new station should significantly increase the number of people that can access community infrastructure such as those related to the CBC. The Transport Assessment (Appendix 17.2) estimates that the proposed Development will be used by approximately 1.8million passengers a year of which 0.5million are new rail passengers. The impact magnitude is therefore considered to be high. Given the sensitivity of the receptor (users of community infrastructure) is medium the overall effect is considered to be Major Beneficial and **Significant**.

### Health

15.5.9 Once complete, the proposed Development would provide potential beneficial health effects for existing residents as a result of an improved environment and new sustainable travel provision. This includes 'Access for All' facilities such as a step-free access with two lifts on each platform covered by canopies. Based on the scale of the proposed facilities and user-friendly accessibility, it is considered that the health impact for the local users of recreational facilities is medium beneficial. Given the sensitivity of the receptors (users of open space and recreational routes) is low given there are numerous alternative opportunities for recreation and exercise the overall effect is Minor Beneficial and **Not Significant**.

## Cumulative Effects

15.5.10 This section considers the inter-project cumulative effects of the CSET scheme and other committed developments within the vicinity of the site boundary.

### CSET

15.5.11 The Cambridge South East Transport (CSET) scheme is a major public transport intervention in South Cambridge. It aims to link the Cambridge Biomedical Campus via Great Shelford, Stapleford and Sawston to a new travel hub near the A11/A1307/A505 with connections to Babraham, the Babraham Research Campus and Granta Park. The current CSET programme includes a Transport Works Act (TWA) application in summer 2021 with potential construction period of 2023 to 2025. This overlaps with the proposed Development construction period. Close coordination between applicants is likely to be required during the construction of both



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schemes. CoCPs are to be implemented for both schemes, each of which will account for the programme of the other scheme.

- 15.5.12 In relation to the proposed Development population and human health receptors, an overall impact has been considered on the wider development area that incorporates both the proposed Development and CSET. Construction impact on both schemes will be temporary, and where required, mitigation will be implemented to alleviate the effects on residential amenity and nearby community infrastructure. The operational impact will not be significant.
- 15.5.13 Users of open space and recreational routes may see health benefits from the new pedestrian and cycle paths into the station and proposed CSET route along Francis Crick Avenue. However, users would be temporarily negatively impacted by the required diversions on the existing network during construction.
- 15.5.14 National Cycle Network Route 11 (NCN11) will require temporary diversion to accommodate the main eastern construction compound (Construction Compound 1) and construction haul road for the proposed Development for a period of about three years. A temporary bridge will be provided as diversion to the existing NCN11 cycle/pedestrian bridge. Upon completion of the proposed Development if CSET does not go ahead NCN11 will revert back to its original route and bridge. Coordination between the CSET and proposed Development project construction programmes and sufficient diversion measures for NCN11 implemented as part of both schemes, would mean the impact of the CSET scheme, in combination with proposed Development, is considered Negligible during construction, and thus **Not Significant**. If the NCN11 is permanently diverted during operation as a result of the CSET scheme, there would be a Negligible impact as the route would still be open to users and thus **Not Significant**.

### Other Committed Developments

- 15.5.15 A range of cumulative developments are set out at Appendix 2.3. Given that the residual effects on access to community infrastructure from the proposed Development are negligible, the cumulative effect on other community infrastructure receptors such as community facilities, education, healthcare and open space and recreational routes is also likely to be Negligible and thus **Not Significant**.

## 15.6 Assessment Summary

- 15.6.1 Table 15-11 provides assessment summary with respect to population and human health and how they have been addressed.

Table 15-11 Assessment Summary

Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure (If applicable)	Residual Effect Significance
Users of community infrastructure	Impacts on the access to community infrastructure such as education and healthcare services.	C	A range of mitigation measures are proposed in the outline CoCP to address any issues related to access to facilities.	Negligible <b>Not Significant</b>
Local residents	Impact of disruption on the amenity of local residents	C	A range of mitigation measures are proposed in the outline CoCP. Local residents and in proximity to the proposed Development during construction may experience reductions in amenity from changes in air quality,	Minor adverse <b>Not Significant</b>



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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure (If applicable)	Residual Effect Significance
			visual amenity and noise and vibration.	
	Safety of local residents	C	The mitigation measures outlined in the outline CoCP, for example, training and guidance to the construction workforce on appropriate behaviour, would help alleviate the risk of crime.	Minor adverse <b>Not Significant</b>
Users of open space and recreational routes	Short-term health impact	C	Temporary diversions for users of pedestrian and cycle paths and retained access to facilities.	Negligible <b>Not Significant</b>
Patients and Employees of CBC	Mental health of patients and CBC Employees	C	A range of mitigation measures are proposed in the outline CoCP to reduce issues of noise, light and dusts.	Minor adverse <b>Not Significant</b>
Users of community infrastructure	Impacts on the access to community infrastructure such as education and healthcare services.	O	Mitigation is not required.	Major beneficial <b>Significant</b>
Local residents/Users of open space and recreational routes	Health impact on local residents and users of open space and recreational routes.	O	Restoration of walking and cycling routes	Minor beneficial <b>Not Significant</b>

## 15.7 References

Reference	Title
Ref 15.1	National Planning Policy Framework (NPPF) 2019
Ref 15.2	HM Government (2019) A Green Future: Our 25 Year Plan to Improve the Environment
Ref 15.3	Department of Health and Social Care (2010) Government White Paper: Healthy Lives, Healthy People
Ref 15.4	Cambridgeshire County Council (2015) Cambridgeshire Health and Wellbeing Strategy 2012-2017
Ref 15.5	Cambridge City Council (2018) Cambridge City Local Plan
Ref 15.6	South Cambridgeshire Council (2018) South Cambridgeshire Local Plan
Ref 15.7	Homes and Communities Agency (HCA) (2014) Additionality Guide
Ref 15.8	Transport and Works Act (Applications and Objections Procedure) (England and Wales) Rules 2006 [SI 2006 No.1466] as amended, particularly by The Environmental Impact Assessment (Miscellaneous Amendments Relating to Harbours, Highways and Transport) Regulations 2017 [SI 2017 No. 1070] <a href="https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made">https://www.legislation.gov.uk/uksi/2017/1070/schedule/4/made</a>
Ref 15.9	NHS London Healthy Urban Development Unit (HUDU), Planning for Health: Rapid Health Impact Assessment Tool (third edition April 2017)
Ref 15.10	IEMA Health in Environmental Impact Assessment – A Primer for a Proportionate Approach (June 2017)
Ref 15.11	Rail Safety and Standards Board (RSSBN) owed Common Social Impact Framework (CSIF)
Ref 15.12	Health Impact Assessment in spatial planning: a guide for local authority public health and planning teams (October 2020)
Ref 15.13	Office of National Statistics (2011) Census Data
Ref 15.14	Cambridge City/South Cambridgeshire District Council (2020) Health and Wellbeing Data
Ref 15.15	Public Health England (2020) Health Profiles
Ref 15.16	Cambridgeshire and Peterborough (2019) Joint Strategic Needs Assessment (JSNA)



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 16 – Socio-economics**

MAY 2021



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## 16 Socio-economics

### 16.1 Introduction

- 16.1.1 This Chapter of the Environmental Statement (ES) reports the environmental impact of construction and operation of the proposed Development with respect to socio-economics effects.
- 16.1.2 The Chapter presents a summary of relevant legislation, policy and guidance, describes the methodologies used to assess potential effects and presents baseline conditions. This is followed by a description of the potential effects of the proposed Development during the construction and operational phases, details of mitigation measures and an assessment of residual effects.

### Relevant Aspects of the Proposed Development

- 16.1.3 A description of the proposed Development is provided in Chapter 4: The Site and proposed Development of the ES. The proposed Development will include the construction of a railway station with four passenger platforms, a two-storey station building and other associated works. Elements of the proposed Development will potentially affect: the local economy and employment; private property; development land and businesses; community land and assets; and pedestrians, cyclists, and equestrians. Any changes to the local economy, employment opportunities or disruption to the community as a result of the proposed Development are identified, assessed and mitigation proposed (where necessary) in this Chapter.

### 16.2 Assessment Methodology

#### Legislation, Policy and Guidance

- 16.2.1 This section provides an outline of the legislation, policy and guidance relevant to the socio-economics assessment.

##### Legislation

- 16.2.2 Whilst a socio-economic assessment is required as part of the scope of this ES, there is no legislation which specifically governs how socio-economic assessments are undertaken. However, the Localism Act 2011 Part 5 (Ref 16.1) does take account of community empowerment and more specifically, assets of community value.

##### Guidance

- 16.2.3 Whilst the socio-economics assessment forms part of the scope of the ES, there are no specific published guidelines or requirements regarding the methodology for assessing socio-economic impacts as part of an EIA. The assessment therefore seeks to identify and assess relevant changes which may arise from the proposed Development, using available guidance for specific socio-economics sub-topic areas combined where appropriate with professional judgement. Relevant guidance that has been used to inform the assessment of the impacts of the proposed Development on the economy and employment includes:
- The Homes and Communities Agency (predecessor to Homes England) 'Additionality Guide' 2014 (Ref 16.2), which explains how to assess the additional impact of local economic growth for various interventions.
  - Guidance produced by the former Office of Project and Programme Advice and Training (OffPAT) which has been used to assess employment impacts (Ref 16.3).
  - The principles contained in the Rail Safety and Standards Board (RSSBN) owned Common Social Impact Framework (CSIF) are broadly integrated into this socio-economic impact assessment (Ref 16.4)
- 16.2.4 The HM Treasury Green Book (Ref 16.5) states that Impact Assessments (IAs) are used to support the appraisal of new primary or secondary legislation, or in some cases the impact of non-legislative policy change. The Green Book should be used for the appraisal required for

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IAs in the same way as for spending proposals. It sets out the methodology for appraisal of social value and distributional effects.

- 16.2.5 The economic and employment impact assessment will be informed by the Additionality Guide which is based on the principles of the HM Treasury Green Book and describes a methodology for defining the additional economic benefits arising from an intervention. Additionality is the extent to which something happens as a result of an intervention that would not have occurred in its absence.
- 16.2.6 Some cross-cutting themes covered in this chapter use the conclusions of other ES technical topics e.g. noise and air quality which are covered by their own specific legislation and legal standards.

## Policy

### National Policy

- 16.2.7 This section outlines national policy relevant to socio-economics and sets out how this policy has been taken into account and the project response.

#### **National Planning Policy Framework (NPPF) 2019**

- 16.2.8 The revised NPPF (Ref 16.6) was updated on 19 February 2019 and sets out the Government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous NPPF published in March 2012 and revised in July 2018.
- 16.2.9 Policy 6 '*Building a strong, competitive economy*' requires planning policies to encourage economic growth whilst considering the local business needs and maximising wider opportunities for development. The new and improved facility may create inward investment opportunities by attracting new companies to locate in the area due to the improved public transport infrastructure.

### Regional Policy and Strategies

- 16.2.10 This section outlines regional policy relevant to socio-economics and sets out how this policy has been taken into account and the project response.

#### **Economic Strategy for the East of England (2020)**

- 16.2.11 The Economic Strategy published by Industry Fund Managers (IFM) Investors (Ref 16.7) looks at the recent economic history, governance structure and infrastructure of the East of England, identifies the combined ambitions of the region for the future and considers some of the challenges and opportunities for the UK over the next decades and identifies the East of England's prime position in being able to tackle these, based on the region's assets and strengths. Finally, the strategy outlines the challenges the region faces, lists the main interventions that the local authorities have planned for the future and identifies some broad potential solutions.
- 16.2.12 The spatial vision states there is a big opportunity to more closely link Greater Cambridge to the rest of the region and the UK through improved transport infrastructure. The proposed Development is identified as a major infrastructure asset in the region.

#### **Cambridgeshire Greater Cambridge Greater Peterborough Enterprise Partnership Strategic Economic Plan (2014)**

- 16.2.13 The Strategic Economic Plan (Ref 16.8) aims to release the area's significant potential for continued economic growth, through a targeted range of interventions. It is based on significant engagement with the area's businesses and communities, updated economic evidence, and a robust view of what can be achieved in the short term (during 2015 and 2016) and medium term (up to 2020).
- 16.2.14 'Transport Connectivity' is identified as one of the prioritised intervention packages. The package seeks to create a transport network fit for an economically vital high growth area, to

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work with partners to facilitate improvements to key routes and ensure the delivery of the six local transport priorities approved through the Local Transport Board. In order to grow the local economy, transport options that enable workers to access employment centres are needed, and flexibility to serve shift times and remote areas of employment.

- 16.2.15 Another intervention, 'Removing Skills Barriers to Growth' seeks to align skills provision with business demand, raise aspiration and increase economic awareness within the potential workforce and increase the number of businesses who plan and budget for skills and training.
- 16.2.16 Compliance with the Strategic Economic Plan interventions will help lead to a better functioning rail network in the area and consequently improve the local economy within the area surrounding the proposed Development. In terms of employment benefit, the construction phase of the proposed Development would require a skilled workforce.

Local Policy

- 16.2.17 This section outlines local policy relevant to population and socio-economics and sets out how this policy has been taken into account and the project response.

**Cambridge City Local Plan (2018)**

- 16.2.18 The Cambridge City Local Plan (Ref 16.9) forms part of the development plan for Cambridge. It sets out the vision, policies and proposals for the future development and land use in Cambridge to 2031. It is the main consideration in the determination of planning applications.
- 16.2.19 Policy 2 'Spatial strategy for the location of employment development' outlines the Growth Strategy's plan to support Cambridge's economy, offering a wide range of employment opportunities and iterates the Council's aim is '*to ensure sufficient land is available to allow the forecast of 22,100 new jobs in Cambridge by 2031, including some 8,800 in B-use class (offices and industry)*'. This economic growth has been predicated on the close links that have built up between businesses and research and educational facilities linked to the University of Cambridge.
- 16.2.20 Section Five of the Local Plan focusses on 'Supporting on the Cambridge Economy'. For example, policy 40 'Development and expansion of business space' encourages new offices, research and development and research facilities in the areas around the two existing rail stations and near the Cambridge Biomedical Campus, that is adjacent to the proposed Development.
- 16.2.21 Policy 5 'Sustainable transport and infrastructure' requires that 'development proposals must be consistent with and contribute to the implementation of the transport strategies and priorities set out in the Cambridgeshire Local Transport Plan (LTP) and the Transport Strategy for Cambridge and South Cambridgeshire (TSCSC)'. Once operational the proposed Development will enhance the resilience of the rail network and pedestrian and cycle improvement links will promote greater levels of walking and cycling.

**South Cambridgeshire Local Plan (2018)**

- 16.2.22 The South Cambridgeshire Local Plan (Ref 16.10) sets out the planning policies and land allocations to guide the future development of the district up to 2031. It includes policies on a wide range of topics such as housing, employment, services and facilities, and the natural environment.
- 16.2.23 Policy S/5 'Provision of New Jobs and Homes' establishes a target of 22,000 new jobs to be provided in the district between 2011 and 2031.
- 16.2.24 Policy E/2 'Cambridge Biomedical Campus Extension' is focussed on the extension to the Cambridge Biomedical Campus (CBC), that is supported on land shown on the Policies Map for biomedical and biotechnology research and development within class B1(b) and related higher education and sui-generis medical research institutes.
- 16.2.25 The 2012 Cambridge City and South Cambridgeshire Employment Land Review identified a particular need for office space in or on the edge of Cambridge. On the southern fringe of Cambridge, the delivery of development of the CBC has been brought forward by the planned



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relocation of AstraZeneca to the site. The proximity of the AstraZeneca sites to the proposed Development, will mean their employees will be main users of the new station.

## Consultation and Scoping

16.2.26 Table 16-1 provides a summary of consultee issues raised with respect to socio-economics scope of the EIA and how they have been addressed.

Table 16-1 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
Greater Cambridge Shared Planning; Cambridge City Council and South Cambridgeshire District Council (19/06/20)	Meeting to discuss stakeholder feedback on approach to Socio-economic effects Scoping Report proposed. Main point made was to ensure engagement during the assessment process with officers from Cambridgeshire County Council (CCoC) Community Development and Open Spaces.	Relevant CCoC and officers consulted and their views fed into the assessment of potential impacts on Community Development and Open Spaces
Cambridge City Council and South Cambridgeshire Council Economic Development Officers (04/02/21)	Consultation email sent to Joint Director of Planning and Economic Development (Cambridge City Council and South Cambridgeshire District Council) on the 4 <sup>th</sup> February 2021 seeking feedback on economic assessment	No response received
Cambridge City Council and South Cambridgeshire Council Public Rights of Way (PRoW) Officers (04/02/21)	Consultation email sent to the Highways Asset Management team at Cambridgeshire County Council on the 4 <sup>th</sup> February 2021 seeking feedback on assessment of impact on public rights of way and recreational resources and receptors.	No response received

16.2.27 No comments relevant to socio-economics were received in the formal Scoping Opinion response.

## The Study Area

16.2.28 The spatial scope includes both wider and local study areas. Table 16-2 summarises how various sub-topics are assessed within each study area.

16.2.29 The wider study area is intended to capture the majority of economic effects which may occur outside of the immediate local area. Baseline information has been considered at both ward (Coleridge, Queen's Edith and Trumpington), local authorities (Cambridge City Council and South Cambridgeshire District Council) and County level (Cambridgeshire County Council) as necessary. For certain topics, a regional and national baseline is assessed (the wider East of England region and England) using Office for National Statistics (ONS) and census data sources (Nomis), to consider some of the wider impacts of the proposed Development as necessary.

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Table 16-2 Spatial Scope for Assessment

Study Area	Description	Relevant Sub-Topic
The site boundary	Relates to all land within the Order limits for the proposed Development. The study area will be used to assess effects of the proposed Development in terms of permanent and temporary land-take.	Community services and infrastructure Open space and recreation
Local Study Area	The local study area corresponds to an area covering the three adjacent wards of Coleridge, Queen's Edith and Trumpington. The local study area will be used to assess effects of the proposed Development on topics including community facilities and recreational routes.	Economy and employment Community services and infrastructure Open space and recreation
Wider Study Area	The wider study area would consider data at appropriate spatial levels including ward level, Cambridge City Council and South Cambridgeshire Council. The purpose of the wider study area is to primarily consider the impacts of the proposed Development in terms of the wider economy.	Economy and employment

## Methodology for Establishing Baseline Conditions

16.2.30 A range of data sources have been used to inform the assessment, including:

- Local Economy and Employment:** Data relating to economic activity, employment, qualifications and skills have been gathered using online resources such as ONS and Nomisweb. Other sources of data include the Cambridge City and South Cambridgeshire Local Plan economic evidence base, growth strategies and infrastructure studies produced for the City of Cambridge;
- Community Infrastructure:** Identification of community infrastructure, residential and commercial assets within the relevant study areas.

### Forecasting the Future Baseline

16.2.31 Future baseline data has been collected in relation to predicted economic and employment growth. This data is presented in the Future Baseline section below.

## Defining the Importance/Sensitivity of resources/receptors

16.2.32 Resources are the assets and facilities which may be affected by the proposed Development; receptors are the users or beneficiaries of those resources. Table 16-3 summarises the resources and corresponding receptors that have been considered as part of this assessment.

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Table 16-3 Socio-economics – Resources and Receptors

Resource	Corresponding Receptor
Community infrastructure (for example education, healthcare, community facilities)	Users of community infrastructure
Areas of open space and recreational routes	Users of these spaces and facilities
Residential properties	Local residents
Local employment opportunities	Local workforce
Local businesses (including farms)	Local business owners and workers

16.2.33 The sensitivity of receptors or resources have been categorised as either 'High', Medium', or 'Low' using professional judgment. The broad criteria are shown in Table 16-4.

Table 16-4 Receptor/Resource Sensitivity

Sensitivity	Criteria
High	Where a receptor has limited ability to respond to change
Medium	Where a receptor has some ability to respond to change
Low	Where a receptor is particularly responsive to change in that it is able to cope with change without substantial effects on its existing status or viability.

16.2.34 The sensitivity of relevant receptors is set out with a justification in the appropriate assessment section below.

## Methodology for Assessing Impacts

### Impact Characterisation

16.2.35 The assessment of significance has been informed by the sensitivity of the receptor and the magnitude of impact as set out in Table 16-5. For the purposes of this assessment, only moderate and major effects are considered 'significant'.

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Table 16-5 Significance Criteria

Impact Magnitude	Sensitivity of Receptor			
		High	Medium	Low
	High	Major adverse/ beneficial	Major adverse/ beneficial	Moderate adverse/ beneficial
	Medium	Moderate adverse/ beneficial	Moderate adverse/ beneficial	Minor adverse/ beneficial
	Low	Moderate adverse/ beneficial	Minor adverse/ beneficial	Negligible
	Negligible/ Neutral	Minor adverse/ beneficial	Negligible	Negligible

16.2.36 Impact magnitude has been assessed by consideration of the following factors:

- The magnitude of the predicted impact;
- The geographic extent of the impact;
- The duration and reversibility of the impact; and
- The capacity of the local economy or area to absorb or adjust to the impact.

16.2.37 The approach to the assessment includes both construction and operation aspects of the proposed Development. Cumulative effects with other committed schemes are included as necessary within assessments following review of interfacing projects and others within the zone of influence of the proposed Development.

16.2.38 The assessment of socioeconomic impacts uses a combination of quantitative and qualitative methodologies. Specific methodologies for assessing the effects of the proposed Development are as follows.

- **Local Economy and Employment:** Employment generated during the construction phase has been quantified by dividing the total estimated construction cost by the average output per construction employee as taken from data published by the Office for National Statistics (ONS) Annual Business Survey and Business Register (Ref 16.11) and Employment Survey for the East of England (Ref 16.12). The assessment includes an estimate of deadweight (i.e. what would happen in the absence of the proposed Development), leakage (employment accessed by workers from outside the study area), displacement (reduction of employment elsewhere as a result of the proposed Development and multiplier effects (increased employment in supply chains and as a result of local spend by new employees). Employment generated or affected during the operational phase is assessed using the best available information, for example business case for operation employment or qualitative professional judgment in regard to effects on agricultural employment.
- **Community Infrastructure:** An audit of the existing community infrastructure in terms of location, capacity, access and use has been undertaken. Consideration has been given to accessibility to / from education facilities such as Trumpington Community College, Long Road Sixth Form College, Cambridge Academy for Science and Technology and Trumpington Park Primary School and community facilities such as Clay Farm Community Centre and Trumpington Pavilion.

- **Open Space and Recreation:** An audit has been undertaken of the existing open space, sports and play provision within the local study area. Consideration has been given to impact of the proposed Development on parks, nature reserves, existing walking and cycle routes and Public Rights of Way (PRoW).

## Assessing Significance

16.2.39 Professional judgement has been used to define the extent and significance of effects. The terms used to define the significance of effects are as follows:

- **Adverse:** detrimental or negative impacts to a socio-economic resource or receptor
- **Negligible:** imperceptible impacts to a socio-economic resource or receptor
- **Beneficial:** advantageous or positive impact to a socio-economic resource or receptor

16.2.40 Where beneficial or adverse effects have been identified, these have been assessed against the following scales:

- **Minor:** slight, very short or highly localised impact. Not considered to be significant
- **Moderate:** limited impact (by extent, duration or magnitude) which may be considered significant
- **Major:** considerable impact (by extent, duration or magnitude) of more than local significance (for example a sizeable change in relation to the baseline or affecting a wide geographic area). Major impacts are considered to be significant.

## Limitations and Assumptions

16.2.41 Limitations of the assessment, together with assumptions used are summarised as follows:

- Baseline conditions have been established using data that is currently available;
- Professional judgement and expertise have been used to assess impacts where quantitative information or appropriate guidance is not available.
- The full implications of the Covid 19 pandemic are not fully known at this stage so this assessment does not make specific assumptions related to its impact.

## 16.3 Baseline

16.3.1 This section presents a description of the existing and future baseline for the local study area, wider study area, with comparative information for regional and national areas as relevant.

### Existing Baseline

#### Population

16.3.2 Table 16-6 illustrates the population profile for the local and wider study areas. The table shows that population growth between 2011-2019 in the local study area exceeded that of growth levels in the wider study area, the regional average for the East of England and nationally for England.

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Table 16-6 Population

Study Area	2011	2019 Population (Est)	Population Growth 2011-2019 (%)
Local Study Area	26,547	32,383	22.0
Wider Study Area	272,622	283,884	4.2
East of England	5,846,965	6,236,072	6.7
England	53,012,456	56,286,961	6.2

Source: Office for National Statistics Census Data 2011, ONS Population Estimates Mid-2019

16.3.3 The local study area has seen a significantly higher population growth since the 2011 census compared to wider study area, East of England region and England as a whole.

### Community Infrastructure

- 16.3.4 Community infrastructure includes education, healthcare facilities, libraries, post offices, community centres, youth centres and places of worship. Community facilities are a means of stimulating social inclusion and provide an important resource to the existing and future community.
- 16.3.5 The proposed Development is located to the south of Cambridge City Centre. The proposed Development is adjacent to Addenbrooke's Bridge which carries the Cambridgeshire Guided Busway over the railway and will provide a new transport choice to patients, visitors and employees when travelling to and from the Cambridge Biomedical Campus. The proposed Development is adjacent to several University facilities such as the Anne McLaren Laboratory for Regenerative Medicine and School of Clinical Medicine, related buildings such as the AstraZeneca Energy & Data Centre and AstraZeneca Research and Development Enabling buildings and amenities and services provided in nearby Trumpington.
- 16.3.6 Other community infrastructure within the study area includes educational facilities (Hills Road Sixth Form College, Long Road Sixth Form College, Trumpington Park Primary School and Trumpington Community College), Community Centres (Clay Farm Community Centre, Trumpington Pavilion and Jubilee Pavilion). The community facilities/infrastructure within the vicinity of the proposed Development are shown on Figure 15-1 in Appendix 15.1.

### Local Economy and Employment

- 16.3.7 Table 16-7 shows the economic activity and inactivity rates for the wider study area and those of the East of England and England as a whole. The proportion of people economically active in the wider study area is slightly greater than the regional and national average. In addition, the wider study area has comparable levels of residents in employment with regional and national averages.
- 16.3.8 The wider study area has slightly fewer residents registered as self-employed in comparison to the East of England and England. The wider study area has a slightly lower proportion of residents who are economically inactive, although a slightly greater proportion of residents who are retired, compared to England as a whole.

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Table 16-7 Economic Activity and Inactivity (%)

	Wider Study Area	East of England	England
Economically Active	82.3	81.1	79.7
Self-employed	9.0	10.9	11.0
Unemployed	2.8	3.5	4.0
Economically Inactive	17.8	18.9	20.3
Retired	13.7	15.8	13.4

Source: ONS annual population survey Jul 2019-Jun 2020.

16.3.9 Table 16-8 provides details of employment by occupation. The table shows that there is a higher proportion of residents in major group (1-3) occupations (61.7%) in the wider study area than the average for the East of England (46.3%) and national average (49.5%). The wider study area has a lower proportion of residents in elementary, process plant and machine operatives than regional and national levels.

Table 16-8 Employment by Occupation (%)

Soc 2010 Group		Wider Study Area	East of England	England
1	Managers, directors and senior officials	12.3	13.3	12.0
2	Professional occupations	37.5	21.1	22.3
3	Associate professional & technical	11.9	13.9	15.2
4	Administrative & secretarial	7.3	10.5	9.8
5	Skilled trades occupations	7.9	10.2	9.6
6	Caring, leisure & other service occupations	6.2	8.8	8.8
7	Sales and customer service occupations	4.5	6.5	6.8
8	Process plant & machine operatives	3.2	5.8	5.7
9	Elementary occupations	9.6	9.8	9.6

Source: ONS annual population survey Jul 2019-Jun 2020

16.3.10 Employment by sector taken from the ONS Business Register and Employment Survey (BRES) data for 2019 is shown in Table 16-9. This shows that in South Cambridgeshire District and Cambridge City in 2019 there were approximately 6,500 people working in the Construction sector. In the East of England there were 167,000 working in the Construction sector. It also shows that there is a higher proportion of people working in the Professional, Technical and Business sector in the wider study area (27.5%) relative to the East of England (21.5%) and England (19.9%).

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Table 16-9 Employment by Business Sector (2019)

Business Sector	Wider Study Area		East England		England	
	No.	%	No.	%	No.	%
Primary <sup>1</sup>	2,095	1.1	54,000	1.9	458,000	1.7
Manufacturing	12,500	6.3	212,000	7.6	2,091,000	7.9
Construction	6,500	3.3	167,000	6.0	1,271,000	4.8
Motor Trades	2,900	1.5	68,000	2.4	493,000	1.9
Wholesale	4,250	2.1	120,000	4.3	1,054,000	4.0
Retail	12,000	6.0	255,000	9.2	2,427,000	9.2
Transport & storage	3,000	1.5	137,000	4.9	1,326,000	5.0
Accommodation & food services	14,000	7.0	191,000	6.9	1,976,000	7.5
Information & communication	16,000	8.0	107,000	3.8	1,180,000	4.5
Financial & insurance	2,250	1.1	69,000	2.5	933,000	3.5
Professional, Technical and Business <sup>2</sup>	54,650	27.5	598,000	21.5	5,228,000	19.9
Public administration & defence	3,750	1.9	92,000	3.3	1,064,000	4.0
Education	32,000	16.1	257,000	9.2	2,281,000	8.7
Health	25,000	12.6	332,000	11.9	3,331,000	12.7
Arts, entertainment, recreation & other	8,000	4.0	124,000	4.5	1,195,000	4.5
<b>Total</b>	<b>198,895</b>	<b>100.0</b>	<b>2,783,000</b>	<b>100.0</b>	<b>26,308,000</b>	<b>100.0</b>

Source: ONS BRES (2019)

## Open Space and Recreation

16.3.11 Open space and public rights of way are shown at Figure 16.1 in Appendix 16.1. There are some areas of open space defined as land used for public recreation purposes, within the boundaries of the proposed Development. This includes parts of Hobson's Park, Clay Farm Community Garden, Clay Farm Allotments and Nine Wells Local Nature Reserve are within 2km of the site boundary.

<sup>1</sup> Combining BRES sectors - Agriculture, forestry & fishing, Mining, quarrying & utilities

<sup>2</sup> Combining BRES sectors Scientific & Technical; Business Administration & support services; Property



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16.3.12 There is one cycle route in the immediate vicinity of the proposed Development. National Cycle Network (NCN) Route 11. NCN 11 spans the eastern boundary of the proposed Development along Francis Crick Avenue and crosses the railway line on Addenbrooke's Bridge and heads north to Cambridge City Centre along the Cambridgeshire Guided Busway. Sections of NCN 11 and the Genome Cycle path are 'adopted highway'.

16.3.13 Other key existing walking and cycle infrastructure in the vicinity of the Site includes:

- Long Road and Queen Edith's Way have shared cycleway/footways on either side of the carriageway.
- Hills Road has two slightly raised cycle lanes (also known as 'hybrid cycle tracks') between the main carriageway and the footway.
- On Hills Road between Long Road and the Addenbrooke's roundabout in addition to hybrid cycle tracks, there is an extra provision for southbound cyclists entering the CBC site.
- There is extensive off-road cycle infrastructure both alongside Addenbrooke's Road and the Cambridge Guided Busway (CGB).
- The segregated route alongside the CGB connects with Trumpington Park and Ride, Cambridge Station, the western end of Long Road and residential areas of Trumpington.
- Shelford Cycleway provides a direct, traffic-free route to Great Shelford.
- A Dutch style roundabout is in operation at Fendon Road/Queen Edith's Way/Mowbray Road.
- Babraham Road has off-road shared provision on the eastern side of the carriageway and a footway on the western side; and
- This provision is now connected with the CBC site via an improved link from Red Cross Lane and a new link via Ninewells development. The Ninewells development comprises of 162 contemporary, high-specification properties located along Babraham Road, to the east of Great Shelford.

16.3.14 PRoW (Cambridge Footpath 47) runs immediately adjacent to the eastern boundary of the site boundary along Francis Crick Avenue and Dame Mary Archer Way. The route passes along the southern and western edge of Cambridge Biomedical Campus. PRoW (Great Shelford Footpath 2) lies adjacent to the Nine Wells Local Nature Reserve to the east of the site boundary. PRoW (Great Shelford Footpath 1) lies within the site boundary crossing the railway line at the Shepreth Branch Junction, adjacent to Granham's Farm to the north of Great Shelford. The relevant PRoW and open space areas are illustrated in Figure 16-1 (Public Rights of Way and Open Space) in Appendix 16.1.

16.3.15 There are several permissive paths<sup>3</sup> that dissect or surround the site boundary. PPA/0073 is a permissive footpath that lies within the site boundary and runs parallel to the railway line, immediately to the north of Addenbrooke's Road. PPA/0170 is a permissive footpath that spans the length of Francis Crick Avenue, parallel to PRoW Cambridge Footpath 47. PPA/0155 (DNA Genome Cycle Path) is a permissive cycleway and adopted highway that starts at Robinson Way, within the campus site, that runs to the south of Dame Mary Archer Way and down to the settlement of Great Shelford.

## Agricultural Land

16.3.16 The grade of agricultural land is assessed in more detail in Chapter 12: Ground Conditions and Contamination. The majority of agricultural land within the site boundary is considered to be Grade 2 in terms of the Agricultural Land Classification (ALC) system (see Figure 12-4 in Appendix 12.1). This is considered best and most versatile (BMV) agricultural land. According to the available ALC mapping, approximately 7.5ha of land within the site boundary is Grade 2

<sup>3</sup> A permissive path, permitted path, permitted bridleway or concessionary path is not a public right of way. It is a path clearly signed as a permissive that a landowner allows the public to use it. This may be for walkers, riders, cyclists, or any combination thereof. However, there is no statutory right of access.

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land in current agricultural use (para 12.3.18). However, most of this land is not currently used for agricultural purposes as it forms part of the Hobson's Park and Nine Wells Local Nature Reserve or is unused land either side of major road and rail infrastructure i.e. embankments. Due to the long, linear nature of the site boundary the only actively farmed agricultural land (under arable production) is likely to fall within several land ownerships/farms and is mainly within the periphery of fields. There is one field immediately adjacent to the north west of Nine Wells Local Nature Reserve that appears to be actively farmed and approximately 50% of this field is within the site boundary. The 2.1ha of Exchange Land located to the south of Addenbrooke's Road (Nine Wells bridge) is classified as Grade 2 agricultural land.

## Future Baseline

16.3.17 Local and national population estimates and forecasts have been published by the ONS, and the population forecasts up to 2036 are shown for the relevant study areas in Table 16-10 below:

Table 16-10 Cambridgeshire County Council's 2018-Based Population Forecasts

Study Area	2021	2026	2031	2036	Projected Population Growth 2021-2036 (%)
Local Study Area	35,820	37,610	38,650	38,980	8.8
Wider Study Area	305,620	332,460	350,910	357,100	16.8
Cambridgeshire	685,770	743,400	778,760	794,200	15.8
England	57,030,529	58,505,617	59,789,800	60,905,479	6.8

Source: ONS, 2020

16.3.18 The data in Table 16-10 shows that the wider study area and Cambridgeshire is expected to experience a higher growth rate in population figures over the next 15 years.

16.3.19 Table 16-11 outlines the employment forecasts for South Cambridgeshire highlighting the total projections until 2036 and the three main relevant employment sectors to this assessment; Professional Services, Health & Care and Construction.

Table 16-11 Employment forecast for South Cambridgeshire ('000s FTE) 2016 – 2036 with Selected Relevant Sectors<sup>4</sup>

	2016	2021	2026	2031	2036	% change from 2016 to 2036
Professional services	9.5	9.9	10.2	10.5	10.8	13.7%
Health & care	9.5	9.9	10.3	10.7	11.2	17.9%
Construction	6.3	6.4	6.4	6.5	6.6	4.8%
Total	79.8	80.9	82.0	83.0	83.9	5.1%

Source: East of England Forecasting Model (EEFM) (2017)

## 16.4 Design and Mitigation

16.4.1 The design features of the proposed Development and mitigation measures that would ameliorate adverse effects relating to socioeconomics are set out below.

<sup>4</sup> Note that the EEFM estimate of construction employees is slightly higher than the ONS BRES estimate for SCDC and Cambridge City as shown in

Table 16-11. This is due to the fact the EEFM uses a different approach to define employees in the construction sector. Despite the difference the two tables and information sources are included in this EIA chapter as the marginal difference has no material effect on the conclusions of the assessment.

## Construction Approach and Mitigation of Construction Effects

- 16.4.2 An outline Code of Construction Practice (CoCP Part A) is provided as Appendix 2.4 of this ES. This outlines proposed mitigation measures with respect to socio-economics. In addition, a detailed CoCP Part B) would be prepared by the appointed contractor and approved by the local authority before any construction work commences. This would build on Part A CoCP and would detail appropriate mitigation measures with respect to socio-economic effects. Such measures, as outlined in Part A, would include, for example, site works inductions to be given to ensure contractors act considerately in relation to local residents, and particularly for any works that may be programmed to take place at night.
- 16.4.3 In order to minimise disruption to Non-motorised users (NMU) routes, PRoW, footways and cycle routes, temporary diversions would be put in place together with appropriate signage. This would be carried out in consultation with the local highways authority and other interested stakeholders.
- 16.4.4 Local residents and businesses in proximity to the proposed Development during construction may experience reductions in amenity from changes in air quality, visual amenity and noise and vibration. Detailed information relating to mitigation for these areas would be prepared in relation to individual topics.
- 16.4.5 The mitigation measures relating to noise, vibration, air quality, landscape and transport (which may impact upon residential amenity) are described in more detail in Chapters 5, 6, 7, 13 and 17 respectively.

## Scheme Design and Mitigation of Operational Effects

- 16.4.6 Exchange Land comprising 1.95ha of existing agricultural land will be purchased and converted to open space / recreational land. Also, a new accommodation bridge will be provided prior to the private agricultural use level crossings being permanently stopped up.
- 16.4.7 Provision of access routes and communication routes surrounding the proposed Development would help to improve linkages between residential areas, local businesses and education. Implementation of these measures could also attract investment and business to the area.

## 16.5 Assessment of Residual and Cumulative Effects

### Introduction

- 16.5.1 The following sections outline the residual effects once the mitigation measures described in Section 16.4 have been implemented. These effects fall under the following categories:
- Potential beneficial effects on the local and wider labour market from the creation of additional direct and indirect employment opportunities and by increasing skills in the construction sector during construction.
  - Potential adverse effects on local communities during construction, arising from a combination of construction activities on-site, the movement of materials on the road network, noise and disturbance issues and increased provision need from temporary workforces.
  - Potential adverse effects on PRoW and recreational facilities arising from construction activities, temporary closures or diversions and any operational closures to footpaths or cycle paths.

- Potential amenity impact on residential and business properties from construction disruption such as noise, air quality pollution and visual pollution through construction activities and landscape changes during operation.

## Residual Effects from Construction

### Construction Employment

- 16.5.2 The principal socio-economic effects arising from the construction of the proposed Development relate to the creation of construction employment and opportunities for training and skills development over the short and longer term. This provides an estimate of 1,779 job years (i.e. one person working full time for one year). The process for estimating 1,779 jobs is explained below.
- 16.5.3 Construction employment has been estimated by taking the total estimated construction cost of £190 million and dividing it by the average output per construction employee in the East of England of (£106,783) as taken from the latest available information which is the 2018 Annual Business Survey (Office for National Statistics) (Ref 16.11). For the assessment period, the construction period is estimated to last approximately 2 years between 2023 and 2025, as stated in the Cambridge South Infrastructure Enhancements – Engineering Options Report (GRIP 3) (Ref 16.13). To determine the estimated direct Full Time Equivalent (FTE) construction workers per year, the estimated project construction cost (£190 million) has been divided by the average turnover per construction worker (£106,783) equalling 1,779 person years of employment. To derive FTE, the HM Treasury convention that 10 person years equals 1 FTE job is used. This provides an estimated figure of 178 direct FTE construction workers for the project.
- 16.5.4 To estimate the number of indirect jobs resulting from the construction of the proposed Development, additionality factors have been applied to the direct jobs. This includes leakage, displacement and multiplier effects. Additionality factor assumptions are taken from the HCA Additionality Guide (Ref 16.2).
- 16.5.5 Leakage is defined by the HCA Additionality Guide (Ref 16.2) as being where benefits go outside of the area under consideration. Displacement is where a proportion of outputs are accounted for by reduced outputs elsewhere in the area under consideration. The Additionality Guide provides 'ready reckoners' and advises that they can be used to help quantify likely levels of leakage and displacement when obtaining primary data is not practical. Given the nature of the construction industry (for example the workforce is characterised by relatively high levels of mobility – i.e. Construction workers typically move from place to place with new construction projects and the fact that there are a wide range of opportunities for construction work available), leakage is considered to be medium and displacement is considered to be low. Based on the HCA 'ready reckoners', 50% is applied to Leakage and 25% to Displacement. Finally, there are likely to be indirect employment effects arising from the proposed Development. These may relate for example to supply chain linkages or from employment in businesses arising or expanding to service the construction workforce. Also, the additional workers would spend money in local shops and on services, which would generate jobs in the local economy.
- 16.5.6 The HCA Additionality Guide (Ref 16.2) provides guidance about composite multipliers that can be applied to quantify benefits arising from these more indirect sources; at the local level (local authority wide) a composite multiplier of 1.15 has been applied, extending to 1.7 for the wider region, recognising the strong local supply linkages and income or induced effects likely to arise as a result of the proposed Development. A summary of the construction employment impacts calculations using these additionality assumptions is provided in Table 16-12.

Table 16-12 Construction Employment Summary

Predicted Employment Effect	Construction Employment (FTE)
FTE direct construction jobs	178

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Predicted Employment Effect	Construction Employment (FTE)
Leakage (50%)	89
Displacement (25%)	67
Composite multiplier (1.15 local study area)	77 (net FTE construction jobs – local area)
Composite multiplier (1.7 wider region)	<b>114</b> (net FTE construction jobs – wider region)

- 16.5.7 The generation of construction jobs for the proposed Development would have a direct effect on the construction employment economy. Although the effect is temporary there would be construction employment for two years. There are estimated to be approximately 6,500 people working in the construction sector in South Cambridgeshire and Cambridge City and 167,000 at the East of England regional level (see Table 16-9 above). The construction workforce is mobile, with many workers travelling throughout their region and often further afield for work. The total workforce at a regional level (167,000) is large and there are numerous opportunities for work given the significant amounts of housebuilding occurring across the region. Therefore, the sensitivity of the receptor (Local workforce) to new employment opportunities is considered to be low.

*The magnitude of the impact of 178 direct and 77 net additional jobs at a local level can be considered as being high and beneficial as it represents approximately 1.2% of the total local construction workforce. The percentage of the total local construction workforce has been calculated by dividing the 77 net additional jobs by the approximate number of people working in the construction sector in the wider study area (6,500 as shown in*

- 16.5.8 Table 16-11). Therefore, the effect is considered to be a Minor Beneficial and therefore **Not Significant**.

## Residential Amenity

- 16.5.9 The construction phase is likely to lead to some temporary disruption for local communities and potential effects on residential amenity in relation to noise, vibration, disturbance, construction traffic, potential air quality changes (for example construction dust) as well as changes to the visual landscape. Residents from Trumpington would be particularly vulnerable to changes in residential amenity, by virtue of their proximity to the proposed Development.

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- 16.5.10 In relation to air quality (chapter 7), the construction dust impact assessment takes account of the impact of dust soiling on residential amenity. It concludes that with the construction mitigation measures incorporated the impacts are considered to be Negligible.
- 16.5.11 The environmental impact of construction and operation of the proposed Development with respect to transport is assessed in chapter 17. The key conclusion of this is that there will be no significant effects during the construction phase. There are likely to be some slight adverse effects in terms of fear and intimidation for pedestrians and cyclists due to increased traffic. However, mitigation measures will be put in place such as adherence to the designated construction routes, planning HGV movements to avoid peak hours, use of traffic marshals if required and the provision of instructions to drivers to pay special attention to pedestrians and cyclists.
- 16.5.12 In relation to noise (chapter 5) and vibration impacts (chapter 6) from the construction phase, it is concluded that there will be some significant amenity effects on residential receptors close to the railway line. This includes significant noise impacts on The Belvedere residential properties on Hills Road in the north of the site boundary and significant vibration impacts on residential properties around Davey Crescent, Abberley Wood and Grahams Close in the south of the site boundary. However, these impacts are expected to be short term and temporary in nature and will be mitigated through Best Practicable Means (BPM).
- 16.5.13 In relation to Landscape and Visual impacts (chapter 13) from the construction phase, it is concluded that construction activity, in the form of cranes, hoardings and temporary cabins, and the movement of machinery and workers are a familiar part of the area's character and have been for the last 10-11 years. Therefore, further activity arising from the construction phase of the Development would not bring about a noticeable change in the character of the area surrounding it. In summary there are no significant effects in terms of socio-economic receptors.
- 16.5.14 The sensitivity of the receptor (local residents) to construction related disruption is considered to be low. People have a capacity to tolerate some temporary disturbance related to the construction process. The impact magnitude is considered to be medium as there would be some residual adverse impacts after the proposed mitigation measures in terms of visual and landscape amenity, noise and vibration. Therefore, the effects on residential amenity are expected to be Minor Adverse and so **Not Significant**.

### Crime and Safety

- 16.5.15 Construction works have the potential to affect public safety and/or the perception of public safety. Construction areas would need to be appropriately cordoned off with physical boundaries to prevent public access. In particular, the construction site must be secured following the working day to prevent population groups from accessing the site boundary.
- 16.5.16 Construction vehicles entering and exiting the site boundary have the potential to cause congestion, disruption of access and generate negative noise, dust and air pollution. There are also physical risks to public safety from road accidents with the addition of large HGVs and construction vehicles using the local road network.
- 16.5.17 There could be some crime and safety concerns for local residents as during construction there will be an influx of new workforce. There may be a reduction in the natural surveillance of spaces and residents may perceive there to be a reduction in personal safety. Changes in accessibility and perceptions of personal safety may have a resultant impact on levels of relative social cohesion during the construction phase. However, the mitigation and construction processes outlined in the CoCP Part A, for example, training and guidance to the construction workforce on appropriate behaviour, would help alleviate the risk of crime and so the impact is deemed to be negligible. Given the sensitivity of receptor (Local residents ) to construction related crime and safety is medium, the overall effect is considered to be Negligible and **Not Significant**.

### Community Infrastructure

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- 16.5.18 Residual effects on users of community infrastructure would include any changes in access to facilities such as educational, healthcare services or other community infrastructure. A number of university linked buildings (e.g. Anne McLaren Laboratory of Regenerative Medicine and University of Cambridge School of Clinical Medicine) are located within the vicinity of the site boundary. In addition, University research related buildings such as the AstraZeneca Energy & Data Centre and AstraZeneca Research and Development Enabling buildings lie either side of the railway line and within the site boundary of the proposed Development.
- 16.5.19 As referenced in the GRIP 3 Options Report (Ref 16.13) and Figures 4.2 to 4.8 in Chapter 4 of this ES, there will be temporary disruption to the AstraZeneca buildings from the construction compounds. Construction Compound 6 (CC6) will be located at the north east of the AstraZeneca car park/ service yard to support construction of the station. This will be a temporary/ transient compound will only take space for identified construction activities. It will not affect the functioning of these organisations and access to them by their workforce or members of the community. Overall, the GRIP 3 Option Study (Ref 16.10) demonstrates that there will be no disruption to existing community infrastructure during construction.
- 16.5.20 The temporary and small-scale nature of the construction work disruption means the impact on community infrastructure is considered to be of negligible magnitude. Given the sensitivity of the receptor (users of community infrastructure) is medium, the overall effect is considered to be Negligible and **Not Significant**.

## Open Space and Recreation

- 16.5.21 The design of the proposed Development seeks to limit the extent of permanent land take in Hobson's Park. During construction, the western access would implement a shared or segregated pedestrian and cycle path through Hobson's Park approximately parallel to the Cambridge Guided Busway (CGB). The existing CGB crossing connecting Trumpington residential area and Hobson's Park and adjacent section of the shared use path on the western side of the CGB would be widened to accommodate additional pedestrian and cycle movements. A new un-signalised CGB crossing will be created on the east-west spur of the CGB to maintain connectivity to the Active Recreation Area on the north side of the CGB.
- 16.5.22 National Cycle Network (NCN) Route 11 would require temporary diversions to accommodate the need to widen the tracks and the main eastern construction compound (CC1) for the proposed Development for a period of approximately three years. A section of the Genome Cycle Path will be temporarily stopped up during construction and diverted to the east of proposed Development site. The section to be diverted is between a point approximately 200m south of the Nine Wells Bridge and the Addenbrooke's Road/ Francis Crick Avenue/ Dame Mary Archer Way Roundabout.
- 16.5.23 The proposed temporary diversion would route users along the southern edge of the main eastern construction compound, along the eastern side of the proposed construction compound access road and across the Dame Mary Archer Way arm of the Addenbrooke's Road/ Francis Crick Avenue/ Dame Mary Archer Way roundabout. It would then connect to NCN Route 11 on Francis Crick Avenue. The diversion length in total is approximately 570m. This is around 50m more than the existing NCN Route 11 section which can be considered a negligible impact for users of the cycle path. The diversion route is shown on Figure 17.2 contained within Appendix 17.1 of the Transport chapter.
- 16.5.24 CC1 is located adjacent to Addenbrooke's Road to the east of the railway alongside the track from Addenbrooke's Road/ Dame Mary Archer Way roundabout. This would be the main construction compound for the proposed Development site with all of the associated construction infrastructure including car parking, offices, welfare, stores, materials handling, waste handling. The compound area is located between Footpath 47 and the permissive paths (PPA/0073 footpath and PPA/0155 cycleway).
- 16.5.25 Construction access points would create some temporary disruption to users of open space and recreation in the close vicinity of the proposed Development. Construction Access Point 1 (AP1) is located from Addenbrooke's Road to east of the railway on the Addenbrooke's Road/ Dame Mary Archer Way roundabout, at the end of Francis Crick Avenue (Footpath 47) and Construction Access Point 4 (AP4) is located from Francis Crick Avenue (Footpath 47) north



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of the adjacent Guided Bus corridor the east of the railway. The location of these access points would lead to temporary disruption to the users of the PRoW. It is not anticipated that AP4 will be a heavily used access.

- 16.5.26 Residual effects on users of open space and recreational routes during the construction phase are likely to include changes in access to employment that may arise, health impacts associated with environmental change (for example changes to noise levels or air quality) and changes in levels of physical activity as a result of impacts on walking, cycling routes and open space. Users would be temporarily negatively impacted by the required diversions during construction. As a suitable, adequate diversion route within relative proximity to NCN Route 11 is proposed and due to the temporary nature of CC1, the level of impact on users is considered to be negligible. The sensitivity of the receptor (users of open space and recreational routes) is considered to be low because the users will be able to tolerate the temporary disturbance to the route related to the construction process and have numerous alternative routes to use for recreational purposes. Therefore, the effect is Negligible and **Not Significant**.

### Agricultural Land

- 16.5.27 As outlined in the Ground Conditions chapter (chapter 12), approximately 7.5ha of Grade 2 land in current agricultural use will be temporarily unavailable for agricultural production during the construction period. This land includes small areas on the periphery of fields alongside the railway line and around half of the field between Nine Wells Local Nature Reserve and Addenbrooke's Road (an estimated 2.4ha) and the field to the south west of Addenbrooke's Road (Nine Wells bridge) where 2.1ha of Exchange Land will be provided.
- 16.5.28 This temporary loss is unlikely to cause operational issues for any of the farms or any fragmentation of their business. Given the small amounts of permanent land loss (approximately 4.5ha) following the reinstatement of land required temporarily, the impact magnitude is considered to be low. The sensitivity of the receptor (agricultural businesses and their workers) to change is considered low as there are numerous alternative options for agricultural work in this area. On balance the proposed Development will therefore have a Negligible effect on the operations of local farm businesses and so **Not Significant**.

### Residual Effects from Operation

- 16.5.29 The operation of the proposed Development would have a range of effects in terms of the local economy, open space provision and associated services and facilities.

### Economy and Employment

- 16.5.30 Effects on employment and economic growth in the area as a result of the proposed Development relate principally to the potential for employment generation such as on-site jobs.
- 16.5.31 Following construction, there would be relatively low levels of operational employment on proposed Development. However, the Network Rail Engineering Options Report (GRIP 3) (Ref 16.13) for the proposed Development confirms that staff (Customer Service Assistants) will be required for the Train Operating Company (TOC) and will be expected to operate the station ticket concourses and supervise the gate lines. It is understood that a maximum of four to six station staff will be required during peak times (FTEs), with typically two staff operating each station 'wing', primarily selling tickets and attending one or both gate lines. In addition to this, there will be a number of additional people staffing retail outlets at the station.
- 16.5.32 Based on the information in the GRIP 3 Options study this assessment assumes that there will be approximately 10 direct FTE jobs generated during operation. In the context of an estimated 3,000 transport sector workers in the wider study area (See Table 16-9) the impact of these new jobs can be seen as low. The sensitivity of the receptor (local workforce) is considered to be medium as although there is a relatively healthy local economy with numerous employment opportunities in the wider area, any additional employment opportunity is valuable. Therefore, the overall effect is considered to be Minor Beneficial and **Not Significant**.

## Wider Economic Impacts

16.5.33 The new station would bring wider economic benefits for the local economy through improving the local rail network, thereafter, creating greater opportunities for travel to employment. A high level wider economic impact assessment has been undertaken in line with HM Treasury Green Book principles and the Homes and Communities Agency's Additionality guidelines. This assessment is included within the Cambridge South Rail Station Strategic Case (Outline Business Case) document. The Outline Business Case estimates that approximately 44 new jobs per annum could be created in the wider local economy as a direct result of the proposed Development. The assessment assumes these jobs would be generated by businesses choosing to locate close to the new station due to the better accessibility to local labour markets. It should be noted that this growth is not yet committed.

*To assess the extent of the impact of the new jobs on the local workforce, the job creation figures for the station and the wider economy have been compared to the existing baseline figures for the wider study area in the Scientific & Technical, Business Administration & support services sectors (see*

16.5.34 Table 16-11). The projected creation of 44 jobs per annum for the wider economy as a result of the proposed Development is considered to be beneficial but low impact magnitude given it would represent only around 0.2% of the Professional, Technical and Business sector in the wider study area.

16.5.35 The sensitivity of the receptor (local workforce and local businesses) is medium. Therefore, the overall effect is Minor Beneficial and **Not Significant**.

## Open Space and Recreation

16.5.36 This section considers the impacts of the proposed Development on existing walking and cycling routes, sports and play provision and local recreation facilities.

16.5.37 An estimated 1.95ha of recreational land/open space will be lost within Hobsons Park and the Active Recreation Area around the proposed Development. However, reciprocal Exchange Land (1.95ha) from the nearby agricultural field to the south-west of Addenbrooke's Road (Nine Wells bridge) will be provided. Also, segregated cycle and pedestrian access would be provided to the north of the eastern forecourt and an additional pedestrian access route would be provided along the southern boundary with AstraZeneca. The primary access route to the west building would be from a new shared pedestrian and cycle path provided parallel to the Guided Busway to the north of Hobson's Park. Part of an existing route from the centre of Hobson's Park would also be adjusted and re-graded to meet the new forecourt. The path will rise up to the station forecourt which is approximately 1m higher than the railway. In turn, the railway is higher than the adjacent land in the park. The landscape design objectives for the proposed Development include natural planting and a palette of hard and soft landscape materials that complement those being used within the Circus green space (on the opposite side of Francis Crick Avenue).

16.5.38 The sensitivity of the receptor (users of open space and recreation routes) is considered to be medium as users have limited comparable and accessible alternatives within the relevant area and some, but not much, ability to respond to change. The net impact magnitude of the proposed Development on open space and recreation routes is considered to be low due to the replacement recreational/open space provided. Although the new sustainable user-friendly landscaping and segregated routes being delivered will be beneficial for the health and wellbeing of the community, they also provide a marginal benefit compared to the existing provision. The overall effect is therefore considered to be Minor Beneficial and **Not Significant**.

### Agricultural Land

16.5.39 Only a small amount of operational BMV Grade 2 agricultural land is likely to be permanently lost during operation. Also, a new accommodation bridge will be provided prior to the private agricultural use level crossings being permanently stopped up. Negligible amounts of land on the periphery of fields adjacent to the railway line could also be lost. However, this loss is unlikely to cause operational issues for any of the farms or any fragmentation of their business. Given the small amounts of land loss, the impact magnitude is considered to be low. The sensitivity of the receptor (agricultural businesses and their workers) to change is considered low as there are numerous alternative options for agricultural work in this area. On balance therefore, it is considered that the proposed development will have a Negligible effect on the operations of local farm businesses during operation and so is **Not Significant**.

## Cumulative Effects

16.5.40 This section considers the inter-project-cumulative effects of the Cambridge South East Transport (CSET) scheme and other committed schemes within the vicinity of the site boundary.

### CSET

16.5.41 The CSET scheme is a major public transport intervention in South Cambridge. It aims to link the CBC via Great Shelford, Stapleford and Sawston to a new travel hub near the A11/A1307/A505 with connections to Babraham, the Babraham Research Campus and Granta Park. The current CSET programme includes a Transport Works Act (TWA) application in summer 2021 with potential construction period of 2023 to 2025. This overlaps with the proposed Development construction period. Close coordination is required during construction of both schemes. The coordination will be critical to the impact on the socioeconomics receptors during the construction phase.

16.5.42 As per the proposed Development, NCN11 will require temporary diversion to accommodate the main eastern construction compound for the proposed Development for a period of about three years. Temporary diversion follows existing access track which is also proposed alignment of CSET. Both schemes replace existing NCN11 cycle/pedestrian bridge over Nine Wells stream. Coordination of the construction programmes and sufficient diversion measures implemented as part of the proposed Development mitigation means the effect of the CSET scheme is considered Negligible, thus **Not Significant**.

### Other Committed Schemes

16.5.43 A range of committed schemes are set out at Appendix 2.3. The proposed Development together with committed schemes identified would generate employment opportunities as a result of construction activities and in the operational phase. Whilst a quantitative assessment of the value of this activity is not known, it is expected that there would be a significant beneficial effect on construction and operational phase related employment. Given that the residual effects on social infrastructure from the proposed Development are negligible, the cumulative effect on other social infrastructure receptors such as community facilities, education, healthcare and open space and recreation is also likely to be Negligible, thus **Not Significant**.

## 16.6 Assessment Summary

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16.6.1 Table 16-13 provides assessment summary with respect to socio-economics and how they have been addressed.

Table 16-13 Assessment Summary Table

Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure (If applicable)	Residual Effect Significance
Local workforce	Employment during the construction phase	C	CoCP Part A will outline a local employment strategy, setting out how local employment and training opportunities would be maximised as far as possible.	Minor beneficial <b>Not Significant</b>
Local residents	Impact of disruption on the amenity of the local residents	C	Local residents and in proximity to the proposed Development during construction may experience reductions in amenity from changes in air quality, visual amenity and noise and vibration. A range of mitigation measures are proposed and are outlined in the CoCP Part A.	Minor adverse <b>Not Significant</b>
Local residents	Safety of the local residents	C	The mitigation and construction processes outlined in the CoCP Part A, for example, training and guidance to the construction workforce on appropriate behaviour, would help alleviate the risk of crime.	Negligible <b>Not Significant</b>
Users of community infrastructure	Impacts on the access to community infrastructure such as education and healthcare services.	C	No infrastructure is affected by the construction works, therefore no mitigation required.	Negligible <b>Not Significant</b>
Users of open space and recreational routes	Impact on the users of the PRow and recreational facilities during construction.	C	In order to minimise disruption to Non-motorised users (NMU) routes, PRow, footways and cycle routes, temporary diversions would be put in place	Negligible <b>Not Significant</b>

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure (If applicable)	Residual Effect Significance
			together with appropriate signage. This would be carried out in consultation with the local highways authority and other interested stakeholders. For example, adequate diversion route within relative proximity to NCN Route 11.	
Users of agricultural land	Temporary loss of BMV agricultural land (Grade 2)	C	Compensation for temporary loss of the land from landowners	Negligible <b>Not Significant</b>
Local workforce	Impact on local workforce and local businesses during operation.	O	No mitigation required	Minor beneficial <b>Not Significant</b>
Local workforce and businesses	Wider Economic Impacts: The new station would bring wider economic benefits for the local economy through improving the local rail network, thereafter, creating greater opportunities for travel to employment.	O	No mitigation required	Minor beneficial <b>Not Significant</b>
Users of open space and recreational routes	Impact on the users of the PRoW and recreational facilities during operation.	O	Permanent loss of open space is being replaced with exchange land, also new facilities being provided to improve connectivity to station for NMU's.	Minor beneficial <b>Not Significant</b>
Users of agricultural land	Loss of BMV agricultural land (Grade 2)	O	Compensation for temporary loss of the land from landowners. A new accommodation bridge will be provided prior to the private agricultural use level crossings being permanently stopped up.	Negligible <b>Not Significant</b>

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**16.7 References**

Reference	Title
Ref 16.1	Localism Act 2011
Ref 16.2	The Homes and Communities Agency's 'Additionality Guide (2014)
Ref 16.3	Office of Project and Programme Advice and Training (OffPAT)
Ref 16.4	Common Social Impact Framework; RSSB (2018)
Ref 16.5	HM Treasury Green Book
Ref 16.6	National Planning Policy Framework (2019)
Ref 16.7	Economic Strategy for the East of England (2019)
Ref 16.8	Cambridgeshire Greater Cambridge Greater Peterborough Enterprise Partnership Strategic Economic Plan (2014)
Ref 16.9	Cambridge City Local Plan (2018)
Ref 16.10	South Cambridgeshire Local Plan (2018)
Ref 16.11	ONS Business Register and Employment Survey
Ref 16.12	Annual Employment Survey for the East of England
Ref 16.13	Cambridge South Infrastructure Enhancements – Engineering Options Report (GRIP 3)



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# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 17 – Transport**

JUNE 2021



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## 17 Transport

### 17.1 Introduction

- 17.1.1 This Chapter of the Environmental Statement (ES) reports on the environmental impacts of construction and operation of the proposed Development with respect to transport. The assessment incorporates relevant design and additional mitigation measures that would be employed during construction of the proposed Development.
- 17.1.2 The proposed Development is located approximately two miles south of Cambridge Station, located adjacent to Addenbrooke's Bridge which carries the Guided Busway to the west of the Cambridge Biomedical Campus (CBC). Addenbrooke's Hospital, Royal Papworth Hospital and the CBC growth area lie to the east. To the west lies the village of Trumpington with significant new housing development beyond the adjacent Hobson's Park which is designated as Green Belt.
- 17.1.3 The proposed Development, described in detail in Chapter 4, but in summary is expected to comprise:
- A new Cambridge South Station;
  - Junction improvements at Shepreth Branch Junction;
  - A new connection between existing lines at Hills Road.
- 17.1.4 The proposed station works have been assessed in this chapter as the other works do not impact transport. The station works comprise:
- Four platforms with all-weather cover with step-free access via a footbridge and lifts;
  - Seating and shelter for waiting passengers;
  - A station building, ticket office and ticket vending machines, along with automatic ticket gates; facilities such as a retail/catering unit, waiting room, toilets, baby changing facilities, staff facilities;
  - Cycle parking on both sides of the railway for a total of 1,000 cycles;
  - Pedestrian and cycle access paths on both sides of the railway; and
  - Five parking bays for Blue Badge Holders; two parking bays for station staff; two parking bays for maintenance staff; three bays for drop-off/pick-up by private cars; and three bays for drop-off/pick-up by taxis.
- 17.1.5 Access to the station will be provided from both the east and west of the railway. To provide full integration of the station within the existing urban environment, with good access to local populations and services, the station has been designed to provide direct access and interchange with key transportation modes. The access has also been designed to prioritise sustainable onward journeys for passengers.
- 17.1.6 The station will provide sufficient cycle parking for passengers, appropriate access for passengers with reduced mobility, and safe and convenient cycle and pedestrian access. It is anticipated that up to 95% of passengers will use sustainable, non-vehicular travel modes (walking, cycling and public transport) to travel to and from the station. Furthermore, the proposed Development will, by its very nature, promote sustainable modes of travel, being a rail station, and is predicted to result in a reduction in traffic on the local and strategic road networks.
- 17.1.7 A number of embedded mitigation measures are proposed to limit the impacts associated with trips generated by the proposed Development and to improve accessibility during operation:
- Widening the existing crossing on the southern arm of Francis Crick Avenue/Guided Busway junction;
  - Widening the existing crossing across the Guided Busway connecting Trumpington residential area and Hobson's Park;

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- Providing a shared pedestrian and cycle path through Hobson's Park;
  - Providing cycle and pedestrian access from both the east and west (with cycle parking provided on both sides of the railway); and
  - Providing high-quality wayfinding to the station for all transport modes.
- 17.1.8 The proposed Development accords with national, regional and local transport policies and meets the principal objectives of the key policy documents listed in section 17.2.
- 17.1.9 During the operational phase, users and staff will be encouraged to walk, cycle or use public transport to travel to/from the proposed Development. Vehicle trips to and from the station would account for a small percentage of trips, as stated in the Transport Assessment (see Appendix 17.2), as the parking/drop off provided will only be for disabled (five places) and staff/maintenance (four places), as well as a very limited number of taxi and car drop-off bays (six bays in total). Many of the taxi trips will be made by less mobile people travelling to the hospitals, e.g. outpatients.
- 17.1.10 Furthermore, it is expected that the proposed Development would have overall positive effects during the operational phase through encouraging more people to travel by rail to and from the surrounding area including the CBC and Trumpington residential area, and through improvements to the walking and cycling infrastructure within the site boundary. For these reasons, it is anticipated that the proposed Development would result in net beneficial effects on transport networks, transport networks users and sensitive receptors during the operational phase.
- 17.1.11 The consideration of potential traffic impacts would focus upon the construction of the proposed Development. The Study Area will be focused upon the highway network to be used by construction vehicles and the adjacent land use and sensitive receptors. An assessment of traffic impacts during the operational phase will also be undertaken in order to quantify and assess anticipated beneficial effects.

## Relevant Aspects of the Proposed Development During Construction

- 17.1.12 Construction materials will be delivered to site by road. Delivering materials by rail is not feasible due to the potential impacts on existing rail services on this line, which is already running at capacity. Extensive sidings would also not be feasible due to the significant environmental and financial impacts associated with construction and subsequent demolition of the required sidings.

### Construction Compounds

- 17.1.13 Proposed construction compound locations are shown in Figure 17-1.

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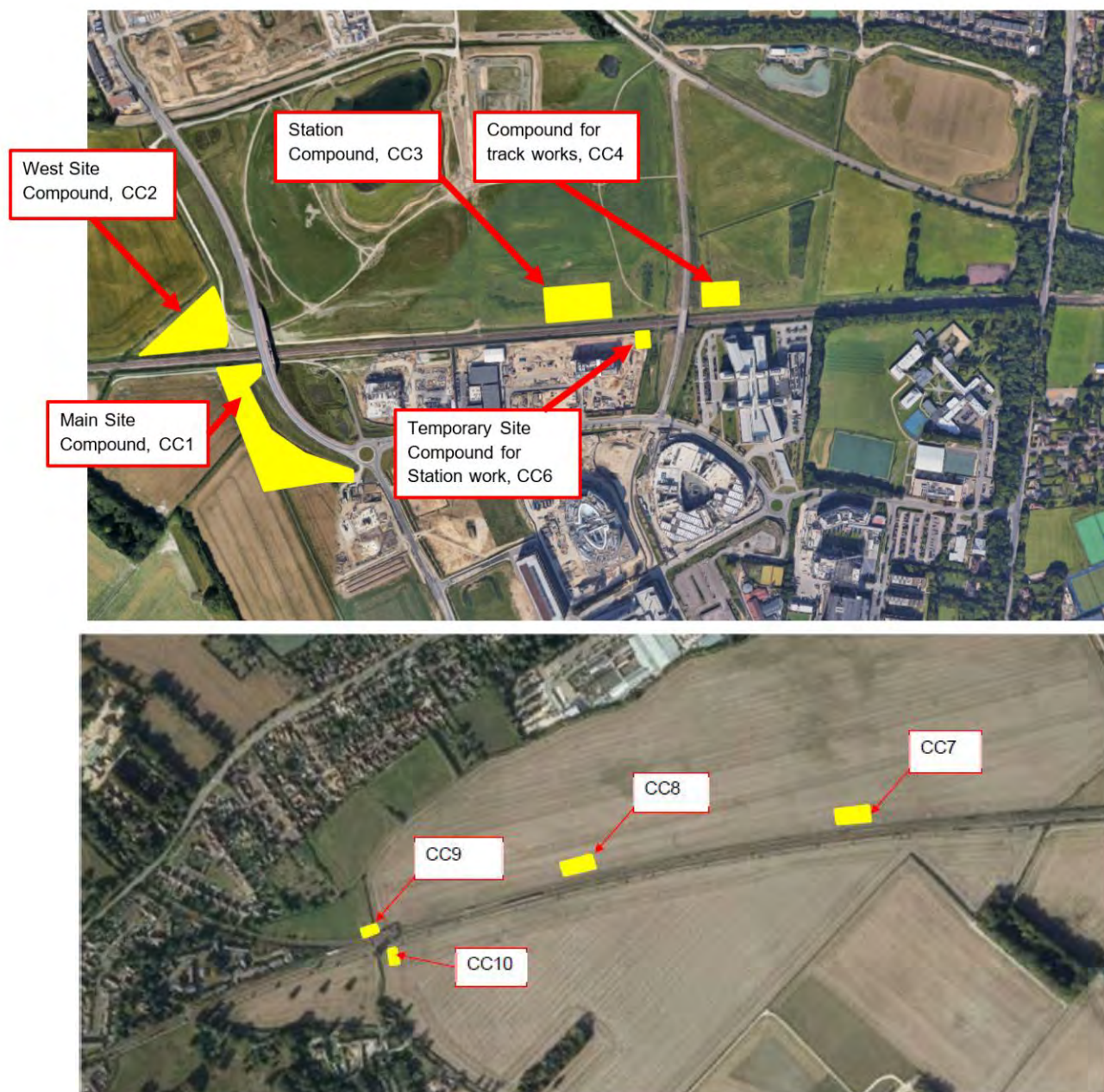


Figure 17-1 Construction Compounds

### Construction Access Points

17.1.14 Identified construction access points to the site from the public highway are required as follows:

- AP1 provides access to construction Compound (CC)1 from Addenbrookes Road to east of the railway on the Addenbrookes Road/Dame Mary Archer Way roundabout at the end of Francis Crick Avenue;
- AP2 provides access to CC2, CC3, CC7, CC8 and CC9 from Addenbrookes Road to west of the railway via a track just east of Hobsons Brook to the south of Nine Wells Bridge, 1544C. The junction entrance will need to be widened to accommodate passing vehicles in the entrance;
- AP3 provides access to CC5 and CC6 from Long Road, between the railway and the guided busway corridor;



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- AP4. From Francis Crick Avenue north of the adjacent Guided Bus corridor the east of the railway;
- AP5 provides access to CC6 from Francis Crick Avenue south of the adjacent Guided Bus corridor the east of the railway; and
- AP6 provides access to CC10 from Granham's Road.

17.1.15 The proposed access points are shown in Appendix 17.1.

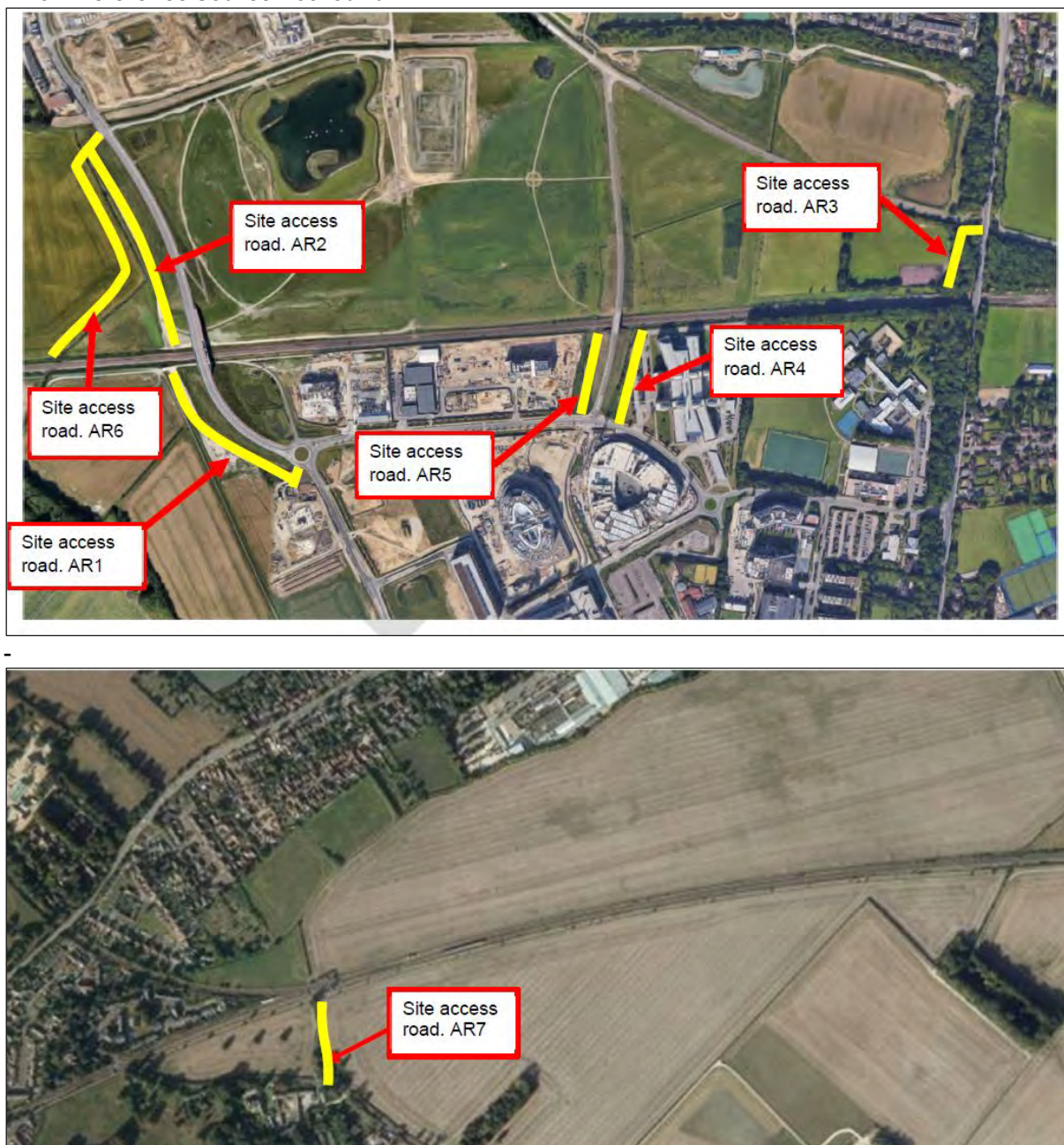
### Temporary Construction Access Roads

17.1.16 Construction access roads are required to provide links between Access Points off the public highway and Construction Compounds identified in Section 17.1. The access roads have been designed to minimise the impact from the construction traffic on the surrounding areas and on people using them. Proposed temporary access roads are shown in **Error! Reference source not found.** below and are as follows:

- AR1. From AP1 via a track from Addenbrooke's Road/Dame Mary Archer Way roundabout at the end of Francis Crick Avenue. A short access road across to the railway would be required. This will require an upgrade of an existing unmetalled access and will require the diversion of the NCN11 Cycle Route.
- AR2. From AP2 via a track just north of Hobsons Brook just south of Nine Wells Bridge. Active or redundant farmland is present on both the east and west sides of the railway, at or near grade, with remnant access tracks visible created during construction of the highway and Nine Wells Bridge. The corridor, including the remnant access tracks, are within the boundary of Hobson's Park.
- AR3. From AP3, via an existing access into the St Margaret's College playing fields. This is an existing metalled access which is already suited to the intended purpose although is likely to need to be repaired on completion of the works.
- AR4. From AP4 along the northern bank of the Guided Busway embankment. There is no existing path and an unmetalled road would be required for the duration of the work. This road may need to cross a swale assumed to be required for the Guided Busway drainage.
- AR5. From AP5 along the southern bank of the Guided Busway Embankment. There is no existing path and an unmetalled road to the railway will be required until the area is transformed into the eastern station forecourt.
- AR6. From AP2 via a track just south of Hobson's Brook. A temporary bridge over Hobson's Brook would be required.
- AR7. From AP6 off Granham's Road to provide access to Construction Compound CC10.

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**Error! Reference source not found.***Figure 17-2 Construction Haul Roads*



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## Construction Routes

17.1.17 The M11 to the west of the site and the A11 to the south east of the site are the primary highway routes servicing the area of the site work. This is shown in Figure 17-3.

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Figure 17-3 Primary Highway Network

17.1.18 Proposed construction routes to each access point from the primary highway routes are as follows:

- For AP1: M11 J11 – A1309 Hauxton Road – Addenbrooke's Road – Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way Roundabout - Site Access
- For AP2: M11 J11 – A1309 Hauxton Road – Addenbrooke's Road – Maintenance track through Hopson's Park
- For AP3: M11 J11 – A1309 Hauxton Road – A1309 High Street – A1134 Long Road - Site Access
- For AP4: M11 J11 – A1309 Hauxton Road – Addenbrooke's Road – Francis Crick Avenue - Site Access
- For AP5: M11 J11 – A1309 Hauxton Road – Addenbrooke's Road – Francis Crick Avenue - Site Access
- For AP6: A11 – A1307 Cambridge Road - A1307 Babraham Road/Cambridge Road – Granham's Road – Site Access

17.1.19 The proposed construction routes are shown in Appendix 17.1.

## 17.2 Assessment Methodology

### Legislation, Policy and Guidance

#### Legislation

- 17.2.1 Whilst a Transport and Traffic impact assessment is required as part of the scope of this ES, there is no legislation which specifically governs how Transport and Traffic impact assessments should be undertaken.

#### Policy

- 17.2.2 The following national traffic and transport legislation and policy documents are relevant to the proposed assessment:

##### National Planning Policy Framework 2019 (Ref 17-13)

- 17.2.3 The framework underlines the importance of looking at transport issues from the earliest stages of plan-making and development proposals.

##### Transport Assessments and Statements in Decision-Taking 2014 (Ref 17-14)

- 17.2.4 This government document highlights the role of the Environmental Impact Assessment in environmentally sensitive areas and where the proposed development could have implications for a breach of statutory thresholds as a result of traffic generated by the site or as a consequence of the impact of existing traffic on the site under construction.

##### Transport Evidence Bases in Plan Making and Decision Taking 2015 (Ref 17-15)

- 17.2.5 The document looks at the key issues which should be considered in development a transport evidence base. The EIA must assess the existing situation and likely generation of trips over time by all modes of transport and the impact on the environment. The document also highlights the need to consider the cumulative impacts of existing and proposed development on the transport networks.

##### Department for Transport (DfT), various dates: Travel Plan Guidelines (Ref 17-16)

- 17.2.6 Travel plans have a positive impact in encouraging sustainable travel, lessening traffic generation and its detrimental impacts and reducing carbon emissions and climate impacts. The document supports national planning policy in seeking effective and sustainable outcomes and aims to mitigate the impact of any new proposed developments. The EIA will inform sustainable approaches to transport at a plan-making level, based on robust evidence and a thorough assessment of the transport impacts of both existing developments, the proposed development and future developments in the surrounding area.

##### Department for Communities and Local Government / Department for Transport, 2007: The Manual for Streets (Ref 17-17)

- 17.2.7 The Manual for Streets explains how to respond to issues related to the towns and communities. It does not set out new policy or legislation, it shows how street design can be enhanced. The document updates the link between planning policy and residential street design and emphasises the need for walking and cycling as important modes of travel, offering a more sustainable alternative to the car and making a positive contribution towards tackling climate change.

##### Department for Communities and Local Government / Department for Transport, 2010: The Manual for Streets 2, CIHT, 2010 – a companion guide to Manual for Streets (Ref 17-18)

- 17.2.8 Manual for Streets 2 is a wider application of the principles set out in the 2007 original version. The latest document does not supersede the original but explains how the principles can be applied more widely.

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17.2.9 The following regional and local traffic and transport policy and strategy documents are relevant to the proposed assessment:

Cambridgeshire Local Transport Plan 2011-2031 (July 2015) (Ref 17-19)

17.2.10 The Cambridgeshire Local Transport Plan sets out the policies and plans for transport to contribute towards CCoC's vision of creating communities where people want to live and work, now and in the future. The Local Transport Plan highlights the key challenges that need to be addressed. This includes future-proofing the maintenance strategy and the new transport infrastructure to cope with the effects of climate change. The document also discusses the necessity of making sustainable modes of transport viable and an attractive alternative to the private car.

Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy (July 2015) (Ref 17-20)z

17.2.11 The Long-Term Transport Strategy (LTTS) forms part of the Local Transport Plan and contains further detail regarding major transport schemes and services that may be needed to support housing growth and the local economy up to 2031. The main objective that is relevant to the EIA is to encourage sustainable alternatives to the private car, including rail.

Transport Strategy for Cambridge and South Cambridgeshire (March 2014) (Ref 17-21)

17.2.12 The Transport Strategy for Cambridge and South Cambridgeshire (TSCSC) is part of the suite of policy documents that supports the Local Transport Plan 3 (LTP3) and provides a framework for addressing problems and challenges identified in the LTP3.

17.2.13 There is an overall goal to minimise the need to travel by private vehicle and encourage trips by sustainable modes.

Cambridge City Council Local Plan (2018), Cambridge City Council (Ref 17-22)

17.2.14 The Cambridge Local Plan sets out policies and proposals for future development and land use to 2031. It sets out a vision for Cambridge and objectives for the achievement of that vision. It provides a means of guiding change over long periods of time.

17.2.15 The Cambridge Local Plan and the planning system have a fundamental role to play in achieving the land use planning aspects of sustainable development.

17.2.16 Policy 17 is focused on the development of the Cambridge Biomedical Campus. The policy states that all applications in the area should:

- maximise opportunities to improve the 'legibility' of the CBC by providing a network of cycle and pedestrian routes, high quality new public realm and open space;
- include measures to enhance access to the CBC for cyclists, pedestrians, wheelchair users and other disabled people, and mitigate the impact on the existing road network and parking in the surrounding area;

17.2.17 Policy 80 states that to support walking and cycling, all developments will be designed to:

- give priority for these modes over cars;
- ensure maximum convenience for these modes;
- be accessible to those with impaired mobility;
- link with the surrounding walking and cycling network; and
- safeguard existing and proposed routes for walking, cycling and public transport.

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South Cambridgeshire Local Plan (2018), South Cambridgeshire District Council (Ref 17-23)

17.2.18 The South Cambridgeshire Local Plan was adopted in 2017 and sets policies and land allocation up until 2031. The vision for the Local Plan is that:

17.2.19 “South Cambridgeshire will continue to be the best place to live, work and study in the country. Our district will demonstrate impressive and sustainable economic growth. Our residents will have a superb quality of life in an exceptionally beautiful, rural and green environment”.

Cambridgeshire and Peterborough Combined Authority Business Plan 2019-2020 (Ref 17-24)

17.2.20 The delivery of an interim railway station at Cambridge South is one of the Combined Authorities key transport priorities. The Business Plan highlights the demand for rapid infrastructure to be introduced where need is most pressing. The CBC is identified as a significant asset, undergoing major growth in the number of people working and visiting the site in recent and coming years.

Cambridge Biomedical Campus Transport Strategy and 5-year Implementation Plan (CBCTS) (Ref 17-25)

17.2.21 The CBCTS has been developed to encourage all users of the campus to travel in sustainable and healthy ways. Site occupants, developers, local government, service operators and charitable organisation all made their input to the travel strategy.

17.2.22 As part of the long-term vision, the CBCTS envisages a new rail station on or adjacent to the Campus, connecting seamlessly with other local stations and the wider rail network.

University of Cambridge Transport Policy (Ref 17-26)

17.2.23 The University of Cambridge (UoC) is a significant occupier at the CBC, in terms of both teaching and research uses. The overarching travel and transport aim of the UoC is:

- “to provide viable and accessible sustainable travel options for staff and students for travel to work, travel at work and travel for work, which results in a reduction in carbon emissions”.
- The University has a Travel Plan that aims to provide alternatives to driving and improve connectivity between sites across the City. The proposed Cambridge South Station will provide an alternative to driving and an additional accessible and sustainable travel option for staff and students to access sites within the CBC.

Cambridge Biomedical Campus Transport Needs Review Parts 1, 2 and 3 (Freely available via SCDC website) (Ref 17-27)

17.2.24 CCoC was commissioned by the GCP to undertake a transport needs review of the CBC in 2019. Among other things, the CBC Transport Needs Review report<sup>1</sup> identifies a range of potential impacts that Cambridge South Station could generate across the wider transport network and sets out the approach taken to demand forecasting and trip distribution results.

## Guidance

17.2.25 The following relevant guidance is referred to in the assessment:

- The Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (2019) (Ref 17.1); and
- Guidelines for the Environmental Assessment of Road Traffic ((Institute of Environmental Management and Assessment (IEMA), 1993) ('IEMA Guidelines') (Ref 17.2).

<sup>1</sup> Atkins (2019) CBC Transport Needs Review Report  
<http://scambs.moderngov.co.uk/documents/s110158/Biomedical%20Campus%20Transport%20Needs%20Review%20Part%201.pdf>



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## Consultation and Scoping

17.2.26 Table 17-1 **Error! Reference source not found.** provides a summary of stakeholder issues raised with respect to transport and how they have been addressed.

Table 17-1 Summary of Consultation

Consultee	Contact/Date	Summary of Issues Raised/Agreed	Response/Action
Greater Cambridge Shared Planning	31 March 2020	CCoC was supportive of the proposals to deliver a new station at Cambridge South, in principle, but are cautious to ensure that the final proposal delivers benefits both to the users of the Cambridge Biomedical Campus (CBC) and also the wider community.	The proposed Development was designed to deliver benefits both to the users of the Cambridge Biomedical Campus (CBC) and also the wider community.
Cambridge University Hospital/University of Cambridge	5 June 2020	All were in agreement on the principle of bus provision facilities to serve the station, regardless of location, acknowledgement that a better understanding of the interchange between the station and the Cambridge South East Transport (CSET) scheme is needed (with Sawston Greenway scheme to a lesser extent).	The Cambridge South Station sponsor and design teams are involved in ongoing liaison with GCP and the CSET design team in order to integrate the two schemes and to maximise potential benefits to users of both schemes.
CCoC	3 August 2020	CCoC recognises that a Transport Assessment (TA) is required for the Transport and Works Act Order (TWAo). Access will be via Francis Crick Avenue which is not an adopted highway; it would be preferable if the station access was adopted; discussion will be needed with CCoC highways Team. Alterations will be needed to the Guided Busway junction. It is not expected that the existing crossings will be capable of dealing with the predicted increase in pedestrians and cyclists. This is a difficult junction with a history of accidents. Needs to be discussed with Highways, Signals, Public Transport and Cycling teams. Attention will have to be given to the construction phase as well to maintain the operation and attractiveness of the Busway. Limited parking/Blue Badge parking provision is welcomed; the TA should emphasise this provision. CCoC parking standards do not cover cycling; this needs to be evidence-based.	NR have confirmed that they will retain responsibility for the station access and forecourt  The existing Guided Busway junction would be updated by introducing a new junction arm with traffic signal modifications. The existing crossing on the southern arm of Francis Crick Avenue/Guided Busway junction would be widened.  Embedded mitigation and improvement measures are discussed in more detail in the Transport Assessment prepared for the proposed Development.

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17.2.27 Table 17-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to transport, and the corresponding location in the ES where they are addressed.

Table 17-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
Strategic Sites Team Greater Cambridge Shared Planning Service	The Planning Inspectorate Advice Note Seventeen 'Cumulative Effects Assessment' August 2019 should be considered to identify other relevant local infrastructure projects based on the most up to date information on the certainty of these projects. In particular, this should consider whether the cumulative effects should include the following other development:  CSET proposal which includes land located immediately to the east of the proposed new station site and access from Francis Crick Avenue. The Department for Transport consulted on the EIA Scoping Report submitted by the applicant in December 2020.	Section 17.5
DfT	Consideration of cumulative effects should include consideration of the CSET scheme.  Clarification and/or consideration is required on how the proposed Development links in with the existing public transport network and in particular whether the development will lead to an increase in bus movements on the local road network. This should be incorporated into the modelling and consideration should be given to the impact on local sensitive receptors if applicable.	Section 17.5  Section 17.5 and the TA (Appendix 17.2)

## The Study Area

17.2.28 For consideration of traffic impacts the Study Area for the proposed Development is focused upon the highway network to be used by construction vehicles and highway network associated with the operational phase, the adjacent land uses and sensitive receptors. The proposed construction routes for proposed construction compounds have been described within Section 17.3 and are shown in Appendix 17.1.

## Methodology for Establishing Baseline Conditions

17.2.29 The existing baseline data has been derived from multiple sources and a desktop-review undertaken. Sources of baseline data are provided below:

- Department for Transport (DfT) counts from 2019 (as agreed with CCoC) along the construction routes to obtain Average Annual Daily Traffic (AADT) flows;
- DfT's statistics table TRA0307 Motor vehicle traffic distribution by time of day and day of the week on all roads was used to apportion AADT data to derive 12-hour (07:00-19:00hrs) traffic flows;
- Calculation of traffic increases above the baseline;
- Height and width restrictions for construction vehicles across all the designated construction routes;
- Pedestrian and cycle facilities along the construction routes;
- Traffic flow data from the TA for the Netherhall Farm (20/01972/OUT) development in the vicinity of the CSIE Scheme;
- Site investigations undertaken in January, March and August 2020;
- Bus and rail timetable and routing information obtained from the CCoC website;

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- Analysis of committed development schemes in CBC and South Cambridge to capture potential traffic growth and proposed construction routes (see Section 17.5 for details);
- Road collision data for the latest 60-month Collision Data for all roads on the construction routes and connecting junctions;
- Information about PRoW obtained from the CCoC website; and
- Online mapping and aerial photographs from Google maps.

17.2.30 Due to COVID-19 restrictions current traffic flows and travel patterns are not representative of normal traffic conditions. Therefore, historical traffic flow data have been obtained from DfT traffic counters and from the TA for the Netherhall Farm (20/01972/OUT) development in the vicinity of the proposed Development, for links along the proposed construction routes, to capture and complete an initial analysis of baseline traffic flows.

### Forecasting the Future Baseline

17.2.31 The TEMPro (Trip End Model Presentation Program) software (version 7.2b) has been used to obtain the traffic flow growth factor from 2019 to 2023 within a geographical area of the study area. The TEMPro software tool is based on the National Trip End Model (NTEM) forecasts and traffic growth from the National Traffic Model (NTM). TEMPro includes projected population and employment growth and is based on information provided by local planning authorities based on committed developments. The software tool enables the calculation of traffic growth factors for specified time periods for selected areas.

17.2.32 The obtained traffic growth factor was then applied to the 2019 DfT count data to estimate the 2023 future baseline traffic flows during the peak construction period along all vehicle routes to construction compounds in accordance with standard industry practice.

17.2.33 Traffic Growth forecasts for 2031 future baseline for the operational phase have been based on the estimates carried out for the CBC Transport Needs Review report (Ref 17-27). This report included detailed calculations for planned and predicted growth in staff and visitors to the CBC up to 2031 and associated additional vehicular trips that would take place as a result of this increase. Additional trips were then added to the 2017 Baseline traffic flows to estimate the future baseline traffic flow. This approach is more robust as it uses a higher growth factor compared to growth factors derived from TEMPro and it takes into account all committed and planned developments in the CBC up to 2031.

### Methodology for Assessing Impacts

17.2.34 The assessment methodology is broadly based on assessment criteria developed for similar major infrastructure projects.

17.2.35 The assessment addresses potential effects relating to impacts from construction and operational traffic during the peak construction period (2023) and the operational assessment year (2031) and considers the following broad receptor groups or categories in relation to traffic and transport effects:

- Transport users: drivers and passengers; pedestrians; cyclists; equestrians (if applicable); public transport users; operators and employees; commercial vehicle users; emergency vehicles users and freight users;
- Sensitive receptors: such as schools, playgrounds, hospitals, tourist attractions etc; and
- Transport infrastructure: road network, Cambridge Guided Busway (CGB) network, and pedestrian and cycle networks.

17.2.36 This assessment has been informed by a desk-based study, and discussions with the design team, in particular around anticipated construction traffic movements and proposed mitigation measures. Discussions have also been held with key consultees to incorporate their requirements, particularly CCoC. Professional judgement has been applied to determine

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whether significant effects may arise which have not been identified by the use of the assessment criteria.

## Temporal Scope

17.2.37 The assessment examines a robust case in terms of traffic and transport effects. The assessment of construction phase effect was undertaken for 2023 as this is the year when the highest predicted levels of construction traffic are expected to occur. The assessment of the operational phase was undertaken for 2031 as this is the year when the projected passenger numbers using the station will be reached and CBC is fully developed. The 2031 operational assessment year has been agreed with Cambridgeshire County Council and aligns with the assessments in the Transport Assessment.

## Traffic Impact Assessment Methodology

17.2.38 For road users, the following rules taken from the IEMA Guidelines are used to define the scale and extent of the assessment:

- Rule 1: Include highway links where the total traffic flows are predicted to increase by more than 30% (or where the number of Heavy Good Vehicles (HGVs) is predicted to increase by more than 30%); and
- Rule 2: Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

17.2.39 Increases below 10% are generally considered 'not significant' given that daily variations in background traffic flow would usually fluctuate by this amount. Therefore, changes in traffic flow below this level are assumed to result in no discernible environmental impact.

17.2.40 Where Rule 1 and Rule 2 would apply, the following potential environmental effects on 'existing road users' would be considered and likely would need to be addressed.

- Severance (reduced ability for pedestrians and cyclists to crossroad links);
- Pedestrian and cyclist delay (changed journey times and distances for pedestrians and cyclists);
- Driver delay (Changed journey times and distances for private and commercial vehicle occupants);
- Public transport users delay (Changed journey times, distances or frequencies for public transport);
- Pedestrian and cycle amenity (loss of amenity for vulnerable road users);
- Fear and intimidation (fear and intimidation issues for pedestrians and cyclists due to increased traffic flows and change in composition);
- Accidents and safety (Reduction in road safety for all road users); and
- Parking (temporary loss of parking and loading facilities due to the need to accommodate construction traffic and holding areas).

## Assessment criteria for potentially significant effects

### Severance

17.2.41 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to minor traffic flows if they impede pedestrian access to essential facilities.

17.2.42 Severance can affect motorists, pedestrians or residents. The IEMA guidelines suggest that changes of traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate'



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and 'substantial' changes in severance respectively. However, there are no predictive formulae, which give simple relationships between traffic factors and levels of severance.

- 17.2.43 The IEMA guidelines state that marginal changes in traffic flow are unlikely to create or remove severance. The guidelines also state that when determining whether severance is likely to be an important issue, consideration should be given to factors such as road width, traffic flow and composition, traffic speeds, availability of crossing facilities and the number of movements that are likely to cross the affected route. Consideration should also be given to different groups such as the elderly and young children.

Driver and Public Transport User Delay

- 17.2.44 Delays for drivers and public transport users can occur at different points on the local highway network as a result of the additional traffic that would be generated by a development. The IEMA guidelines (Ref 17-1) state that 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.

Pedestrian and Cycle Delay

- 17.2.45 Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads. Therefore, increases in traffic levels are likely to lead to greater delays to pedestrians and cyclists. Delays would also depend upon the general level of pedestrian and cycle activity, visibility and the general physical conditions of the crossing.
- 17.2.46 Given the range of local factors and conditions that can influence pedestrian and cycle delay, the IEMA guidelines (Ref 17-1) do not recommend that thresholds be used as a means to establish the significance of pedestrian and cycle delay but recommend that reasoned judgements be made instead. However, the IEMA guidelines note that, when existing traffic flows are low, increases in traffic of around 30% can double the delay experienced by pedestrians and cyclists attempting to cross a road.

Pedestrian and Cycle Amenity

- 17.2.47 Pedestrian and cycle amenity is broadly defined as the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic.
- 17.2.48 The IEMA guidelines (Ref 17-1) note that changes in pedestrian and cycle amenity may be assessed as significant where the traffic flow is halved or doubled, with the former leading to a beneficial effect and the latter an adverse effect.

Fear and Intimidation

- 17.2.49 The scale of fear and intimidation experienced by pedestrians and cyclists is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by factors such as narrow pavement widths, together with factors such as the speed and size of vehicles.
- 17.2.50 There are no commonly agreed thresholds by which to determine the significance of fear and intimidation effects. However, the IEMA guidelines (Ref 17-1) note previous assessments that have been undertaken which put forward thresholds that define the degree of fear and intimidation to pedestrians and cyclists based on factors which include the average traffic flow, HGV flow and average speed (mph) over an 18 hour/day.
- 17.2.51 For traffic flow for all types of vehicles, increases of 600-1,200 per day are considered moderate, 1,200 to 1,800 per day great and more than 1,800 per day severe. For average speed, increases between 10 and 15mph are considered moderate, increases between 15 and 20 mph are considered great and increases more than 20mph are considered severe.
- 17.2.52 The IEMA guidelines also note that special consideration should be given to areas where there are likely to be particular problems, such as high-speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by

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school children, the elderly and other vulnerable groups. The assessment has taken account of these considerations.

#### Accidents and Safety

17.2.53 Due to the numerous local causation factors involved in personal injury accidents, the IEMA guidelines (Ref 17-1) do not recommend the use of thresholds to determine significance. Instead, professional judgement should be applied to the assessment. If a particular accident cluster is identified, then this may also justify further analysis and the implementation of measures to mitigate effects.

#### Parking

17.2.54 No permanent or temporary loss of parking and loading areas within the Study Area would be required as a result of the proposed Development.

### Significance Assessment criteria

17.2.55 In accordance with the IEMA Guidelines, the assessments have been based upon the relative change between the baseline conditions and the situation during the construction and operational phases. The effects along key road links of the adjacent road network affected by traffic associated with the proposed Development have been assessed.

17.2.56 The significance of an environmental effect is a function of the value (sensitivity) of the receptor and the magnitude or scale of the impact (change).

17.2.57 The significance of the effects have been determined from a combination of receptor sensitivity and the magnitude and duration of the impact on receptors. The DMRB LA 104 (Ref 17-2) provides advice on typical descriptors of environmental value, magnitude of change, and significance of effects and this has been used to develop appropriate sensitivity criteria.

17.2.58 For the purposes of this assessment, and in line with DMRB LA 104 (Ref 17-2), effects of moderate or greater significance are considered to be significant in EIA terms.

17.2.59 The impacts of traffic may be on the following receptors (as set out in the 'IEMA Guidelines' (17-1)):

- People at home;
- People at work;
- Sensitive groups including children, elderly and disabled;
- Sensitive locations such as hospitals, churches, schools, and historical buildings;
- People walking;
- People cycling;
- Open spaces, recreational areas, shopping areas;
- Sites of ecological/nature conservation value; and
- Sites of tourist/visitor attraction.

17.2.60 The assessment sensitivity criteria based on DMRB (17-2) and IEMA (17-1) guidance and professional judgement is shown in Table 17-3.

Table 17-3 Receptor Sensitivity

Sensitivity	Type
High	Receptors of greatest sensitivity to traffic flows: schools, colleges, nurseries, playgrounds, accident blackspots, retirement homes, urban/residential roads without footways that are used by pedestrians.

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Sensitivity	Type
<b>Medium</b>	Traffic flow sensitive receptors, including: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, un-segregated cycle ways, community centres, townhalls, parks, recreation facilities.
<b>Low</b>	Receptors with some sensitivity to traffic flows: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.
<b>Negligible</b>	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions.

17.2.61 The methodology proposed for determining the magnitude of impact follows guidance set out by the DMRB LA 104 (Ref 17-2) together with professional judgement. The order of magnitude criteria is shown in Table 17-4

Table 17-4 Magnitude of Change (Impact) Categories

Magnitude of Change	Change from Baseline
<b>Major</b>	Total loss or major alteration to key elements or features of the baseline conditions to the extent that post-scenario character or composition of baseline conditions will be fundamentally changed.
<b>Moderate</b>	Loss or alteration to one or more key elements or features of the baseline conditions to the extent that post-scenario character or composition of the baseline conditions will be materially changed.
<b>Minor</b>	Minor shift away from baseline conditions. Changes arising will be detectable but not material; the underlying character or composition of the baseline conditions will be similar to the pre-scenario situation.
<b>Negligible</b>	Very little change from baseline conditions. Change is barely distinguishable, approximating to a 'no change' situation.

17.2.62 The following parameters will be considered when assessing significance of effects:

- Beneficial, adverse or neutral;
- Extent (the area over which the effect occurs);
- Duration (the time for which the effect is expected to last);
- Reversibility (permanent or temporary); and
- Timing and frequency.

17.2.63 The significance of transport effects has been determined by considering the identified impact magnitudes on the receptors affected by those impacts (taking account of their sensitivity) to determine the significance of effects. The potential significance of effect could be neutral, slight, moderate or large. Moderate and Large adverse/beneficial effects are assumed to represent Significant effects. Slight and Neutral adverse/beneficial effects are assumed to represent Not Significant effects.

17.2.64 Table 17-5 provides a matrix of magnitude of impact against sensitivity of receptors to identify where significant effects are anticipated to occur. The significance matrix is based on Table 3.8.1 presented in the DMRB's LA 104 Environmental Assessment and Monitoring guidance [Ref 17-1].

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Table 17-5 Significance of Effect Matrix

Sensitivity of Receptor	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
High	Large	Large or Moderate	Slight or moderate	Slight
Medium	Large or Moderate	Moderate	Slight	Neutral or slight
Low	Slight or moderate	Slight	Slight	Neutral or slight
Negligible	Slight	Neutral or slight	Neutral or slight	Neutral

## Limitations and Assumptions

### Limitations

- 17.2.65 Construction traffic forecasts are based on an initial high-level estimate of construction materials and programme and are considered to provide a reasonable worst-case scenario. It is considered that these limitations do not affect the robustness of the assessment.
- 17.2.66 Information regarding construction traffic forecasts for identified developments in the vicinity of the proposed Development was not available on the Greater Cambridge Shared Planning Online Planning Register (Ref 17-11) and as such these sites could not be assessed for the cumulative impacts. These schemes may not have triggered the threshold for an assessment of their construction traffic impacts.

### Assumptions

- 17.2.67 Material deliveries for the proposed Development will derive from a number of primary sources

- Imported engineering fill material from local and regional quarries
- Ballast and other track materials supplied by Network Rail
- Surplus suitable fill materials heading to recycling centres
- Unsuitable fill materials heading to landfill for disposal under licence
- Imported plants and materials for biodiversity
- Concrete from local batching plants
- General building materials probably sourced from local merchants
- Pipework and associated drainage products, catch pits, etc.
- Specialist building components
- Modular elements of design manufactured off site including
  - Access for All (AfA) bridge structures, lift shafts, stairs
  - Platform canopies including building services cassettes
  - Waiting room systems
  - Platform elements, typically precast concrete riser wall and block systems
  - Concrete storage tanks required for elements of attenuation

- 17.2.68 The peak construction traffic movements will occur when surplus material will be removed from site and imported engineering fill material will be imported to site. This is estimated at 50 HGVs a day as an upper limit during the peak construction period during 2023.

- 17.2.69 In addition, there will be other site deliveries and internal site traffic to manage and it is reasonable to assume at this stage that outside the start and end of shift periods, the main site

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compounds will generate no more than 10-20 deliveries each hour. These will be a mixture of HGVs and Vans.

## 17.3 Baseline

### Existing Baseline

17.3.1 The following sections provide an overview of the current baseline with regards to:

- The existing local highway network and the surrounding land uses adjacent to the local highway network;
- Pedestrian and cycle facilities;
- Current traffic flows;
- Public transport services in the vicinity of the Site; and
- Information gaps.

### Highway Network

17.3.2 The extent of the highway considered within this assessment is related to the routes being considered for construction traffic and routes which would be used by staff travelling to the construction compounds. Table 17-6 below provides a description of road along the proposed construction routes. The routes are illustrated on the figures within Appendix 17.1.

Table 17-6 Description of construction traffic routes

A1309 Hauxton Road (between the M11J11 and Addenbrooke's Road junctions)	
<b>Description</b>	Dual carriageway road with two lanes in southbound direction and between two and five lane for the northbound direction. The road is accessed from the M11J11 interchange.
<b>Width</b>	Between 18 and 36m
<b>Speed Limit</b>	40mph
<b>Street Lighting</b>	Provided on both sides of the road.
<b>Crossing Facilities</b>	There is signalised crossing facility at the junction with Addenbrooke's Road. Dropped kerbs and tactile paving are provided.
<b>Bus Route</b>	Yes.
<b>Character</b>	A distributor road that links the M11 with Trumpington and, via Addenbrooke's Road, the CBC. This section of the road is fronted by agricultural land from both sides. Heading north, the road is fronted by residential land in Trumpington.
<b>On-street parking</b>	None

Addenbrooke's Road (between junctions with A1309 Hauxton Road and A1301 Shelford Road)	
<b>Description</b>	Single carriageway road with one or two (on approach to junctions) lanes in each direction.
<b>Width</b>	Between 9.5m to 17.50m
<b>Speed Limit</b>	40mph
<b>Street Lighting</b>	Provided on both sides of the road.

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## Addenbrooke's Road (between junctions with A1309 Hauxton Road and A1301 Shelford Road)

<b>Crossing Facilities</b>	Signalised crossings are provided at the junctions with the A1309 Hauxton Road, Glebe Farm Drive and A1301 Shelford Road. These crossings include dropped kerbs and tactile paving.
<b>Bus Route</b>	Yes
<b>Character</b>	An east-west road providing access to the south-easterly corner of Trumpington. There are residential dwellings to the north.
<b>On-street parking</b>	None

## Addenbrooke's Road (between junctions with A1301 Shelford Road and Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way Roundabout)

<b>Description</b>	Single carriageway road with one lane in each direction.
<b>Width</b>	10m
<b>Speed Limit</b>	30mph
<b>Street Lighting</b>	Provided on both sides of the road.
<b>Crossing Facilities</b>	<p>A signalised crossing is provided directly east of the junction with Kingfisher Gardens.</p> <p>The Addenbrooke's Road/Hobson Avenue Roundabout and Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way Roundabout have uncontrolled crossings in the form of dropped kerbs, tactile pavement and refuge islands on all arms.</p> <p>An uncontrolled crossing is also provided on the bridge over Hobson's Brook. The crossing includes dropped kerbs, tactile pavement and a refuge island.</p>
<b>Bus Route</b>	Yes
<b>Character</b>	The road is fronted by residential dwellings on the northern side and agricultural land on the southern side.
<b>On-street parking</b>	None

## Francis Crick Avenue

<b>Description</b>	Single carriageway private road providing access to locations within the CBC.
<b>Width</b>	9.5m
<b>Speed Limit</b>	20mph
<b>Street Lighting</b>	Provided on both sides of the road.
<b>Crossing Facilities</b>	<p>There is a signalised crossing at the junction with the Cambridgeshire Guided Busway. The crossing includes dropped kerbs and tactile paving.</p> <p>Francis Crick Avenue/Mary Archers Way/Addenbrooke's Road roundabout includes an uncontrolled crossing on all arms. The crossings include refuge island, dropped kerbs and tactile paving.</p>
<b>Bus Route</b>	Yes

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## Francis Crick Avenue

<b>Character</b>	There are mandatory cycle lanes and footways along both sides of the carriageway. The Cambridge Biomedical Campus flanks Francis Crick Avenue to the east and west.
<b>On-street parking</b>	None

## A1134 Long Road

<b>Description</b>	Single carriageway road with one lane in each direction.
<b>Width</b>	7.3m
<b>Speed Limit</b>	30mph
<b>Street Lighting</b>	Provided on both sides of the carriageway
<b>Crossing Facilities</b>	Signalised crossings at the junctions with A1309 High Street and Lime Avenue. The crossing have dropped kerbs and tactile paving.
<b>Bus Route</b>	Yes
<b>Character</b>	There are residential dwellings to the north and south of the road. A green verge separates the footway from the road on the northern side, but this is not continuous along the entire road.
<b>On-street Parking</b>	Double yellow line waiting and loading restrictions along the entire length.

## Granham's Road

<b>Description</b>	Single carriageway road with one lane in each direction.
<b>Width</b>	Approximately 7m
<b>Speed Limit</b>	60mph
<b>Street Lighting</b>	None
<b>Crossing Facility</b>	No pedestrianised crossing facilities along the entirety of the road. There is a level crossing towards the western end of the road.
<b>Bus Route</b>	None
<b>Character</b>	Agricultural land to the north and sound of the road. There is no infrastructure for any non-car travel along the majority of the road. There are residential dwellings on each side of the road towards the junction with the A1301.
<b>On-street parking</b>	None

## A1307 Babraham Road/Cambridge Road

<b>Description</b>	Single carriageway road with one lane in each direction. Towards the roundabout junction with the A11, the north-west to south-east lane splits into two lanes.
<b>Width</b>	7m

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**A1307 Babraham Road/Cambridge Road**

<b>Speed Limit</b>	40mph
<b>Street Lighting</b>	Provided on both sides of the road.
<b>Crossing Facility</b>	Only the Cherry Hinton Road arm of the A1307/Cherry Hinton Road/Hinton Way has pedestrian crossing infrastructure. There is a signalised junction at the entrance to the Babraham Road Park and Ride facility. The two crossings have dropped kerbs and tactile paving. There is a four-arm roundabout along the A1307 that provides access to Reeded Barn Farm to the north-west and Babraham Research Campus to the south-east.
<b>Bus Route</b>	Yes.
<b>Character</b>	Agricultural land on both sides of the road. Babraham Road Park and Ride sits on the northern side of the A1307, to the immediate west of the Cherry Hinton Road/Hinton Way/A1307 roundabout.
<b>On-street parking</b>	None

**Robinson Way**

<b>Description</b>	Single carriageway road with one lane in each direction.
<b>Width</b>	7.3m
<b>Speed Limit</b>	20mph
<b>Street Lighting</b>	Provided on eastern side of the carriageway
<b>Crossing Facility</b>	Uncontrolled crossing at the priority junction with the A1134 Long Road and at the roundabout junction with Francis Crick Avenue
<b>Bus Route</b>	Yes
<b>Character</b>	Fronted by playing fields, Long Rod sixth form College and Cambridge Academy for Science and Technology from the west and Car Park 5 and Cancer Research UK Cambridge Institute
<b>On-street parking</b>	None

**Walking and Cycling Infrastructure**

- 17.3.3 As set out in the Transport Assessment (TA) (Appendix 17.2), the proposed Development is accessible by walking, cycling and public transport.
- 17.3.4 The site is located on a high-quality public transport corridor with excellent access to bus services and cycle routes and within walking distance of employment corridors.
- 17.3.5 The following paragraphs summarise walking and cycling infrastructure along the proposed construction routes during construction and the routes to the station once operational.

**A1309 Hauxton Road**Cycling Infrastructure

- 17.3.6 Between the M11J11 junction and the junction with Addenbrooke's Road, there is a cyclists and pedestrians shared use path along the eastern side of the carriageway. After the junction with Addenbrooke's Road and until the junction with Freshways, there are pedestrian and



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cycle shared use paths on both side of the carriageway. Further north, before the junction with Long Road, the shared use path runs along the western side of the carriageway. When this is the case, there is also a marked cycle lane on the eastern side of the road. In the section of the road between the switch of sides, there are marked cycle lanes on both sides of the road.

Pedestrian Infrastructure

- 17.3.7 There are footways or shared use paths along both sides of the carriageway between the junctions with Addenbrooke's Road and Long Road. Between the M11J11 junction and the junction with Addenbrooke's Road, there is a cyclists and pedestrians shared use path along the eastern side of the carriageway

**Addenbrooke's Road**Cycling Infrastructure

- 17.3.8 There are mandatory cycle lanes on both sides of the carriageway. There is also a segregated cycle track on the northern side of the road parallel and level with the footway. The cycle tracks connects to National Cycle Route (NCN) 11 at the roundabout with Dame Mary Archer Way and Francis Crick Avenue. It provides a combination of on-road and traffic-free routes into and around Cambridge city centre, as well as access to Route 24 and Route 51 further to the north, which provide access to the surrounding area within Cambridgeshire. To the south NCN 11 runs parallel to the eastern side of the railway between Addenbrookes Road and Granham's Road. The sections of NCN 11 outside CBC are adopted highways maintainable by CCoC.

Pedestrian Infrastructure

- 17.3.9 There is a footway or shared use path on the northern side separated from the carriageway by a grass verge.

**Francis Crick Avenue**Cycling Infrastructure

- 17.3.10 NCN Route 11 runs along Francis Crick Avenue. It is part of the on-road part of the National Cycle Network. It provides a combination of on-road and traffic-free routes into and around Cambridge city centre, as well as access to Route 24 and Route 51 further to the north, which provide access to the surrounding area within Cambridgeshire.

Pedestrian Infrastructure

- 17.3.11 Pedestrians are well provided for within the vicinity of the site, with Francis Crick Avenue towards the CBC to the north (and the roads leading from it), having footways on both sides of the carriageway. These footways provide a continuous link between the site and local facilities and amenities, particularly the key walking destination to Addenbrooke's Hospital. There is also a footway provided around the Francis Crick Avenue/Dame Mary Archer Way/Addenbrooke's Road roundabout.

**A1134 Long Road**Cycling Infrastructure

- 17.3.12 There is cycling infrastructure on the northern and southern sides of the road. This is in the form of either a shared pathway or a dedicated cycle lane. The cycling infrastructure takes the form of shared pathways when crossing the railway track, with no dedicated cycle lanes.

Pedestrian Infrastructure

- 17.3.13 There are footways on both the northern and southern side of the road. After the junction with Hudson Close, heading in the eastern direction, there is a shared use path on the southern side. After the signalised junction with Lime Avenue, the sides swap in terms of shared used path and footway. Prior to reaching and continuing over the bridge crossing the railway track, there are shared use paths on both sides of the road with no dedicated cycle lanes.

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**Granham's Road**Cycling Infrastructure

17.3.14 There is no dedicated cycling infrastructure along Granham's Road.

Pedestrian Infrastructure

17.3.15 There is no dedicated pedestrian infrastructure along most of Granham's Road. A pedestrian footway is available on the southern side of the road as it enters Great Shelford. There is also a pedestrian footway on the northern side of the road from the level crossing to the junction with the A1301. A public footpath, Footpath No. 1 Great Shelford, runs between Granham's Road and A1301 Cambridge Road. The footpath traverses across the railway via the footbridge adjacent to Websters level crossing.

**A1307**Cycling Infrastructure

17.3.16 There is a shared use path on the northern side of the road. This shared use path continues until reaching the four-armed roundabout that provides access to Reeded Barn Farm to the north-east and Babraham Research Campus to the south-west.

Pedestrian Infrastructure

17.3.17 Pedestrians can make use of the shared use path on the northern side of the road. Between the junction to the Babraham Road Park and Ride and the roundabout with Cherry Hinton Road and Hinton Way, there is a footpath on the southern side of the road.

**Robinson Way**Cycling Infrastructure

17.3.18 There is no dedicated cycle infrastructure along Robinson Way.

Pedestrian Infrastructure

17.3.19 There are footways provided on both sides of the northern section of Robinsons Way. However, south of Puddicombe Way, a footway is only provided on the eastern side of the carriageway.

**Public Transport**Railway

17.3.20 The nearest rail station is Cambridge Station, located 2.6km north of the proposed Cambridge South Station. The station is managed by Greater Anglia and served by:

- Cross-Country Services – including connections to Birmingham New Street, Leicester, Peterborough and Stanstead Airport;
- Great Northern Services- including connections to London Kings Cross, King's Lynn, Ely, Letchworth Garden City, Hitchin and Stevenage;
- Greater Anglia Services – including connections to London Liverpool Street via West Anglia Main Line, Norwich via the Breckland Line and Ipswich; and
- Thameslink Services – including connections to Royston, Letchworth Garden City, Central London, Gatwick Airport, Maidstone East and Brighton.

17.3.21 There is cycle parking provided at Cambridge Station, with 2,850 spaces, as well as cycle hire facilities.

17.3.22 In addition, there is a chargeable car park providing 374 spaces (including wheelchair accessible spaces). Car hire services are also provided at the station.

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Bus Services

17.3.23 A number of bus routes serve the area surrounding the proposed Development. These services vary in terms of route depending on day and time of service. Several local bus services operated by Stagecoach and Whippet Coaches stop or route along the proposed construction routes.

17.3.24 Table 17-7 summarises the bus services serving regular bus stops or routing on roads along the proposed construction routes.

*Table 17-7 Bus services serving bus stops or routing in the vicinity of the proposed station.*

Route No.	Route Description	Monday - Friday	Saturday	Sunday, and bank holiday
<b>Guided Busway A</b>	Chatteris/Ramsey/Somersham – Addenbrooke's – Royston	Between 06:00 and 20:00, three services per hour	Between 06:10 and 20:15, two services per hour	No service
<b>Guided Busway D</b>	Cambridge - Longstow – St Ives	Between 07:00 and 22:00, one service per hour	Between 07:00 and 22:00, one service per hour	Between 09:15 and 18:40, two services per hour
<b>Route H</b>	Addenbrooke's - Papworth	Between 05:30 and 09:00 and 05:00 and 20:20, three services in each timeframe	No Service	No Service
<b>Guided Busway R</b>	Trumpington P&R – Cambridge Rail Station	Between 07:00 and 09:00 and 16:00 to 18:00, four services per hour, and two services an hour from 05:00 to 20:40 excluding the time frames mentioned	No Service	No service
<b>Route U Universal</b>	Eddington – Addenbrooke's Hospital	Between 06:00 and 22:00, four services per hour	Between 07:40 and 22:10, three services per hour	Between 07:50 and 19:00, one service per hour
<b>Citi 7</b>	Saffron Walden - Cambridge	Between 06:40 and 23:40, three per hour	Between 06:40 and 23:40, three per hour	Between 09:25 and 18:25, two per hour
<b>25</b>	Addenbrooke's Hospital – Trumpington	Between 07:00 and 18:30, twice an hour	Between 07:00 and 18:30, twice an hour	No service
<b>13</b>	Cambridge – Linton - Haverhill	Between 07:10 and 00:00, one per hour	Between 08:15 and 23:55, one service per hour	Between 09:35 and 23:35, one service per hour
<b>13A Gold</b>	Cambridge – Linton - Haverhill	Between 07:45 and 18:50, one per hour	Between 10:45 and 18:45, nine services per day	No service
<b>X13 Gold</b>	Cambridge – Linton - Haverhill	Two services at 16:10 and one at 16:18	One service at 16:30	No Service
<b>18</b>	Cambridge - Longstow	Between 08:30 and 18:30, one per hour	Between 08:30 and 9:00, one per hour	No Service
<b>31</b>	Cambridge – Fowlmere - Barley	Between 10:25 and 18:35, six per day	From 10:25 and 18:35, six per day	No Service

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Route No.	Route Description	Monday - Friday	Saturday	Sunday, and bank holiday
132	Cambridge – Duxford – Saffron Walden	No Service	No Service	Every two hours from 09:45 to 17:45
607	Trumpington – Sawston Village College	07:36 & 15:20	No Service	No Service
915	Royston - Cambridge	Hourly between 07:00 and 19:00	Hourly between 07:00 and 19:00	No Service

17.3.25 It should be noted that, due to the changes in travel patterns and demand caused by Covid-19 measures imposed by the Government, some of the bus services identified in Table 17-7 are currently operating using a temporary timetable, with some services not operating at all.

## Accident Data

17.3.26 Collision data for the study area along the proposed construction routes has been obtained from Crashmap (Ref 17-12) for the most recent 60-month period up to December 2020. A summary of recorded road collisions involving personal injury, for roads and links with predicted increase in total traffic and/or HGVs that trigger the need for further assessment, is presented in Section 17.5.

## Sensitive receptors

17.3.27 Table 17-8 provides a summary of the identified key potential sensitive receptors and their sensitivity value within 150m either side of the proposed construction routes.

Table 17-8 Summary of Key Environmental Receptors and their Value

Receptor	Name	Distance from Construction Route (m)	Value of Receptor
Playground	Spinney Road Play Area	Within 150m	High
Playground	Viridis Park Playground	Within 150m	High
Playground	St Michael Street Play Area	Within 100m	High
Playground	Austin Drive Play Area	Within 100m	High
Park	Cornwell Park	Within 100m	Medium
Park	Hobson's Park	Within 50m	Medium
Hospital	Royal Papworth Hospital	Within 100m	Medium
Residential area with adequate footway provision	Residential properties along Addenbrooke's Road	Within 50m	Low
Employment site	MRC Laboratory of Molecular Biology	Within 150m	Low
Employment site	The Anne McLaren Building	Within 50m	Low
Employment site	Abcam	Within 100m	Low
Public open space	Magog Down	Within 50m	Low

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## Existing Traffic Flows

17.3.28 Table 17-9 shows 2019 Baseline traffic conditions for average weekday between 07:00 and 19:00 hours for the construction traffic routes. 2020 traffic conditions were not typical due to Covid.

Table 17-9 Baseline Traffic Conditions – Mon-Fri (07:00-19:00)

Traffic Count Number	Road Name	Total Vehicles Mon-Fri (07:00-19:00)	HGV Mon-Fri (07:00-19:00)	% of HGVs
807621	Addenbrooke's Road	10,091	128	1.3%
81426	Addenbrooke's Road	12,943	285	2.2%
81422	A1309 Hauxton Road	26,105	579	2.2%
81423	A1309 Hauxton Road	14,406	492	3.4%
47586	A1309 High Street	15,878	457	2.9%
7990	A1134 Long Road	11,443	304	2.7%
77145	A1307 Babraham Road	12,793	293	2.3%
NA*	Granham Road	3,924	78	2.0%
NA**	Francis Crick Avenue	4,402	120	2.7%
NA**	Robinson Way	3,030	53	1.7%

\* 2019 Baseline flows were taken from the ES for the Land at Newbury Farm development (19/1168/OUT)

\*\* Traffic flows were estimated using survey data from Thursday 10 October 2019 provided by the CBC

## Future Baseline

17.3.29 Table 17-10 shows 2023 Future Baseline traffic conditions for average weekday between 07:00 and 19:00 hours.

17.3.30 The TEMPro traffic growth factor was then applied to the 2019 DfT count data to estimate the 2023 future baseline traffic flows during the peak construction period along all vehicle routes to construction compounds in accordance with standard industry practice.

Table 17-10 2023 Future Baseline Traffic Conditions – Mon-Fri (07:00-19:00)

Traffic Count Number	Road Name	Total Vehicles Mon-Fri (07:00-19:00)	HGV Mon-Fri (07:00-19:00)	% of HGVs
807621	Addenbrooke's Road	10,605	134	1.3%
81426	Addenbrooke's Road	13,602	300	2.2%
81422	A1309 Hauxton Road	27,435	609	2.2%
81423	A1309 Hauxton Road	15,140	517	3.4%
47586	A1309 High Street	16,687	480	2.9%
7990	A1134 Long Road	12,026	320	2.7%
77145	A1307 Babraham Road/Cambridge Road	13,445	307	2.3%
NA*	Granham Road	4,124	82	2.0%
NA**	Francis Crick Avenue	4,627	126	2.7%

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Traffic Count Number	Road Name	Total Vehicles Mon-Fri (07:00-19:00)	HGV Mon-Fri (07:00-19:00)	% of HGVs
NA**	Robinson Way	3,448	53	1.7%

## Sensitivity of Roads

17.3.31 Sensitivity of roads along the proposed construction routes was assigned based on the presence of sensitive receptors as outlined in Section 17.2 and identified in Table 17-8, and level of provision and quality of existing facilities, such as narrow well-used footways along busy roads or accident black spots.

17.3.32 Table 17-11 provides sensitivity of the local roads along the proposed construction routes based on the identified receptors' value (identified in Table 17-8) and nature of a road and quality of existing infrastructure (summarised in Table 17-6).

Table 17-11 2023 Future Baseline Traffic Conditions – Mon-Fri (07:00-19:00)

Road Name	Sensitivity
Addenbrooke's Road	Sensitive
A1309 Hauxton Road (between M11J11 and the junction with Addenbrooke's Road)	Not Sensitive
A1309 Hauxton Road (north of the junction with Addenbrooke's Road)	Sensitive
A1309 High Street	Sensitive
A1134 Long Road	Sensitive
A1307 Babraham Road/Cambridge Road	Not Sensitive
Granham's Road	Not Sensitive
Francis Crick Avenue	Sensitive
Robinson Way	Sensitive

## 17.4 Design and Mitigation

17.4.1 The design and mitigation measures outlined in this section will be applied throughout the construction and operational phases of the proposed Development. The assessment of residual and cumulative effects in Section 17.5 has been undertaken assuming these measures are in place. The identified measures would be also included in the outline Code of Construction Practice (CoCP Part A) (Appendix 2.4) with further detail to follow in CoCP Part B.

17.4.2 The design development of the proposed Development is on-going and as such an agreed set of detailed mitigation measures has still to be fully developed and assessed. However, initial mitigation measures have been considered which look to minimise the negative effects of the proposed Development on the identified sensitive receptors; assets and facilities, such as highway network and walking and cycling infrastructure; and other road users using these assets and facilities.

## Construction Approach and Mitigation of Construction Effects

17.4.3 A Construction Traffic Management Plan (CTMP) is normally a condition of the planning consent and needs to be formally discharged before work on site can commence. The CTMP would be prepared by the appointed contractor and submitted to CCoC to ensure that all traffic associated with the project's construction works operate in a safe and compliant manner at all times. The CTMP would provide a framework to manage all types of vehicle movement to and

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from the site. It will provide details of the proposed traffic management of delivery vehicles and other traffic generated during the construction phase and would identify measures designed to avoid and reduce the impact wherever possible between construction site traffic and other road users

- 17.4.4 The CTMP would form part of CoCP Part B and would be prepared by the Contractor in accordance with Cambridgeshire County Council guidance. Measures that could be included in the CTMP are outlined below.

### General Mitigation Measures

- 17.4.5 The appointed contractor would schedule and manage works traffic in order to minimise impacts on other road users along the proposed construction routes, including taking all reasonable steps to ensure that, where possible, construction traffic travels to and from the site via the strategic road network, so as to limit any effect on local roads.
- 17.4.6 The appointed contractor will comply with safety standards and practices related to Construction Logistics and Community Safety (CLOCS).
- 17.4.7 All construction HGVs would adhere to the designated construction routes to and from the site, details of which are provided in Section 17.1. Construction traffic route signage will direct vehicles to the specific construction compound access points.
- 17.4.8 Construction HGV movements would be planned to avoid network peak hours.
- 17.4.9 Appropriate temporary road markings and construction site signage will be erected on the local road network in the vicinity of each of the proposed construction accesses, and at other locations as considered necessary, to warn other road users of construction activities and associated construction vehicles. Example of signage to be installed are “Caution Site Access” & “Caution Heavy Plant Crossing”.
- 17.4.10 If required, banksmen and other staff will be used to marshal HGVs into position at the access point from and onto the highway and from and into the construction compound sites.
- 17.4.11 A copy of the construction route plan would be provided to all suppliers and haulage operators when orders are placed to ensure that drivers are fully briefed on the required route to take.
- 17.4.12 All drivers will be fully trained and will be provided with a copy of a routing plan to ensure that they use the correct roads when driving to and from the site.
- 17.4.13 All drivers would be under instruction to drive at or under the speed limits, to pay specific attention to pedestrians and cyclists and give way to pedestrians and cyclists using uncontrolled crossings on Addenbrooke’s Road and at the Francis Crick Avenue/Addenbrooke’s Road/Dame Mary Archer Way roundabout.
- 17.4.14 Temporary traffic management for the construction of the station access road would be designed to minimise delay to all vehicles on Francis Crick Avenue.
- 17.4.15 Adherence to procedures would be monitored by a suitably qualified person.
- 17.4.16 All construction HGV movements to / from the site would be limited to the following hours:
- Monday to Friday 08.00 hrs - 18.00 hrs, however 1 hour either side of working hours would be used for site set up and shut down;
  - Saturday 08.00 hrs - 13.00 hrs; and
  - No Sunday, bank holiday or public holiday working.
- 17.4.17 Work would be permitted outside of these hours only in exceptional circumstances (and only by prior agreement with CCoC).
- 17.4.18 The surrounding land uses will continue to operate during the planned construction period; therefore the site operations and proposed construction routes have been developed so as to

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minimise the impact on the surrounding area, other road users and receptors. All reasonable measures would be taken to enable full access to neighbouring properties.

- 17.4.19 Emergency access protocols would be put in place and would be identified within the site health and safety plan.
- 17.4.20 Drivers will be instructed to pay special attention to pedestrians and cyclists, particularly when driving through residential areas and when undertaking turning movements at the access and egress points. They will also be instructed to give way to pedestrian and cyclists waiting to cross the road at the uncontrolled crossings.
- 17.4.21 All construction works will be undertaken with strict adherence to the current CDM regulations.
- 17.4.22 On a typical day, heavy plant, cranes and Abnormal Indivisible Load (AIL) vehicles are not expected to visit the site. There may be occasions when these types of vehicles are required. These movements will be coordinated to arrive and depart the site during quieter periods (i.e. outside of the network peak periods).
- 17.4.23 During ground works operations, vehicles exiting the site may inadvertently carry deposits of material trapped on their tyres. To ensure that this does not occur, a wheel-cleaning regime will be implemented throughout the duration of the construction phase.
- 17.4.24 The contractor will undertake to sweep the roads on the local highway network, as is reasonably necessary, to remove any spoil or debris deposited on the highway resulting from the construction period.

### Staff Travel

- 17.4.25 As a worst case estimate, the proposed Development is likely to have an average of 150-200 workers and staff on site during the project. There will be some car parking at the two main compounds. At present, site compounds have been envisaged to have a maximum of around 75 car parking spaces. If required, crew buses will well ferry workers to the satellite compounds.
- 17.4.26 In addition, a construction workforce Green Travel Plan would be prepared by the appointed contractor as part of the CoCP Part B with the aim of encouraging the use of sustainable modes of transport to reduce the impact of workforce travel on local residents and businesses.

### NCN Route 11 Temporary Diversion

- 17.4.27 NCN Route 11 will require temporary diversion to accommodate the main eastern construction compound for the proposed Development for a period of approximately three years. The section to be diverted is between a point approximately 200m south of the Addenbrooke's Road bridge and the Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way Roundabout.
- 17.4.28 The proposed temporary diversion would route along the southern edge of the main eastern construction compound, along the eastern side of the proposed construction compound access road and across the Dame Mary Archer Way arm of the Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way roundabout, connecting to NCN Route 11 on Francis Crick Avenue. The diversion length is 570m, which is approximately 50m longer than the existing NCN Route 11 section. The diversion route is shown within Appendix 17.1.
- 17.4.29 Works would require construction of a shared use path skirting the main eastern construction compound along the southern edge and along the east side of the northern section of the construction compound access road.
- 17.4.30 The diversion may require widening or other appropriate improvement of the existing crossing on the Dame Mary Archer Way arm of the Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way roundabout to accommodate additional cycle and pedestrian movements.



## Scheme Design and Mitigation of Operational Effects

17.4.31 The proposed Development has been designed to limit the impact associated with trips generated by the station and to improve accessibility. Proposed mitigation and embedded design measures of operational effects include:

- The station access road off Francis Crick Avenue would be integrated within the existing signalised Francis Crick Avenue/CGB junction Method Of Control (MOC). The access road would be provided directly south of the junction and would introduce a new junction arm with traffic signal modifications.
- The project will provide a total of 1,000 cycle parking spaces for passengers to encourage sustainable travel, appropriate access and five parking spaces for Blue Badge holders, connectivity with bus services and safe and convenient cycle and pedestrian access.
- To facilitate access to the station and to promote sustainable transport modes for passengers, a number of additional improvements to the existing transport infrastructure are proposed:
  - Widening the existing crossings at the Francis Crick Avenue/Guided Busway junction;
  - Widening the shared use cycle path on the west side of Francis Crick Avenue from the north of the Guided Busway;
  - Widening the existing crossing across the Guided Busway connecting Trumpington residential area and Hobson's Park;
  - Providing a pedestrian and cycle path through Hobson's Park approximately parallel to the Guided Busway;
  - Providing cycle and pedestrian access from both the east and west (with cycle parking provided on both sides of the railway); and
  - Providing high-quality wayfinding to the station for all transport modes.

17.4.32 More details with regards to these mitigation measures can be found in the Transport Assessment (TA) prepared for the proposed Development. The TA is contained within Appendix 17.2.

## 17.5 Assessment of Residual and Cumulative Effects

### Introduction

17.5.1 This section provides an assessment of residual and cumulative effects of construction and operation of the proposed Development with respect to transport. The assessment takes into consideration design and mitigation measures that would be employed during the construction and operation of the proposed Development, as presented in Section 17.4.

### Residual Effects from Construction

#### Construction Traffic

17.5.2 Table 17-12 **Error! Reference source not found.** shows estimated construction vehicle movements per construction access point per weekday during the peak construction period in 2023.

*Table 17-12 Estimated Construction Vehicle Movements, per Access Point, per Weekday*

Access Point	Car/Vans (Staff)	HGVs (Materials)	HGVs (Other)	Vans (Other)	Total HGV Movements	Total Car/Van Movements
AP1	76	46	52	156	98	232
AP2	76	46	52	156	98	232
AP3	0	4	8	22	12	22

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Access Point	Car/Vans (Staff)	HGVs (Materials)	HGVs (Other)	Vans (Other)	Total HGV Movements	Total Car/Van Movements
AP4	0	0	2	4	2	4
AP5	0	4	8	22	12	22
AP6	0	0	2	4	2	4
<b>Total</b>	152	100	124	364	224	516

Note: Heavy Goods Vehicle (HGV) refer to vehicles that have a gross vehicle weight over 3.5 tonnes.

- 17.5.3 As can be seen from Table 17-12 **Error! Reference source not found.** in total 224 HGV movements per day (112 vehicles/deliveries) and 516 car/van movements per day (258 vehicles) will occur on the local road network as a result of construction activities for the proposed Development during the peak construction period.
- 17.5.4 An assessment has been undertaken to identify the likely percentage increase in HGV and in total traffic due to construction on the local road network using 2023 baseline traffic flow data.. The predicted increase has been assessed against 12-hour weekday flows (07:00-19:00 hrs). It is anticipated that construction activities on Saturday would be a fraction of weekday activities and as such the assessment of predicted impacts from construction traffic against 12-hour weekday flows (07:00-19:00 hrs) represent the worst case scenario.
- 17.5.5 Table 17-13 sets out the predicted increase in 12-hour (07:00-19:00 hrs) weekday traffic on local roads that could potentially form the proposed construction routes, associated with predicted average construction HGV traffic flows.
- 17.5.6 As can be seen from Table 17-13, the predicted increase for 12-hour (07:00-19:00 hrs) HGV flows exceeds 10% threshold for Addenbrooke's Road and Francis Crick Avenue (roads identified as Sensitive) and the 30% threshold for A1309 Hauxton Road, between M11J11 and the junction with Addenbrooke's Road (identified as Not Sensitive). Therefore, the predicted increase triggers the need for further assessment for these roads.
- 17.5.7 As can be seen from Table 17-13, the predicted increase for 12-hour (07:00-19:00 hrs) total traffic flows is below 10% for all assessed roads.
- 17.5.8 Taking into account the proposed construction design and mitigation measures outlined in Section 17.4, potential effects on the identified receptors (Table 17-8) and existing road users, the potential magnitude of impact has been established using the methodology outlined in Section 17.2.
- 17.5.9 The potential magnitude of impact has also been informed by the fact that the potential impacts would have limited extent (would only affect receptors and users of roads along the proposed construction routes); be temporary in nature and occur only during the construction phase.
- 17.5.10 Table 17-14, Table 17-15 and Table 17-16 summarise the assessed effects.

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Table 17-13 Predicted increase in 12-hour (07:00-19:00) traffic against future 2023 baseline

DfT Traffic Count Number	Road Name	2023 Future Baseline, 12-hour (07:00-19:00) Mon- Fri flows		2023 Peak Construction Traffic				2023 Future Baseline + Development, 12-hour (07:00-19:00) Mon- Fri flows		% Increase in 12h flows (07:00 - 19:00)	
		Total Vehicle Movements	HGV Movements	Total Vehicles	HGVs	Total Vehicle Movements	HGV Movements	Total Vehicle Movements	HGV Movements	Total Vehicle movements	HGV Movements
807621	Addenbrooke's Road	10,605	134	243	105	486	210	11,301	344	6.6%	156%
81426	Addenbrooke's Road	13,602	300	243	105	486	210	14,298	510	5.1%	70%
81422	A1309 Hauxton Road	27,435	609	254	111	508	222	28,165	831	2.7%	36%
81423	A1309 Hauxton Road	15,140	517	11	6	22	12	15,174	529	0.2%	2%
47586	A1309 High Street	16,687	480	11	6	22	12	16,721	492	0.2%	2%
7990	A1134 Long Road	12,026	320	11	6	22	12	12,060	332	0.3%	4%
77145	A1307 Babraham Road/Cambridge Road	13,445	307	2	1	4	2	13,451	309	0.0%	1%
NA*	Granham's Road	4,124	82	2	1	4	2	4,130	84	0.1%	2%
NA**	Francis Crick Avenue	4,627	126	13	7	26	14	4,667	140	0.9%	11%

\* 2019 Baseline flows were taken from the ES for Land At Newbury Farm development (19/1168/OUT)

\*\* Traffic flows were estimated using survey data from Thursday 10 October 2019 provided by the CBC

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Addenbrooke's Road

17.5.11 Table 17-14 provides summary of assessment of potential effects on receptors and other road users along Addenbrooke's Road.

Table 17-14 Assessment of Effects Summary – Addenbrooke's Road

Effect	Description of Effect	Assessment of Effect	Significance of effect
Severance	Reduced ability for pedestrians and cyclists to cross the road.	<p>Trip attractors and generators in the vicinity of Addenbrookes Road are located mostly on the northern side of the road. On the southern side the road is mostly fronted by agricultural land and open space. The road acts as a main route to the CBC from the west and the wider area via the M11.</p> <p>Identified main desire lines across Addenbrooke's Road include:</p> <ul style="list-style-type: none"> <li>• a desire line between two parts of Clay Farm development located on both sides of the road; and</li> <li>• a desire line from the north to Great Shelford and trip generators along the A1301 Shelford Road.</li> </ul> <p>These and other desire lines are served by the existing controlled crossings. This includes signalised crossings at the junctions with the A1309 Hauxton Road, Glebe Farm Drive and A1301 Shelford Road and the crossing directly east of the junction with Kingfisher Gardens. These crossings will ensure that the effect on pedestrian and cyclist delay and severance associated with construction traffic will not be significant.</p>	Slight Adverse <b>Not Significant</b>
Pedestrian and cyclist delay	Changed journey times and distances for pedestrians and cyclists	<p>Nevertheless, drivers will be instructed to pay special attention to pedestrians and cyclists, particularly when driving through residential areas and when undertaking turning movements at the construction site access and egress points. They will also be instructed to give way to pedestrians and cyclists waiting to cross the road at the uncontrolled crossings, including at the Addenbrooke's Road/Hobson Avenue Roundabout and Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way Roundabout and at the uncontrolled crossing on the bridge over Hobson's Brook. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on severance and pedestrian and cycle delay along Addenbrooke's Road is judged to be Negligible. Given presence of a number of sensitive receptors with High assigned value, the potential effect is reported as being reported as Slight Adverse. For these reasons, the predicted effect on pedestrian and cyclist delay is unlikely to be significant.</p>	
Driver delay	Changed journey times and distances for private and commercial vehicle occupants	No road closures or diversions are required as a result of the proposed Development. Potential delay will be associated with vehicles needing to give way to construction traffic at the roundabout and side road junctions, and with delay associated with additional traffic demand for signalised junctions.	Slight Adverse <b>Not Significant</b>

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Effect	Description of Effect	Assessment of Effect	Significance of effect
Public transport users delay	Changed journey times, distances or frequencies for public transport	<p>Addenbrooke's Road is expected to continue to operate well under capacity in 2023 (with approx. 1000 vehicles per hour in both directions, or 500 vehicles per direction, versus theoretical capacity of 2,600 vehicle per hour in both directions, or 1,300 vehicles per direction associated with this road type and carriageway width [Ref 17-8].</p> <p>In addition, construction HGV movements would be planned to avoid peak hours, thus further reducing driver and public transport users delay effects during these hours. These measures would be included in the CTMP which is normally a condition of the planning consent.</p> <p>Taking above into account, the potential magnitude of impact on driver and public transport users delay along Addenbrooke's Road is judged to be Negligible. Given presence of a number of sensitive receptors with High assigned value, the potential effect is reported as being reported as Slight Adverse. For these reasons, the predicted effect on driver and public transport delay is unlikely to be significant.</p>	
Pedestrian and cycle amenity	Loss of amenity for vulnerable road users	<p>There is a footway with a segregated two-way cycle track running parallel to it along the northern side of the 40mph section of Addenbrooke's Road. The footway and cycle track are separated from the carriageway with an approximately 4m wide grass verge.</p> <p>The footway and segregated two-way cycle track continue along the 30mph section of the road, where they run next to the carriageway.</p> <p>The predicted increase in traffic associated with construction traffic would not lead to doubling of the existing traffic and as such, according to IEMA guidelines (Ref 17-1) will not lead to a significant adverse effect.</p> <p>In addition, a number of measures designed to minimise impact on vulnerable road users are proposed. These include appropriate markings and signs, planning HGV movements to avoid peak hours and use of traffic marshals if required. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on pedestrian and cycle amenity along Addenbrooke's Road is judged to be Minor. Given presence of a number of sensitive receptors with High assigned value, the potential effect is reported as being reported as Slight Adverse. For these reasons, the predicted effect on loss of amenity for vulnerable road users is unlikely to be significant.</p>	Slight Adverse <b>Not Significant</b>
Fear and Intimidation	Potential issues for pedestrians and cyclists due to increased traffic flows and change in composition	<p>The predicted increase in 18-hour total traffic and HGVs traffic associated with construction activities would be significantly lower than thresholds noted in the IEMA guidelines (Ref 17-1) and summarised in Section 17.2.</p> <p>In addition, a number of measures designed to minimise impacts on vulnerable road users are proposed as identified in Section 17.4. These include adherence to the designated construction routes, planning HGV movements to avoid peak hours, use of traffic marshals if required and instructions to drivers to pay special attention to pedestrians and cyclists. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p>	Slight Adverse <b>Not Significant</b>

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		Taking above into account, the potential magnitude of impact on pedestrian and cycle fear and intimidation along Addenbrooke's Road is judged to be Negligible. Given presence of a number of sensitive receptors with High assigned value, the potential effect is reported as being reported as Slight Adverse. For these reasons, the predicted effect on fear and intimidation for pedestrian and cyclists is unlikely to be significant.	
Accidents and safety	Reduction in road safety for all road users	<p>The obtained collision data indicate that there were two collisions recorded as serious and four collision recorded as slight along Addenbrooke's Road during the 60-month period to December 2020. Of those recorded collisions, one serious and one slight collision involved a cyclist casualty. No recorded collisions involved pedestrian casualty.</p> <p>Construction HGV drivers would be under instruction to drive at or under the speed limits and to pay specific attention to pedestrians and cyclists. Other mitigation measures would include appropriate traffic management signage, planning HGV movements to avoid peak hours, compliance with safety standards and practices related to Construction Logistics and Community Safety (CLOCS). These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on accidents and safety along Addenbrooke's Road is judged to be Negligible. Given presence of a number of sensitive receptors with High assigned value, the potential effect is reported as being reported as Slight Adverse. For these reasons, the predicted effect on accidents and safety is unlikely to be significant.</p>	Slight Adverse <b>Not Significant</b>
Parking	Temporary loss of parking and loading facilities due to the need to accommodate construction traffic	No temporary loss of parking and loading facilities along Addenbrooke's Road would be required to accommodate construction traffic.	Neutral <b>Not Significant</b>

17.5.12 As can be seen from Table 17-14, the predicted effects on existing road users along Addenbrooke's Road are assessed as **Not Significant**.

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Francis Crick Avenue

17.5.13 Table 17-15 provides summary of assessment of potential effects on receptors and other road users along Francis Crick Avenue.

Table 17-15 Assessment of Effects Summary – Francis Crick Avenue

Effect	Description of Effect	Assessment of Effect	Significance of effect
Severance	Reduced ability for pedestrians and cyclists to cross the road.	Predicted maximum HGV movements during the peak construction period will equate to approximately one HGV movement every hour or one total vehicle movement every 20 minutes, if light goods vehicles and vans are considered.  The existing controlled crossings at the CGB and Francis Crick Avenue junction would be retained to serve the existing crossing desire line, ensuring that there is no significant effect on pedestrian and cycle severance and delay in this location.	Neutral <b>Not Significant</b>
Pedestrian and cyclist delay	Changed journey times and distances for pedestrians and cyclists	Drivers will also be instructed to pay special attention and give way to pedestrians and cyclists using uncontrolled crossings at the Francis Crick Avenue/Addenbrooke's Road roundabout. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.  Taking above into account, the potential magnitude of impact on severance and pedestrian and cycle delay along Francis Crick Avenue is judged to be Negligible. Given presence of a number of sensitive receptors with Low assigned value, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on severance and pedestrian and cycle delay is unlikely to be significant.	
Driver delay	Changed journey times and distances for private and commercial vehicle occupants	No road closures or diversions are required as a result of the development. Potential delay will be associated with temporary traffic management to construct the station access road, vehicles needing to give way to construction traffic at the Francis Crick Avenue/Addenbrooke's roundabout and with delay associated with additional demand for the signalised junction of CGB and Francis Crick Avenue.  Francis Crick Avenue is expected to continue to operate under capacity in 2023. Predicted maximum HGV movements during peak construction periods will equate to approximately one HGV movement per hour or one total vehicle movement every 20 minutes, if light goods vehicles and vans are considered.	Neutral <b>Not Significant</b>
Public transport users delay	Changed journey times, distances or frequencies for public transport	Temporary traffic management for the construction of the station access road would be designed to minimise delay to all vehicles on Francis Crick Avenue.  In addition, construction HGV movements would be planned to avoid peak hours, thus further reducing driver and public transport users delay effects during these hours. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.  Taking above into account, the potential magnitude of impact on driver and public transport users delay along Francis Crick Avenue is judged to be Negligible. Given presence of a number of sensitive receptors with Low assigned value, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on driver and public transport delay is unlikely to be significant.	

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Effect	Description of Effect	Assessment of Effect	Significance of effect
Pedestrian and cycle amenity	Loss of amenity for vulnerable road users	<p>Francis Crick Avenue is subject to a 20mph speed limit. The road has 1.5m mandatory cycle lanes on carriageway and 1.5m footways on both sides of the carriageway. Footways are separated from the carriageway by a 2m grass verge.</p> <p>Given the relatively low predicted increase in traffic associated with construction traffic (one HGV movement every hour or one total vehicle movement every 20 minutes, if light goods vehicles and vans are considered), construction traffic would not lead to doubling of the existing traffic and as such, according to IEMA guidelines (Ref 17-1) would not lead to a significant adverse effect.</p> <p>Nevertheless, when driving along Francis Crick Avenue and turning into and out of the proposed access route to the construction compound off Francis Crick Avenue, drivers will be instructed to pay special attention to cyclists using mandatory cycle lanes. Drivers will also be instructed to give way to pedestrians and cyclists using uncontrolled crossings at the Addenbrooke's Road roundabout. Traffic marshalls may be provided at the construction site access points. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on pedestrian and cycle amenity along Francis Crick Avenue is judged to be Negligible. Given presence of a number of sensitive receptors with Low assigned value, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on loss of amenity for vulnerable road users is unlikely to be significant.</p>	Neutral <b>Not Significant</b>
Fear and Intimidation	Potential issues for pedestrians and cyclists due to increased traffic flows and change in composition	<p>Francis Crick Avenue is subject to a 20mph speed limit. The road has approximately 1.5m mandatory cycle lanes on carriageway and 1.5m footways on both side of the carriageway. Footways are separated from the carriageway by a 2m grass verge.</p> <p>The predicted increase in 18-hour total traffic and HGVs traffic associated with construction activities would be approximately 19 HGV movements, or 61 total vehicle movement every 20 minutes if cars and vans are considered. This is significantly lower than thresholds noted in the IEMA guidelines (Ref 17-1) and summaries in Section 17.2.</p> <p>In addition, a number of measures designed to minimise impact on vulnerable road users are proposed as identified in Section 17.4. These include adherence to the designated construction routes, planning HGV movements to avoid peak hours, use of traffic marshals if required and instructions to drivers to pay special attention to pedestrians and cyclists. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on pedestrian and cycle fear and intimidation along Francis Crick Avenue is judged to be Negligible. Given presence of a number of sensitive receptors with Low assigned value, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on fear and intimidation for pedestrian and cyclists is unlikely to be significant.</p>	Neutral <b>Not Significant</b>



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Effect	Description of Effect	Assessment of Effect	Significance of effect
Accidents and safety	Reduction in road safety for all road users	<p>The obtained collision data indicates that there was one collision recorded in the assessed 60-month period up to December 2020, the collision was recorded as serious and involved a cyclist casualty. No recorded collisions involved a pedestrian casualty.</p> <p>When driving along Francis Crick Avenue and turning into and out of the proposed access route to the construction compound off Francis Crick Avenue, drivers will be instructed to pay special attention to cyclists using mandatory cycle lanes.</p> <p>Drivers will also be instructed to give way to pedestrians and cyclists using uncontrolled crossings at the Francis Crick Avenue/Addenbrooke's Road roundabout.</p> <p>Other mitigation measures would include appropriate traffic management signage, planning HGV movements to avoid peak hours, traffic marshalls, compliance with safety standards and practices related to Construction Logistics and Community Safety (CLOCS). All these measures would ensure that the effect would not be significant. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on accidents and safety along Francis Crick Avenue is judged to be Negligible. Given presence of a number of sensitive receptors with Low assigned value, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on accidents and safety is unlikely to be significant.</p>	Neutral <b>Not Significant</b>
Parking	Temporary loss of parking and loading facilities due to the need to accommodate construction traffic	No temporary loss of parking and loading facilities along Francis Crick Avenue would be required to accommodate construction traffic.	Neutral <b>Not Significant</b>

17.5.14 As can be seen from Table 17-15, the predicted effects on existing road users along Francis Crick Avenue are assessed as **Not Significant**.

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A1309 Hauxton Road (between M11J11 and the junction with Addenbrooke's Road)

17.5.15 Table 17-16 provides summary of assessment of potential effects on receptors and other road users along Hauxton Road between M11J11 and the junction with Addenbrooke's Road.

Table 17-16 Assessment of Effects Summary – Hauxton Road

Effect	Description of Effect	Assessment of Effect	Significance of effect
Severance	Reduced ability for pedestrians and cyclists to cross the road.	<p>There is only one natural desire line along the assessed section of the road, given its nature (a rural connector road subject to 40mph speed limit, fronted by fields) and existing pedestrian and cycle facilities along it (shared use path along the western side). The identified crossing desire line is between western side of Hauxton Road and Addenbrooke's Road. This desire line is currently served by a controlled crossing which is part of the signalised Hauxton Road/Addenbrooke's Road junction.</p> <p>Taking above into account, the potential magnitude of impact on severance and pedestrian and cycle delay along Hauxton Road is judged to be Negligible. Given the absence of sensitive receptors, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on severance and pedestrian and cycle delay is unlikely to be significant.</p>	<p>Neutral</p> <p><b>Not Significant</b></p>
Pedestrian and cyclist delay	Changed journey times and distances for pedestrians and cyclists		
Driver delay	Changed journey times and distances for private and commercial vehicle occupants	<p>No road closures or diversions are required as a result of the Development. Potential delay will be associated with delay associated with additional demand for the signalised junction of Addenbrooke's Road.</p> <p>As a link, the A1309 Hauxton Road is expected to continue to operate under capacity in 2023 including additional construction traffic generated by the development.</p> <p>In addition, construction HGV movements would be planned to avoid peak hours, thus further reducing driver and public transport users delay effects during these hours. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on driver and public transport users delay along Hauxton Road is judged to be Minor. Given the absence of sensitive receptors, the potential effect is reported as being reported as Slight Adverse. For these reasons, the predicted effect on driver and public transport delay is unlikely to be significant.</p>	<p>Slight Adverse</p> <p><b>Not Significant</b></p>
Public transport users delay	Changed journey times, distances or frequencies for public transport		
Pedestrian and cycle amenity	Loss of amenity for vulnerable road users	<p>The A1309 Hauxton Road is a very busy road with predicted 12-hour (07:00-19:00hrs) flows in 2023 of approximately 27,000 vehicle movements. Additional vehicle movements generated by the development as a result of construction activities would lead to the predicted traffic increase of 2.7%. This increase would not lead to doubling of the existing traffic and as such, based on the IEMA guidelines (Ref 17-1) unlikely to lead to a significant adverse effect.</p> <p>Nevertheless, drivers will be instructed to pay special attention to cyclists using the shared use path on the western side of the carriageway. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p>	<p>Neutral</p> <p><b>Not Significant</b></p>

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Effect	Description of Effect	Assessment of Effect	Significance of effect
		Taking above into account, the potential magnitude of impact on pedestrian and cycle amenity along Hauxton Road is judged to be Negligible. Given the absence of sensitive receptors, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on loss of amenity for vulnerable road users is unlikely to be significant.	
Fear and Intimidation	Potential issues for pedestrians and cyclists due to increased traffic flows and change in composition	<p>The assessed section of the road is subject to a 40mph speed limit. The road has approximately 3m wide share use path on the western side of the carriageway.</p> <p>As indicated in Table 17-13, the predicted increase in 18-hour total traffic and HGVs traffic associated with construction activities would be significantly lower than thresholds noted in the IEMA guidelines (Ref 17-1) and summaries in Section 17.2.</p> <p>In addition, a number of measures designed to minimise impact on vulnerable road users are proposed as identified in Section 17.4. These include adherence to the designated construction routes, planning HGV movements to avoid peak hours and instructions to drivers to pay special attention to pedestrians and cyclists. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on pedestrian and cycle fear and intimidation along Hauxton Road is judged to be Negligible. Given the absence of sensitive receptors, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on fear and intimidation for pedestrian and cyclists is unlikely to be significant.</p>	Neutral <b>Not Significant</b>
Accidents and safety	Reduction in road safety for all road users	<p>The obtained collision data indicate that there were three collisions recorded in the assessed 60-month period up to December 2020, the collisions was recorded as slight and did not involve cyclist or pedestrian casualty. Construction HGV drivers would be under instruction to pay specific attention to pedestrians and cyclists. Other mitigation measures would include appropriate traffic management signage, planning HGV movements to avoid peak hours, compliance with safety standards and practices related to Construction Logistics and Community Safety (CLOCS). This would ensure that the effect is unlikely to be significant. These measures would be included in the CTMP which will form part of the CoCP Part B which will be submitted to the Local Planning Authority to discharge a deemed planning condition.</p> <p>Taking above into account, the potential magnitude of impact on accidents and safety along Hauxton Road is judged to be Negligible. Given the absence of sensitive receptors, the potential effect is reported as being reported as Neutral. For these reasons, the predicted effect on accidents and safety is unlikely to be significant.</p>	Neutral <b>Not Significant</b>
Parking	Temporary loss of parking and loading facilities due to the need to accommodate construction traffic	No temporary loss of parking and loading facilities along the A1309 Hauxton Road would be required to accommodate construction traffic.	Neutral <b>Not Significant</b>

17.5.16 As can be seen from Table 17-16, the predicted effects on existing road users along Hauxton Road between M11J11 and the junction with Addenbrooke's Road are assessed as Not Significant. Although the significance threshold for HGVs has been exceeded for Addenbrooke's Road, Francis Crick Avenue and Hauxton Road between M11J11 and the junction with Addenbrooke's Road, given the temporary nature of this impact, the mitigation measures set out in Section 17.4 to be implemented in the CTMP, it is considered that the result of the peak construction traffic in both scenarios would be **Not Significant**.

## Residual Effects from Operation

17.5.17 During the operational phase, the station users and staff will be encouraged to walk, cycle or use public transport to travel to/from the proposed Development. Vehicle trips to and from the station would account for a small percentage of trips.

17.5.18 The TA has been produced in line with national and local guidance (Ref 17-9) and considers the operational effects of the proposed Development on the local highway network. The TA details all aspects of the proposed Development related to its transport and characteristics and their effect and is contained within Appendix 17.2.

17.5.19 Table 17-17 shows the predicted mode share and number of trips on a typical weekday in 2031 associated with the proposed Development, as identified in the TA.

*Table 17-17 Mode Share and Trip Generation for each Mode*

Mode	Total trips	Mode Share
Car Passenger (Drop off / Pick up)	146	2%
Car Passenger (Taxi)	171	3%
Public Transport	678	11%
Cycle	1565	24%
Walk	3868	60%
All modes	6428	100%

17.5.20 As can be seen from Table 17-17, on a typical weekday, there will be additional 317 vehicular trips on the road network as a result of passengers being dropped off, picked up and taking a taxi to/from the proposed Development.

17.5.21 At the same time, based on the estimates undertaken for the CBC Transport Needs Review report (Ref 17-10) commissioned by CCoC (contained in the TA (Appendix 17.2) as Appendix R), it is predicted that, in 2031, Cambridge South Station would result in the gross reduction of 746 daily two-way vehicular trips to the CBC. This equates to the reduction of 1,492 vehicle movements per day on the local road network. Taking into account the additional 317 vehicular trips on the road network as a result of passengers being dropped off, picked up and taking taxis to/from the proposed Development, the proposed Development is predicted to lead to the net reduction of 1,175 vehicular movements on the local road network.

17.5.22 Table 17-18 shows the predicted gross and net reduction in traffic as a result of the proposed Development, against the 2031 baseline, on the links and roads assessed for the operational traffic effects.

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Table 17-18 Predicted gross and net reduction in traffic on selected links as a result of the station against 2031 baseline

DfT Traffic Count #	Road Name	Operational Traffic 2031		Gross Reduction in Traffic 2031		Net Reduction in Traffic 2031	
		Distribution	Vehicle Movement	Distribution	Vehicle Movement	Vehicle Movement	%
807621	Addenbrooke's Road	16%	101	50%	746	645	4.7%
81426	Addenbrooke's Road	16%	101	50%	746	645	3.7%
81422	A1309 Hauxton Road	8%	51	5%	75	24	0.1%
81423	A1309 Hauxton Road	8%	51	5%	75	24	0.1%
47586	A1309 High Street	8%	51	5%	75	24	0.1%
7990	A1134 Long Road	8%	51	5%	75	24	0.2%
77145	A1307 Babraham Road	11%	70	25%	373	303	1.7%
NA**	Francis Crick Avenue	51%	323	50%	746	423	7.1%
NA**	Robinson Way	49%	311	50%	746	435	10.6%

\*\* Traffic flows were estimated using survey data from Thursday 10 October 2019 provided by the CBC

17.5.23 As can be seen from Table 17-18, the biggest relative and absolute reductions in traffic during the operational phase would be on Addenbrooke's Road and Francis Crick Avenue. On Addenbrooke's Road, the predicted reduction would be 645 vehicle movements or 4.7% compared to the 2031 Baseline and on Francis Crick Avenue, the predicted reduction would be 423 vehicle movements or 7.1% compared to the 2031 Baseline.

17.5.24 As indicated in Table 17-18, the proposed Development would have overall positive effects during the operational phase via the reduction in vehicular trips on the local road network, through encouraging more people to travel by rail to and from the CBC and surrounding area and through encouraging sustainable travel. For these reasons, it is anticipated that the proposed Development would result in net beneficial effects on transport networks, transport networks users and sensitive receptors during the operational phase.

## Cumulative Effects

17.5.25 The analysis undertaken in this section has taken into account committed developments in the vicinity of the proposed Development. The identified committed developments are shown in a table and plan presented within Appendix 2.3.

17.5.26 The identified committed developments were assessed to determine if they are likely to be constructed at the same time as the proposed Cambridge South Station and if so, whether construction traffic from these developments would use roads along the proposed construction routes shown within Appendix 17.1. Any development that met the above criteria was then further assessed to determine the type and quantum of construction traffic they will potentially generate during their respective construction periods. The assessment was undertaken using documents submitted with relevant planning applications on the Greater Cambridge Shared Planning Online Planning Register (Ref 17-11).

17.5.27 However, information regarding construction traffic forecasts for identified developments in the vicinity of the proposed Development was not available and as such these sites could not be

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assessed for the cumulative impacts. These schemes may not have triggered the threshold for an assessment of their construction traffic impacts.

- 17.5.28 In addition to the identified committed developments, the CSET scheme has been reviewed and assessed within this section, to determine cumulative effects associated with construction of the CSET scheme.

## ID3 - AstraZeneca UK Ltd (19/1070/REM)

- 17.5.29 Reserved matters application pursuant to outline approval 06/0796/OUT (amended by Section 73 approval 17/2258/S73) for: an R&D Enabling Building of 13,197sqm; an Amenities Hub of 3,261sqm; associated car, motorbike and cycle parking including a Multi Storey Car Park; a temporary Multi Use Games Area; hard and soft landscaping; and internal roads, supporting facilities and ancillary infrastructure.
- 17.5.30 The Enabling Building construction is to start in 2021 Q2 and to finish in 2023 Q4. The schedule of deliveries will be adopted to avoid peak traffic, Monday to Friday AM peak and PM peak, and pedestrian peak time within the immediate locality. All construction vehicles travel through Francis Crick Avenue.
- 17.5.31 A plan was produced for the development to form a single access point to service all three buildings and the wider site construction for the project duration. All deliveries will be pre-booked and managed to avoid blocking up access and traffic movements.
- 17.5.32 A strategic route would be used for vehicles travelling to and from the site depending on which direction the vehicle is coming from. This route is between Addenbrooke's Hospital and the M11 Junction 11, via Addenbrooke's Road and Francis Crick Avenue. The principles for dealing with abnormal loads will be to avoid routes minor roads that are lightly trafficked and to avoid impact on routes to and from Addenbrookes hospital.
- 17.5.33 However, no construction HGV or total vehicle traffic data is provided within the documents submitted as part of the planning application for this site, and as such this site could not be included in the cumulative impact assessment.

## ID6 - Netherhall Farm (20/01972/OUT)

- 17.5.34 Outline application (all matters reserved except for means of Access) for the erection of up to 200 residential dwellings, with associated infrastructure works, including access (vehicular, pedestrian and cycle), drainage, public open space and landscape at the Netherhall Farm, Worts Causeway, Cambridge CB1 8RJ, site. The site area is approximately 7.2 hectares in total area.
- 17.5.35 Construction is proposed to start on the site in 2021/2022 with completion in 2023/2024. During the three-year build, no demolition will take place and the proposed development will be constructed in one phase.
- 17.5.36 The documents submitted with the planning application stated that the anticipated number of additional HGV movements during this period is expected to be relatively low. Thus, it is anticipated that the level of heavy goods vehicle traffic will not be noticeable on the local highway network. All HGV construction traffic is likely to use Wort's Causeway to the east of the site to access the wider highway network. It is estimated that construction generated traffic movements including staff and HGVs will not increase total traffic flows by more than 10% on any link. However, as no construction HGV and/or total vehicle traffic data is provided within the available documents for this site, this site could not be included in the cumulative impact assessment.

## ID8 - Land South of Dame Mary Archer Way (16/0176/OUT)

- 17.5.37 Development of up to 75,000sqm floorspace of Research and Development (B1b) and Clinical (C2 and/or D1), sui generis and higher education uses, including related support activities within use class B1; ancillary uses in addition (A1, A3, A4, A5, D1 and/or D2); up to two multi

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storey car parks; open space and landscaping and all other associated supporting infrastructure.

- 17.5.38 The first building provided as part of CBC Phase 2 has been occupied by Abcam since approximately 2018. The remainder of the development is anticipated to be completed by 2026.
- 17.5.39 It is considered that the impact of construction traffic on the capacity of the local road network will be relatively small overall. The majority of HGV movements would occur throughout the day avoiding peak times and therefore would not add to peak hour traffic. The construction hours are likely to dictate that the staff are required to be at the site prior to the AM peak and leave after the PM peak.
- 17.5.40 It has been proposed that there are two vehicular accesses to the development from Dame Mary Archer Way in the form of priority 'T' junctions. These junctions are located close to the western and eastern site boundaries and link to the new road which will act as the southern site boundary and form a circular route around the perimeter of the development.
- 17.5.41 The location of these accesses onto Dame Mary Archer Way have been chosen to ensure that they do not impact upon the operation of surrounding junctions and thus inhibit any trips being made by emergency vehicles through these junctions.
- 17.5.42 However, as no construction HGV and/or total vehicle traffic data is provided within the available documents for this site, this site could not be included in the cumulative impact assessment.

## ID 37 - Cambridge South East Transport (CSET)

- 17.5.43 CSET aims to provide better public transport, walking and cycling options for those who travel in the A1307 and A1301 area, improving journey times and linking communities and employment sites in the area south east of Cambridge. The project is promoted by Greater Cambridge Partnership (GCP). The current potential construction period is from 2023 to 2025.
- 17.5.44 Phase 1 of the project included short-term package of measures including road safety, walking, cycling and bus priority measures along the A1307 between Haverhill and Cambridge. This includes a continuous shared-use path for pedestrians, cyclists and horse riders from Cambridge to Linton and will form part of the Linton Greenway. Phase 1 measures are currently under construction and are scheduled to be completed over the next two years. As such, Phase 1 is not expected to be impacted by the proposed station's design, construction and operation.
- 17.5.45 Phase 2 of the project includes a new dedicated Mass Rapid Transit (MRT) route between the A11 and the CBC via Sawston, Stapleford, Great Shelford with onward connection to the city centre and includes:
- A new segregated public transport route from the A11 to the CBC;
  - A new path for walkers, cyclists and horse riders, similar to the one along the existing Guided Busways; and
  - A new travel hub near the A11/A1307 junction.
- 17.5.46 The CSET proposals include major junction modifications at Francis Crick Avenue/Guided Busway which will require a left-in/left-out priority junction for the station access due to the proximity of the general traffic northbound stop-line. The station access in the CSET scheme will need to be relocated approximately 12m to the south and will require minor reconfiguration of the transport interchange in the station forecourt.
- 17.5.47 The current CSET programme includes TWA application in summer 2021 with potential construction period of 2023 to 2025. As such, there is potential overlap of CSET and proposed Development construction activities. The proposed CSET route also bisects the main CSIE

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eastern construction compound located south of the Addenbrooke's Road/Francis Crick Avenue/Dame Mary Archer Way Roundabout junction.

17.5.48 The CSET Draft Code of Construction Plan received from the scheme designers indicates that the working hours would be Monday to Friday, 07:30 – 18:00 hrs. Saturday construction work can start at the same time but finish at 16:00 hrs but only with prior agreement from Principal Contractor. Night works are restricted to works that cannot be complete with standard traffic management, such as carriageway surfacing which will be completed under full road closures. A Construction Travel Plan is yet to be developed but aims to minimise the impact on the local road network and environment.

17.5.49 The CSET Draft Code of Construction Plan specifies that there is no intention of any site vehicles to access the site through the centre of Cambridge and that adequate access is possible via A roads. Access to all construction compounds will be from the A1307 Babraham Road, except Compound 7 which would be accessed from Addenbrookes Road via M11 Junction 11. However, no information regarding construction traffic to Compound 7 was available at this stage.

### Summary of Cumulative Effects

17.5.50 As indicated in this section, three developments were identified as having overlapping construction phases with the construction phase for the proposed Development, and potentially using the same proposed construction routes identified in Appendix 17.1. Relevant planning documents located on Greater Cambridge Shared Planning Online Planning Register (Ref 17-11) have been reviewed to determine construction traffic type and quantum these developments would generate. However, as indicated above this information was not available and as such these sites could not be included in the cumulative impact assessment for the proposed Development.

17.5.51 In addition to the identified committed developments, the CSET scheme has been reviewed and assessed, to determine the cumulative effects associated with construction of this scheme. Construction HGV and total vehicle traffic data has been requested from the CSET designers, however as the scheme has not progressed sufficiently enough, this information was not available at this stage.

17.5.52 Nevertheless, giving the proposed mitigation measures identified in Section 17.4 and for each of the developments reviewed in this section, it is considered that the magnitude of cumulative impact of the proposed developments during the construction phase would be slight adverse (**Not Significant**) in terms of delay, severance, fear and intimidation and amenity for pedestrian and cyclists; slight adverse (**Not Significant**) in terms of driver and public transport users delay; and slight adverse in terms of accidents and safety and parking.

## 17.6 Assessment Summary

17.6.1 Table 17-19 Constuction Impact Assessment Summary **Error! Reference source not found.** provides construction impact assessment summary with respect to transport and how they have been addressed.

Table 17-19 Constuction Impact Assessment Summary

Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Pedestrians and cyclists	Severance	C	See section 17.4	Slight Adverse <b>Not Significant</b>
Pedestrians and cyclists	Delay	C	See section 17.4	Slight Adverse



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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
				<b>Not Significant</b>
Pedestrians and cyclists	Amenity	C	See section 17.4	Slight Adverse <b>Not Significant</b>
Pedestrians and cyclists	Fear and intimidation	C	See section 17.4	Slight Adverse <b>Not Significant</b>
Drivers	Delay	C	See section 17.4	Slight Adverse <b>Not Significant</b>
Public Transport Users	Delay	C	See section 17.4	Slight Adverse <b>Not Significant</b>
Pedestrians, cyclists, drivers and public transport users	Accidents and safety	C	See section 17.4	Slight Adverse <b>Not Significant</b>
Drivers	Parking	C	See section 17.4	Neutral <b>Not Significant</b>

17.6.2 The proposed Development would have overall positive effects during the operational phase due to the reduction in vehicular trips on the local road network, through encouraging more people to travel by rail to and from the CBC and surrounding area and through encouraging sustainable travel. For these reasons, it is anticipated that the proposed Development would result in net beneficial effects on transport networks, transport networks users and sensitive receptors during the operational phase.

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**17.7 References**

Reference	Title
Ref 17.1	The Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (2019)
Ref 17.2	<u><a href="#">Guidelines for the Environmental Assessment of Road Traffic ((Institute of Environmental Management and Assessment (IEMA), 1993) ('IEMA Guidelines')).</a></u>
Ref 17-3	Department for Transport (DfT) traffic counts: <a href="https://roadtraffic.dft.gov.uk/#6/55.254/-6.064/basemap-regions-countpoints">https://roadtraffic.dft.gov.uk/#6/55.254/-6.064/basemap-regions-countpoints</a> [accessed on 11/11/2020]
Ref 17-4	DfT's Road traffic statistics (TRA) <a href="https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra">https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra</a> [accessed on 11/11/2020]
Ref 17-5	Bus timetable and routing information, CCoC website, <a href="https://www.cambridgeshire.gov.uk/residents/travel-roads-and-parking/buses/bus-timetables">https://www.cambridgeshire.gov.uk/residents/travel-roads-and-parking/buses/bus-timetables</a> [accessed on 11/11/2020]
Ref 17-6	PRoW, CCoC website, <a href="https://www.cambridgeshire.gov.uk/residents/libraries-leisure-culture/arts-green-spaces-activities/rights-of-way">https://www.cambridgeshire.gov.uk/residents/libraries-leisure-culture/arts-green-spaces-activities/rights-of-way</a> [accessed on 11/11/2020]
Ref 17-7	TEMPPro (Trip End Model Presentation Program) software, <a href="https://www.gov.uk/government/publications/tempo-downloads">https://www.gov.uk/government/publications/tempo-downloads</a> [accessed on 11/11/2020]
Ref 17-8	What is the capacity of the road network for private motorised traffic and how has this changed over time? TfL Roads Task Force - Technical Note 10 <a href="http://content.tfl.gov.uk/technical-note-10-what-is-the-capacity-of-the-road-network-for-private-motorised-traffic.pdf">http://content.tfl.gov.uk/technical-note-10-what-is-the-capacity-of-the-road-network-for-private-motorised-traffic.pdf</a> [accessed on 11/03/2021]
Ref 17-9	Transport Assessment Requirements, September 2019, Cambridgeshire County Council <a href="https://www.cambridgeshire.gov.uk/asset-library/transport-assessment-requirements.pdf">https://www.cambridgeshire.gov.uk/asset-library/transport-assessment-requirements.pdf</a> [accessed on 12/03/2021]
Ref 17-10	CBC Transport Needs Review report (2019), Atkins <a href="http://scams.moderngov.co.uk/documents/s110158/Biomedical%20Campus%20Transport%20Needs%20Review%20Part%201.pdf">http://scams.moderngov.co.uk/documents/s110158/Biomedical%20Campus%20Transport%20Needs%20Review%20Part%201.pdf</a> [accessed on 12/03/2021]
Ref 17-11	Greater Cambridge Shared Planning Online Planning Register <a href="https://applications.greatercambridgeplanning.org/online-applications/">https://applications.greatercambridgeplanning.org/online-applications/</a> [accessed on 22/03/2021]
Ref 17-12	Crashmap <a href="https://www.crashmap.co.uk/">https://www.crashmap.co.uk/</a> [accessed on 15/03/2021]
Ref 17-13	National Planning Policy Framework. 2019.
Ref 17-14	Department for Communities and Local Government, March 2014: Travel Plans, Transport Assessments and Statements in Decision-Taking
Ref 17-15	Department for Communities and Local Government (DCLG), March 2015: Transport Evidence Bases in Plan Making and Decision Taking
Ref 17-16	Department for Transport (DfT), various dates: Travel Plan Guidelines

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Reference	Title
Ref 17-17	Department for Communities and Local Government / Department for Transport, 2007: The Manual for Streets
Ref 17-18	<u>Department for Communities and Local Government / Department for Transport, 2010: The Manual for Streets 2, CIHT, 2010 – a companion guide to Manual for Streets</u>
Ref 17-19	Cambridgeshire Local Transport Plan 2011-2031, July 2015
Ref 17-20	Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy (July 2015)
Ref 17-21	Transport Strategy for Cambridge and South Cambridgeshire (March 2014)
Ref 17-22	<u>Cambridge City Council Local Plan (2018), Cambridge City Council</u>
Ref 17-23	South Cambridgeshire Local Plan (2018), South Cambridgeshire District Council
Ref 17-24	Cambridgeshire and Peterborough Combined Authority Business Plan 2019-2020
Ref 17-25	Cambridge Biomedical Campus Transport Strategy and 5-year Implementation Plan (CBCTS)
Ref 17-26	<u>University of Cambridge Transport Policy</u>
Ref 17-27	Cambridge Biomedical Campus Transport Needs Review Parts 1, 2 and 3 (Freely available via SCDC website)

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Chapter 18 – Water Resource and Flood Risk



# **Environmental Statement**

## **Volume 2: Main Environmental Statement**

### **Chapter 18 – Water Resources and Flood Risk**

JUNE 2021

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Appendix 18.5 Data used to inform the assessment

## 18 Water Resources and Flood Risk

### 18.1 Introduction

- 18.1.1 This Chapter of the ES reports the environmental impact of construction and operation of the proposed Development with respect to water resources and flood risk. The assessment incorporates relevant design and other mitigation measures that would be employed during construction of the proposed Development, as well as during its operation, to avoid or reduce significant effects.
- 18.1.2 This Section should be read in conjunction with Chapter 8: Biodiversity and Chapter 12: Ground Conditions and Contamination.
- 18.1.3 It has been prepared alongside and informed by a Flood Risk Assessment (FRA), provided in Appendix 18.2, and surface water drainage information contained within Appendix 18.5. This Chapter is also informed by groundwater abstraction data, provided in Appendix 18.3, and a Simple Index Approach (SIA) assessment of water quality pollution risks from the operation of the scheme, provided in Appendix 18.4.

### Relevant Aspects of the Proposed Development

- 18.1.4 A full description of the proposed Development is given in Chapter 4: The Site and the proposed Development. The management of surface water generated from the proposed Development is of particular relevance to this assessment.
- 18.1.5 Measures to safeguard the water quality of local water features are necessary with the aim of contributing towards the objectives of key legislation, such as the Water Framework Directive (WFD) 2000 (Ref 18.1).
- 18.1.6 Management of the effects of the proposed Development on existing groundwater, land drainage and watercourse flow regimes are also key aspects in terms of ensuring that there is no detriment to flood risk or water environment receptors on or off-site.

### 18.2 Assessment Methodology

#### Legislation, Policy and Guidance

##### Legislation

- 18.2.1 This impact assessment has been undertaken in accordance with current legislation specific to the water environment, a summary of which is provided below.
- Directive 2000/60/EC of the European Parliament (the Water Framework Directive 2000) (Ref 18.1) introduced a single system of water management across the European Union (EU), which is based on the principle of river basin management. In order to achieve the Directive's objectives Member States are required to identify 'River Basin Districts' (RBDs) and produce 'River Basin Management Plans' (RBMPs) for each of the respective RBDs. The relevant RBMP for the proposed Development is the Anglian RBMP (Ref 18.2).
  - The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 18.3) implement the WFD in England and Wales, and became retained EU law at the end of the Brexit transition period. The Regulations identify the RBDs and the processes that the responsible authorities for the implementation of the Directive should follow in order to: produce the necessary RBMPs; identify bodies of water within each RBD that are used, or intended to be used, for the abstraction of drinking water; and produce a register of 'protected areas' within each RBD.
  - The Water Resources Act 1991 (Ref 18.4), as amended, sets out the regulatory regime under which water abstraction and impounding is licensed by the Environment Agency (EA) in England.
  - The Pollution Prevention and Control Act 1999 (Ref 18.5) provides for a unified system of environmental permitting. Within this the Environmental Permitting (England and

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Wales) Regulations 2016 (as amended) (Ref 18.6) provide the permitting regime that encompasses water discharge activities, groundwater activities, waste management activities and some activities associated with mines and quarries, including waste mining operations. An environmental permit is required for specified activities. Certain activities may benefit from an exemption from the environmental permitting regime, provided that they fulfil the conditions set by the EA.

- The Land Drainage Act 1991 (Ref 18.7) together with the Water Resources Act 1991 provide for the EA to prevent the obstruction of any main river through the construction of flow control structures, culverts or any other structure in a main river. Where culverting or other works have a potential to affect the flow regime on ordinary watercourses, consent is required from the Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010 (Ref 18.8), which legislates for more comprehensive management of flood risk for people, homes and businesses.

## Policy

- 18.2.2 The assessment has considered the National Planning Policy Framework (NPPF) (Ref 18.9) and its supporting Planning Practice Guidance – Flood Risk and Coastal Change (Ref 18.10). The NPPF sets out Government policy on development and flood risk. Its aims are to ensure that flood risk is taken into account at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is exceptionally necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.
- 18.2.3 The assessment also considers relevant policies of the Cambridge Local Plan 2018 (Ref 18.11). These include Policy 17: Cambridge Biomedical Campus (including Addenbrooke's Hospital) Area of Major Change, Policy 31: Integrated water management and the water cycle and Policy 32: Flood risk.
- 18.2.4 Relevant policies of the South Cambridgeshire District Council (SCDC) Local Plan (Ref 18.12) have also been considered. These include policies that address water use efficiency, safeguarding water quality, embedded Sustainable Drainage Systems into new developments and managing flood risk.
- 18.2.5 The Cambridge Biomedical Campus (CBC) is covered by covenants with the Hobson's Conduit Trust regarding drainage and special arrangements are in place to safeguard and monitor the quality of surface water entering Hobsons Brook and Hobsons Conduit. These covenants govern the right to access, for the purpose of carrying out works, the Hobsons Conduit. Discharge of surface water into Hobsons Conduit, through the North Ditch and/or South Ditch and/or other ditches constructed through the green corridor between the Cambridge Biomedical Campus and Hobson's Conduit, must also be controlled under the covenant.

## Guidance

- 18.2.6 A number of standards and non-statutory guidelines, which provide details of assessment methodologies and mitigation techniques, have been used to inform the assessment, including:
- LA 113 Road drainage and the water environment (formerly HD 45/09) (Ref 18.13);
  - Non-Statutory Technical Standards for Sustainable Drainage Systems (SuDS) (Ref 18.14);
  - CIRIA (C753) The SuDS Manual (Ref 18.15);
  - Code of practice for surface water management for development sites (BS8582:2013) (Ref 18.16);
  - Cambridge Sustainable Drainage Design and Adoption Guide (Ref 18.17); and
  - Guidance for Pollution Prevention series (Ref 18.18).



## Consultation and Scoping

### Consultation

**18.2.7 Error! Reference source not found.** Table 18-1 provides a summary of Consultee issues raised with respect to water resources and flood risk and how they have been addressed.

Table 18-1 Summary of Consultation

Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
<p>Greater Cambridge Shared Planning (GCSP) – incorporating Cambridgeshire County Council – Lead Local Flood Authority (LLFA)</p> <p>Hilary Ellis, Luisa Nunes, Brian Hefernan and Jessica Press</p> <p>Email correspondence, meetings on 14 May 2020, 19 June 2020, 13 August 2020 and 24 February 2021</p>	<p>The LLFA identified the following considerations for surface water and flood risk management:</p> <ul style="list-style-type: none"> <li>• Surface water drainage needs to follow the hierarchy of drainage solutions as set out in the National Planning Policy Framework (NPPF) (Ref 18.9) and Cambridge Local Plan (2018) (Ref 18.11), preferably for infiltration and soakaways, before discharge into local waterways (including Hobson's Brook) is considered.</li> <li>• Underground floodwater attenuation storage should be avoided where possible.</li> <li>• Any discharges to the Hobson's Brook need to be limited to greenfield rates and, in regard to water quality, the discharge should be treated before it enters existing sensitive watercourses.</li> <li>• Compensatory Sustainable Drainage Systems (SuDS) features should be provided where works affect any existing features. Consideration should be given to access for maintenance and inspection of SuDS.</li> <li>• No detriment should be caused to the functioning of the wider drainage system serving the Cambridge Biomedical Campus.</li> <li>• The LLFA confirmed that the existing drainage features on the Cambridge Biomedical Campus are currently managed by Cambridge Medipark Limited.</li> <li>• When accounting for climate change an allowance of 40% uplift in peak rainfall intensity should be used.</li> </ul> <p>The LLFA advised that groundwater levels are high in the vicinity of the proposed Development.</p> <p>The LLFA noted that by-laws cover the maintenance of Hobson's Brook and</p>	<p>The surface water and flood risk management measures that have been incorporated are detailed in the FRA (Appendix 18.2) and Appendix 18.5. These set out how the proposed Development will be safe from flooding over its lifetime, including for resilience to climate change, and how surface water runoff will be managed.</p> <p>SuDS have been incorporated into the drainage proposals where appropriate given the restricted space and layout constraints of the proposed Development.</p> <p>Flood risk from the North Ditch and Tibbets culvert have been assessed by undertaking hydraulic calculations, as detailed in the FRA.</p> <p>The preliminary drainage design is sympathetic to the functioning on the wider drainage system serving the Biomedical Campus</p> <p>Climate change allowance of 40% uplift in peak rainfall intensity has been applied in the preliminary drainage design.</p> <p>The assessment of effects on groundwater that has been undertaken is reported in Section 18.5.</p> <p>Hobson's Conduit Trust have been consulted and a copy of the covenants has been obtained.</p>

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	<p>consideration should be given to accessing the watercourse.</p> <p>The LLFA set out requirements for the Surface Water Drainage Strategy as shown in Table 18-2.</p>	<p>The requirements for the Surface Water Drainage Strategy were discussed with the LLFA in the meeting on 24 February 2021 and are addressed in the Surface Water Drainage Strategy section of the FRA.</p>
<p>Hobson's Conduit Trust (HCT)</p> <p>John Latham, Email correspondence, 22 June 2020</p> <p>Steve Boreham, Meeting 25 November 2020</p>	<p>The Trust clarified that "the whole Biomedical Campus is covered by covenants with the Trustees of Hobson's Conduit related to drainage and special arrangements are in place to safeguard and monitor the quality of surface water entering the Brook and Conduit."</p> <p>The Trust's key concern is preserving the quantity and quality of water in Hobson's Brook and Hobson's Conduit.</p> <p>In regard to flood risk, the Trust advised that the main flood risk in the Hobson's Brook catchment arises from changes to the existing surface water drainage regime. The existing regime is not designed to deal with flashy flows and therefore the Trust are keen to ensure flows are suitably attenuated from all developments with a connection to the Hobson's Brook.</p>	<p>The CBC was considered for the development of the drainage design. Appropriate measures regarding the treatment of runoff from the proposed Development during construction and operation are reported in Section 18.4.</p> <p>Section 18.4 summarises the measures secured to minimise the impact of the proposed Development on surface water receptors during construction and operation, including both water flows (quantities) and quality.</p> <p>The drainage strategy for the proposed Development has been designed to be sympathetic to the existing surface water drainage regime. Details of proposed SuDS and attenuation features are included in Appendix 18.5 and have been designed in accordance with the relevant standards (listed above in Section 18.2.5). Outline drainage plans are shown in Appendix 18.5.</p>
<p>Environment Agency (EA)</p> <p>Email correspondence, 3 March 2020 and clarification 20 October 2020</p>	<p>The EA provided comments as part of the Round One Public Consultation. Comments relevant to this topic are summarised below:</p> <ul style="list-style-type: none"> <li>There are sensitive surface water features in the area including Hobson's Brook, drains and ponds.</li> <li>It is important that surface waters are adequately managed and protected throughout the development lifecycle, taking into account potential impacts upon both water quality and water quantity.</li> <li>Dewatering activities could have an adverse impact upon local wells, water supplies and/or nearby watercourses and environmental interests. Subject to a detailed impact assessment (to be carried out by the Applicant) compensation and/or monitoring measures may be required for the</li> </ul>	<p>The sensitivity of the surface water features has been assessed in Section 18.3.</p> <p>Section 18.4 summarises the measures secured to minimise the impact of the proposed Development on surface water features during construction and operation, including both water flows (quantities) and quality.</p> <p>With reference to the third bullet point, the assessment undertaken is reported in Section 18.5. Risks to identified water features have been assessed in advance of detailed design information or GI being available.</p> <p>Details of proposed SuDS are included in Appendix 18.5 and have been designed in accordance with the relevant standards (listed above in Section 18.2.5). Outline drainage plans are shown in Appendix 18.5</p>

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Consultee/Contact/Date	Summary of Consultee Issue	How Addressed?
	<p>protection of other water users and water features.</p> <p>Discussion with the Groundwater and Contaminated Land team have clarified the scope of works required under the third bullet point above. The EA require a level of assessment commensurate with the project design stage.</p> <p>Any infiltration SuDS would need to meet relevant standards and must not be constructed in contaminated ground.</p>	

## Scoping

18.2.8 Table 18-2 provides a summary of consultee responses contained within the Scoping Opinion in relation to water resources and flood risk, and the corresponding location in the ES where they are addressed.

Table 18-2 Summary of Scoping Opinion

Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
LLFA	<p>The principles of surface water drainage outlined within the scoping report are acceptable to the LLFA. The LLFA set out a list of requirements that they expect to be covered in the FRA/surface water drainage strategy:</p> <ol style="list-style-type: none"> <li>1. How the proposed surface water drainage scheme has been determined following the drainage hierarchy.</li> <li>2. Pre-development run-off rates.</li> <li>3. Post development run-off rates with associated storm water calculations.</li> <li>4. Discharge location(s).</li> <li>5. Drainage calculations to support the design of the system.</li> <li>6. Drawings of the proposed surface water drainage scheme including sub-catchment breakdowns where applicable.</li> <li>7. Maintenance and management plan of the surface water drainage system (for the lifetime of the development) including details of future adoption.</li> </ol>	The surface water drainage proposals are described in Section 18.4. The listed requirements are addressed in detail in the FRA in Appendix 18.2
GCSP	Water quality pollution risks from the operation of the new infrastructure should be assessed using the methodology from Chapter 26 of the CIRIA SuDS Manual. The Simple Index Approach should be followed for this scheme to demonstrate that appropriate treatment is applied to mitigate the impact of the proposals.	Paragraph 18.4.13 of Section 18.4 and SIA in Appendix 18.4
EA	A sequential approach should be taken to the site layout, with all development located outside Flood Zone 3 where possible to avoid any potential increase in flood risk. For any new development that has to be located within Flood Zone 3, a detailed assessment and full details of proposed floodplain compensation should be included to demonstrate that there will be no increase in flood risk to third party land.	Paragraphs 18.3.28 and 18.3.29 of Section 18.3; paragraph 18.4.11 of

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Consultee/Contact	Summary Scoping Opinion Response	Location in the ES
	<p>The FRA and EIA should consider opportunities for reducing flood risk both within the site and upstream or downstream of the site and make recommendations for how the scheme should be designed to reduce flood risk overall.</p> <p>The EA expect a detailed assessment of the effects of climate change to be undertaken. If any changes to existing culverts or any new culverts are proposed, then these changes should be included in any detailed modelling to assess the impact of these on flood risk.</p>	<p>Section 18.4 and FRA in Appendix 18.2</p> <p>Climate change is covered in detail in Chapter 9: Climate Change Adaptation. More detailed development of the drainage proposals will be undertaken at later design stages along with detailed modelling</p>

## The Study Area

- 18.2.9 The study area for this assessment includes land within the proposed Development site boundary where there is potential for direct effects on water environment receptors. The potential for indirect effects on flood risk, drainage and water quality is considered at a catchment wide scale (i.e. the Hobson's Brook catchment, see Figure 18.1 of Appendix 18.1).
- 18.2.10 The study area has been defined in consultation with the relevant statutory bodies, including the LLFA, to reflect the surrounding water environment. The study area is considered to be sufficient for the inclusion of all potentially affected water receptors.
- 18.2.11 For the purposes of groundwater, the study area extends to a distance of 1 km from the proposed Development boundary.

## Methodology for Establishing Baseline Conditions

- 18.2.12 A desk-based study was carried out to establish baseline conditions within the study area. The desk study was informed by a number of published datasets available from the British Geological Survey (BGS), the EA, the LLFA, Soilscales (Cranfield Soil and Agrifood Institute) and Magic Map (DEFRA/EA). Hydrological catchment areas and characteristics were defined using the Centre for Ecology and Hydrology Flood Estimation Handbook (FEH) Web Service (Ref 18.19) and the EA's Catchment Data Explorer (Ref 18.20). Other data sources referenced include the Anglian RBMP (Ref 18.2) and the EA Water Quality Archive (Ref 18.21). Relevant information from site visits, walkovers and surveys has been used to inform the desk study. Data was also gathered through consultation with the key consultees listed in Table 18-1 and Table 18-2, and this is summarised below.
- 18.2.13 The EA, Cambridge City Council (CCiC) and SCDC were contacted to determine if they held any records of abstractions and active consented discharges in proximity to the proposed Development within the study area. The EA provided records of active consented discharges and deregulated abstractions; SCDC provided records of private water supply abstractions and CCiC advised they do not hold records of abstractions within the boundary of Cambridge City. The EA confirmed that there were no licenced abstractions within the study area. Information about the Babraham pumping station and the artificial recharge scheme has been gathered from the Cambridge Water AMP6 RSA Desk Study: Nine Wells Report (Ref 18.22).
- 18.2.14 Cambridge Medipark Limited has been responsible for undertaking surface water monitoring of Hobson's Brook in association with the Clay Farm development (located west of the proposed Development, near Trumpington village). The Hobson's Brook Surface Water

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Monitoring Report from July 2020 (Ref 18.23) and the raw data from the surveys undertaken in June 2020 (Ref 18.24) were provided by the LLFA and have been used to characterise the water quality and flow regime of this watercourse.

- 18.2.15 Understanding of baseline flood risk has been established by completing a FRA, which has been prepared in line with the requirements of the NPPF and is provided in Appendix 18.2. The FRA has used flood risk data and flood history information collected from a number of strategic reports produced by CCiC and Cambridgeshire County Council (CCoC) including the Strategic Flood Risk Assessment (SFRA) (Ref 18.25), Preliminary Flood Risk Assessment (PFRA) (Ref 18.26) and Addendum (Ref 18.27) and Surface Water Management Plan (Ref 18.28). The FRA also incorporates calculations/modelling of the North Ditch and Tibbets culvert which was informed by survey data of the channel and culvert.
- 18.2.16 Information in Appendix 18.5 which describes existing surface water drainage networks has been used to establish the existing land and railway track drainage regimes. Information on the drainage regime of the neighbouring CBC has been gathered from the Surface Water Strategy report for the extension of the CBC (Ref 18.29).

### Forecasting the Future Baseline

- 18.2.17 In the absence of the proposed Development, the current water environment is expected to be subject to future temporal variations. For example, it is anticipated that baseline water quality throughout the study area would be subject to change driven by implementation of measures to deliver the objectives of the WFD.
- 18.2.18 Climate change is anticipated to increase peak rainstorm intensities resulting in the potential for an increased frequency of flash flood events. However, there is also the potential for more frequent periods of drought, reducing the availability or reliability of surface and groundwater resources for both water supply and to transport and dilute wastewater effluents.
- 18.2.19 Other consented developments or those in planning in proximity to the proposed Development, also have the potential to influence the future baseline, with potential effects on overland drainage pathways, catchment hydrology and water quality. This is further discussed in Section 18.5.

### Defining the Importance/Sensitivity of Resources

- 18.2.20 The adopted assessment methodology is drawn from Volume 11 Section 3 Part 10 of the Design Manual for Roads and Bridges: LA113 Road Drainage and the Water Environment (Ref 18.13). The importance (or sensitivity) of receptors and their attributes is assigned based on the quality indicators and measures in Table 3.70 of LA113, which is shown in extract in Table 18-3 below (refer to Table 3.70 of LA113 for typical examples for each importance category).

Table 18-3 Criteria for Estimating the Importance (or Sensitivity) of Water Environment Attributes

Importance	Criteria
Very High	Nationally significant attribute of high importance
High	Locally significant attribute of high importance
Medium	Attribute of moderate quality and rarity
Low	Attribute of lower quality

## Methodology for Assessing Impacts

### Impact Characterisation

18.2.21 The magnitude of change (or impact) on the baseline condition of an attribute of the water environment is assigned considering the scale and extent of change and the nature and duration of the impact. Definitions of magnitude are provided in Table 18-4 below, which were adapted from Table 3.71 of LA113 with reference to the paper Practical Methodology for Determining the Significance of Impacts on the Water Environment (Ref 18.30).

Table 18-4 Criteria for Determining the Magnitude of Impact on Water Environment Receptors

Magnitude of Impact	Criteria
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute
Minor Adverse	Results in some measurable change in attribute quality or vulnerability
Negligible	Results in effect on attribute of insufficient magnitude to affect the use or integrity
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction
Minor Beneficial	Results in some beneficial effect on an attribute or a reduced risk of a negative effect occurring
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement in attribute quality

### Assessing Significance

18.2.22 The overall significance of an effect is then derived by combining the value (sensitivity) of the receptor with the magnitude of the predicted impact (change), as illustrated in

18.2.23 Table 18-5 below. The matrix is based on Table 3.8.1 in LA 104 – Environmental assessment and monitoring (Ref 18.31). Slight, moderate and large/very large significance may be adverse or beneficial.

Table 18-5 Criteria for Determining the Significance of Effects on Water Environment Receptors

		MAGNITUDE OF IMPACT				
		No Change	Negligible	Minor	Moderate	Major
SENSITIVITY OF ATTRIBUTE	Very High	Neutral	Slight	Moderate/Large	Large/Very Large	Very Large
	High	Neutral	Slight	Slight/Moderate	Moderate/Large	Large/Very Large
	Medium	Neutral	Neutral/Slight	Slight	Moderate	Moderate/Large
	Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/Moderate

18.2.24 Where more than one level of significance is possible, professional judgement is used to determine which is most appropriate on a case-by-case basis and ensuring regard to the precautionary principle. Effects with an overall significance of moderate, large and very large are considered Significant for the purposes of the relevant EIA regulations (Ref 18.32).



## Limitations and Assumptions

### Limitations

- 18.2.25 Flood risk to the proposed Development has been defined and assessed using currently available data from the EA and the LLFA, in addition to a hydraulic assessment of the North Ditch and Tibbets culvert. The limitations applicable to this hydraulic assessment are outlined in the FRA (Appendix 18.2).
- 18.2.26 In relation to the drainage of the proposed Development, it has been assumed that the drainage systems would discharge into existing watercourse networks. This assumption is made as no site investigation data is available to prove the feasibility of infiltration-based drainage solutions.

### Assumptions

- 18.2.27 The main assumption applicable to the hydraulic assessment of the North Ditch is that the peak water levels in the Ditch along the reach of interest are not influenced by water levels in the Hobsons Brook. Further information is provided in the FRA (Appendix 18.2).
- 18.2.28 No further assumptions relevant to this assessment that lie outside of the outline construction methodology and available operational information, documented in Section 18.4, have been made.

## 18.3 Baseline

### Existing Baseline

#### Catchment Hydrology

- 18.3.1 The topography of the study area slopes from the Gog Magog Hills in the south-east towards the River Cam in the north-west, with ground levels varying between approximately 7m and 72m Above Ordnance Datum (AOD).
- 18.3.2 Governed in part by this topography, surface water mainly flows from the south and south-east to the north and north-west. The proposed Development is located in the Hobson's Brook catchment which is drained by a network of small watercourses and drainage ditches which discharge to Hobson's Brook. The Hobson's Brook catchment has an area of approximately 12km<sup>2</sup> and the catchment boundary defined by the Flood Estimation Handbook (FEH) Web Service (Ref 18.19) is shown in Figure 18.1 of Appendix 18.1.
- 18.3.3 Hobson's Brook rises in Nine Wells Spring, a Local Nature Reserve (LNR), and flows generally northwards and parallel with the railway line within the study area, which is illustrated in Figure 18.1 of Appendix 18.1. Downstream of its crossing with Long Road, the watercourse splits into Hobson's Conduit and Vicar's Brook. Hobson's Conduit supplies water to the Cambridge University Botanic Garden and the city of Cambridge further downstream. Vicar's Brook discharges to the River Cam approximately 2km downstream of the Long Road crossing and 4km downstream of Nine Wells.
- 18.3.4 The River Cam is an EA designated main river and Hobson's Brook is an ordinary watercourse which is managed by Hobson's Conduit Trust (HCT) who have responsibility for the Brook and Conduit. The CBC is covered by covenants with the HCT regarding drainage and special arrangements are in place to safeguard and monitor the quality of surface water entering the Brook and Conduit (see paragraph 18.2.5).
- 18.3.5 Other surface water features within the study area include small watercourses, land drains and several ponds. These features are shown in Figure 18.1 of Appendix 18.1. The North Ditch and South Ditch are partially located within the proposed Development boundary. These two watercourses discharge to Hobson's Brook and both comprise culverted and open channel reaches.
- 18.3.6 The Hobson's Brook WFD waterbody (waterbody ID: GB105033037620) has a hydromorphological designation of 'heavily modified' which indicates that the watercourse has been heavily modified by human activity, in accordance with criteria specified in the WFD.

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- 18.3.7 Hobson's Conduit is an artificial channel that was created in the early 17<sup>th</sup> century to maintain a water supply into Cambridge from Nine Wells Spring. A review of historical mapping (1885 – 1938) (Ref 18.33) shows that there has been very little change in the alignment of Hobson's Brook over this time. Despite the increased development in the Hobson's Brook catchment since the 1940s, there has been no major change in the alignment of the watercourse in this time.
- 18.3.8 Between 50% and 80% of the flow in Hobson's Brook is from the Chalk springs at Nine Wells (Ref 18.22). The flow of water at Nine Wells is influenced by an artificial recharge scheme. The Cambridge Water AMP6 RSA Desk Study: Nine Wells report (Ref 18.22) provides information on the Babraham pumping station and the artificial recharge scheme. The artificial recharge scheme was put in place following investigations which showed there is a direct link between the abstraction of water at the Babraham pumping station and the flow of water at Nine Wells. The artificial recharge scheme was put in place to help maintain the flow of water from the spring at Nine Wells. Water is piped underground from the pumping station and is injected into four boreholes upstream of Nine Wells. This allows water to percolate naturally through the bedrock and rise at the spring at a minimum discharge rate of 20 litres per second: mimicking the natural process as closely as possible. HCT's monitoring data shows that summer flow in Hobson's Brook (which is fed by the spring at Nine Wells) was maintained in 2020. According to the HCT, 2020 is the first year that flow has been maintained throughout the summer in recent years.
- 18.3.9 Nine Wells springs are therefore fed by groundwater flowing from the south east. The LNR is therefore upgradient from the proposed Development boundary.
- 18.3.10 According to BGS online mapping (Ref 18.34), the proposed Development is partially underlain by River Terrace Deposits (sand and gravel) which are fluvial in origin. These superficial deposits are classified as a 'Secondary A Aquifer' which means the deposits are capable of supporting water supplies at a local rather than strategic scale. A portion of the proposed Development site is underlain by the Sand and Gravel Second Terrace Deposit (Sidgwick Avenue Member), which forms the present-day Hobson's Brook valley, with variable thickness up to 6m.
- 18.3.11 BGS mapping shows the proposed Development is underlain by bedrock of West Melbury Marly Chalk Formation which is classified as a 'Principal Aquifer'. Principal Aquifers are described as geology that exhibits high permeability and/or provide a high level of water storage. These may support water and/or river base flow on a strategic scale. The Chalk is often described as a dual-porosity system, where groundwater is primarily stored within the rock matrix, but movement (flow) occurs with fractures and solution features. The West Melbury Marly Chalk is however characterised by a high clay content such that matrix porosity is expected to be low 11-15%. The Chalk is also frequently found to be a dual permeability aquifer where the majority of groundwater flow occurs within fractures that are relatively close to the ground surface, often enhanced through chemical dissolution processes. The base of the West Melbury Marly Chalk is marked by the Gault outcrop. High transmissivity values are expected at the proposed Development site in the Chalk due to higher prevalence of fractures commonly occurring in valleys. Further detail regarding ground conditions is provided in Chapter 12: Ground Conditions and Contamination.
- 18.3.12 A review of the Soilsmap map (Ref 18.35) has been undertaken and the map shows that the soil types for the proposed Development site are freely draining lime-rich loamy soils and hallow lime-rich soils over chalk. Boggy conditions have been observed immediately to the south-west of Nine Wells underbridge (the bridge that carries Addenbrooke's Road) and along the pathways in the south of Hobson's Park. This may be indicative of shallow groundwater or localised poor drainage of surface water.
- 18.3.13 The existing drainage network for the CBC is served by a series of SuDS, ditches, gullies and attenuation features which have been designed to receive and attenuate flows from the wider surface water drainage system of the Campus, as detailed in Appendix 18.5. Three attenuation basins (situated north, middle and south) are part of the existing drainage system and have been designed to accommodate runoff generated in the 1 in 100 year plus 20% climate change allowance storm event. During more extreme rainstorm events that exceed the



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storage capacity and freeboard of the systems, landscaped areas which surround the basins have been designed to receive exceedance flows and retain the waters. The north and middle attenuation basins discharge, via flow control structures, to the North Ditch which conveys flows to Hobson's Brook approximately 600m downstream of these flow control structures. The south attenuation basin discharges, via a flow control structure, to the South Ditch which discharges to Hobson's Brook approximately 200m downstream of this flow control structure. The drainage ditches and attenuation basins within the existing drainage system are surrounded by swales. These are vegetated depressions which encourage infiltration of surface water runoff before it reaches the ditches and basins. In some parts of the drainage network, such as the AstraZeneca site to the south and east, surface water drainage is attenuated in underground tanks. Attenuation for runoff from Francis Crick Avenue (known as the 'Boulevard') is based on an allowable discharge rate of 3 litres per second per hectare based on a 100 year storm event. Runoff from adjacent development plots is attenuated to sustain an allowable discharge rate of 2 litres per second per developed hectare based on a 100 year storm event plus 20% allowance for climate change.

- 18.3.14 An assessment of the existing railway track drainage was undertaken and is reported in Appendix 18.5. The assessment showed that the existing method of track drainage varies throughout the study area. In some areas positive track drainage is graded so that water collects and flows to a lower elevation but for the majority of the track in the study area there is no formal drainage and water infiltrates naturally into the ground.

### Water Quality

- 18.3.15 The WFD sets out standards for water quality in rivers, estuaries, coastal waters and aquifers. RBMPs identify the main issues within a catchment and outline the means of achieving the targets set by the Directive.

- 18.3.16 Within the study area, the Hobson's Brook and the Cam and Ely Ouse Chalk groundwater body are classified under the European Parliament and Council WFD (Ref 18.1). Baseline water quality has been characterised for these waterbodies using WFD monitoring data relevant to the Cycle 2 2019 baseline. The EA Water Quality Archive (Ref 18.21), the Hobson's Brook Surface Water Monitoring Report (Ref 18.23) and sampling data from June 2020 (Ref 18.24) have also been used to characterise baseline surface water quality.

- 18.3.17 The Hobson's Brook WFD waterbody currently achieves an overall status of Moderate and a summary of the WFD data available for the waterbody is shown below in

- 18.3.18 Table 18-6.

Table 18-6 Hobson's Brook WFD Data Summary (Source: Cycle 2 data accessed via Ref 18.20)

WFD Parameter	Hobson's Brook (GB105033037620)
Current Ecological Status	Moderate
Current Chemical Status	Fail
Supporting Elements	
Supporting elements (Surface Water)	Moderate
Biological quality elements	Good
Hydromorphological Supporting Elements	Supports Good
Physico-chemical quality elements	Good
Priority substances	Good

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WFD Parameter	Hobson's Brook (GB105033037620)
Priority hazardous substances	Fail

18.3.19 Whilst WFD legislation is also applicable to the smaller watercourses and drains within the study area, these features are not specifically monitored under the WFD. Therefore, the water quality attributes of smaller watercourses and drains have been inferred using the data for Hobson's Brook to which they drain, as summarised in

18.3.20 Table 18-9.

18.3.21 The chemical status of the Hobson's Brook WFD waterbody is limited by priority hazardous substances. Of the priority hazardous substances monitored under the WFD, the waterbody fails due to the presence of polybrominated diphenyl ethers (PBDEs) and perfluorooctane sulphonate (PFOS). PBDEs are artificial organobromine compounds which have been used as flame retardants in a wide range of products such as electrical equipment, textiles and foams (Ref 18.36). PFOS is artificial and belongs to a group of substances that have been used over the past 50 years in a diverse range of domestic consumer products, in industrial processes and in foams used for firefighting (Ref 18.37). PBDEs and PFOS are recognised as persistent, bioaccumulative and toxic under the WFD.

18.3.22 There are four reasons for the Hobson's Brook waterbody not achieving good status listed in the RBMP, which include three groundwater abstraction activities (assigned a surface water management issue of flow) and one activity attributed to urban and transport (assigned a surface water management issue of physical modification).

18.3.23 The Hobson's Brook Surface Water Monitoring Report from July 2020 (Ref 18.23) and the data from the surveys undertaken in June 2020 (Ref 18.24) provide further insight into the water quality of the Hobson's Brook and also provide an indication for the North Ditch and the South Ditch. The water quality data has been compared against the relevant WFD Environmental Quality Standards (EQS) (Ref 18.38) for each monitoring location. Monitoring locations are along Hobson's Brook in Hobson's Park (between Addenbrooke's Road and Long Road), in the outflow pipes from the ponds in Hobson's Park, along the North Ditch and downstream of the southern attenuation basin at the CBC. These sites are illustrated in Figure 18.1 of Appendix 18.1. The concentrations of the parameters measured in June 2020 were broadly indicative of Good or High status, with the exception of the following parameters at the following monitoring locations:

- H4, Pond 1, Pond 2 and Brook US Ditch – dissolved oxygen was indicative of Poor status
- Pond 1 – ammonia was indicative of Poor status
- All sampled pond sites – total phosphorous was indicative of Bad status
- H3, Brook US Ditch and Pond 1 – total zinc exceeded the standard
- H3 – suspended solids exceeded the standard
- H2, H4 and Pond 1 – nitrate exceeded the standard

18.3.24 The report also presents cumulative results from water quality data collected since 2012. Cumulative results for parameters such as temperature and pH are indicative of Good WFD status. However, exceedances of the standards for Good WFD status were identified in the cumulative results for the following parameters at one or more of the monitoring locations: dissolved oxygen, biological oxygen demand, ammonia, phosphorus, copper, zinc, suspended solids and nitrate. The inclusion of the June 2020 data (which alone indicates Good or High status) did not lead to any improvements in the indicative status of the cumulative results.

18.3.25 A high-level review of the data available on the EA Water Quality Archive (Ref 18.21) for surface water monitoring locations at the proposed Development shows that the data is commensurate with the data from the Hobson's Brook Surface Water Monitoring Report.

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18.3.26 The proposed Development is located in two Nitrate Vulnerable Zones (NVZs): the Ely Ouse and Cut-off surface water NVZ and the Anglian Chalk groundwater NVZ. NVZs are areas designated by the EA as being at risk from agricultural nitrate pollution. Waters are defined as polluted if they contain or could contain, if preventative action is not taken, nitrate concentrations greater than 50mg/l.

18.3.27 The Cam and Ely Ouse Chalk WFD groundwater body (waterbody ID: GB40501G400500) currently achieves an overall status of Poor and a summary of the WFD data available for the waterbody is shown below in Table 18-7.

Table 18-7 Cam and Ely Ouse Chalk WFD Data Summary (Cycle 2, 2019)

WFD Parameter	Cam and Ely Ouse Chalk (GB40501G400500)
Quantitative	Poor
Chemical (GW)	Poor
Supporting Elements	
Quantitative Saline Intrusion	Good
Quantitative Water Balance	Good
Quantitative Groundwater Dependent Terrestrial Ecosystems (GWDTEs) Test	Good
Quantitative Dependent Surface Water Body Status	Poor
Chemical Drinking Water Protected Area	Poor
General Chemical Test	Poor
Chemical GWDTEs test	Good
Chemical Dependent Surface Water Body Status	Good
Chemical Saline Intrusion	Good

18.3.28 There are 16 reasons stated in the RBMP for the Cam and Ely Ouse Chalk groundwater body not achieving good status. These include seven groundwater abstraction activities, four poor nutrient management activities, two sewage discharge (continuous) activities, two transport drainage activities and one activity assigned 'other' which has been identified as a probable diffuse source. As recharge dominates in sections of the unconfined chalk, areas exposed without terrace deposits are the most vulnerable to surface-derived pollutant inputs. The karstic properties of the chalk further highlight the vulnerability to contamination, with topsoil providing minimal protection, and a soil leaching potential that is high in the unconfined chalk.

### Flood Risk

18.3.29 A FRA has been carried out for the proposed Development and is provided in Appendix 18.2. The baseline flood risk to the proposed Development is summarised below.

18.3.30 The EA Flood Map for Planning (Rivers and Sea) (Ref 18.39) as provided in Figure 3-1 of the FRA, indicates that the majority of the proposed Development is located in Flood Zone 1, with an annual chance of flooding from rivers less than 1 in 1,000 (0.1%). Land where the station is proposed is designated as Flood Zone 2 (with an annual chance of flooding from rivers between a 1 in 100 (1%) and 1 in 1,000 (0.1%)) and Flood Zone 3 (with an annual chance of flooding from rivers greater than 1 in 100 (>1%)). The source of flood risk is identified as the

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North Ditch. Flood Zones refer to the probability of river and sea flooding ignoring the presence of defences. The proposed Development is not located in an area benefitting from flood defences.

- 18.3.31 The EA advised that the mapped Flood Zones in the study area have been derived through JFlow generalised computer modelling, which is a coarse modelling approach that produces Flood Zones that cannot be relied on to inform site-specific assessments of flood risk. Therefore a study has been undertaken to more accurately ascertain fluvial flood risk to the proposed Development from the North Ditch more accurately. The study focussed on the area of the proposed Development where the new station would be situated and included hydrological modelling of the North Ditch catchment to derive flood flow estimates and hydraulic modelling of a 150m reach of the watercourse. The modelling results show that no out-of-bank flooding is predicted for the 1 in 100 year or 1 in 1,000 year events. The site-specific modelling results have confirmed that the EA Flood Map for Planning mapped flood zones, derived from the national generalised model, do not accurately represent flood risk local to the proposed Development.
- 18.3.32 As detailed within the FRA, there are no recorded incidents of flooding within the proposed Development site boundary. The EA and LLFA have confirmed this through consultation. The closest recorded incidents of flooding to the proposed Development site boundary are summarised in the FRA.
- 18.3.33 The LLFA recognises surface water flooding and drainage as key concerns in the area of the proposed Development and these issues have been discussed in meetings throughout the EIA process as summarised in Table 18-1. The sensitivity of the surface water features in the vicinity of the proposed Development was also noted by the EA in their response to the first round of consultation.
- 18.3.34 The EA Risk of Flooding from Surface Water Map (Ref 18.40) as provided in Figure 4-1 of the FRA, shows that the risk of surface water flooding varies across the proposed Development. Some areas of the proposed Development site, such as between Shepreth Branch Junction and Nine Wells, are shown to be at 'very low' risk of surface water flooding, equivalent to an annual chance of flooding less than 1 in 1,000 (0.1%). The area of the proposed Development site to the north of Nine Wells, around Addenbrooke's Road, is shown to be predominantly at 'low' risk of surface water flooding (chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%) each year). Small parts of this area around Addenbrooke's Road are shown to be at 'medium' risk (chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%) each year) and 'high' risk (chance of flooding of greater than 1 in 30 (3.3%) each year) of surface water flooding including where Hobson's Brook is culverted under the railway line. There are reported drainage issues along the pathways in the south of Hobson's Park.
- 18.3.35 The Risk of Flooding from Surface Water Map also shows there are areas of elevated surface water flood risk to the south of the Guided Busway, where the new station is proposed, and along the North Ditch on the reach where it is culverted under the railway line (Tibbets culvert) into Hobson's Park. There are also areas shown to be at elevated risk of surface water flooding adjacent to the railway line, between the Guided Busway and Hills Road. The FRA provides more detail on surface water flow paths, elevated areas of surface water flood risk and how these have been considered in the drainage design for the proposed Development.
- 18.3.36 The Cambridge and South Cambridgeshire SFRA (Ref 18.25) reports on flood risk from groundwater sources and is informed by data compiled by the EA and BGS. Data from the SFRA, combined with information on the underlying geology (see 18.3.10), suggests that the proposed Development is located in an area that is at risk of groundwater flooding. Furthermore, the LLFA advised during consultation that groundwater levels are high in the vicinity of the proposed Development. This is supported by available BGS borehole data within the proposed Development site, where the groundwater level is struck close to the ground level indicating that the hydraulic head is maintained within the second terrace deposit. The presence of a Principal Aquifer (see 18.3.10) suggests that there is a risk of groundwater flooding by the clearwater flooding mechanism. This mechanism is associated with the water table rising to the surface in areas of permeable bedrock geology such as the Chalk which partially underlies the proposed Development. Groundwater flooding is also possible by 'river-

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groundwater interaction' where river levels interact with permeable superficial deposits within river valleys. This mechanism of groundwater flooding is possible in the area of the proposed Development underlain by superficial deposits. Despite the potential for groundwater flooding indicated in the SFRA and the high groundwater levels, there are no recorded incidents of groundwater flooding within the proposed Development boundary.

18.3.37 As Hobson's Brook is inland, not tidally influenced and the River Cam is not tidally influenced, the proposed Development is not considered to be at risk of tidal flooding.

18.3.38 The proposed Development does not lie within an area at risk of flooding from reservoirs. The nearest extent of flooding from reservoirs shown on the EA long term flood risk map (Ref 18.40) is along the River Cam to the west of the proposed Development and the River Granta (a tributary of the Cam) to the south.

18.3.39 Utilities plans from Cambridge Water and Anglian Water show that there are water mains and foul sewers within the proposed Development boundary. However, mapping in the Cambridge and South Cambridgeshire SFRA (Ref 18.25) shows that there are no recorded incidents of sewer flooding at the proposed Development site.

## Water Resources

18.3.40 The study area is known to have limited surface and groundwater resources and is considered to be a water stressed area (Ref 18.2). Low average annual rainfall in the catchment makes it one of the driest areas in the country and the catchment has been affected by droughts in the past. The EA recognise over-abstraction as a key management issue within the Cam and Ely Ouse catchment (which incorporates the Hobson's Brook catchment) in the Anglian RBMP (Ref 18.2).

18.3.41 Records of six active discharge consents (five of which are within the study area) and one deregulated groundwater abstraction were provided by the EA. South Cambridgeshire District Council (SCDC) provided details for seven deregulated groundwater abstractions (four of which are within the study area). These are shown in Figure 18.2 of Appendix 18.1 and listed in Table 18-8 below and in Appendix 18.3.

Table 18-8 Active Discharge Consents

Consent Number	Date Effective	National Grid Reference	Permit Holder	Discharge Type	Receiving Waterbody
PRCNF04431	16/08/1991	TL4567053600	Scotsdale Nursery and Garden Centre Ltd	Shop	Hobson's Brook
PRCNF17649	14/12/2011	TL4638053950	Sir Francis Pemberton	Wastewater Treatment Works (not water company)	Hobson's Brook
PRCNF05025	23/04/1992	TL4622055010	Cambridge University Hospitals NHS Foundation Trust	Dental/ hospital/ nursing home/ human health	North Ditch
EPRCB3492AP	07/08/2015	TL4610055100	Mace Limited	Construction of buildings	North Ditch
EPREB3793WK	28/10/2016	TL4602454627	Unknown	Construction of buildings	South Ditch

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18.3.42 The receiving waterbodies in Table 18-8 have been inferred based on the locations of the discharges.

18.3.43 Information on the location of wells, springs and boreholes, within 1 km of the proposed Development boundary has been collated from EA, BGS, Local Authority and Ordnance Survey datasets. These are summarised in Appendix 18.3. (The location of the Nine Wells augmentation boreholes is not recorded on either of these data sets). The location of these features is shown in Figure 18.2. It is considered likely that all of the features above are (or were) reliant on water from the Chalk Aquifer. (There is a high likelihood that boreholes identified from historical BGS records are no longer operational, but they will be retained in the assessment until this is confirmed).

18.3.44 All the private water supplies identified by the local authority are located at distances in excess of 1 km from the proposed Development boundary and are thus not included in Appendix 18.3.

18.3.45 The abstraction of water for the Babraham pumping station is known to have a direct impact on water flow at Nine Wells, as detailed previously in paragraph 18.3.8. The abstraction for the Babraham pumping station is a groundwater borehole and is operated by Cambridge Water.

18.3.46 Potable water is supplied to the study area by Cambridge Water and their water resources are supplied from groundwater sources: 97% are from chalk aquifers and 3% from greensand aquifers (Ref 18.41). The proposed Development is located in the Cam and Ely Ouse Chalk Drinking Water Protected Area. Within the WFD, Drinking Water Protected Areas are where raw water is abstracted from reservoirs, rivers and the ground. Raw water is treated if required and then supplied as potable water.

18.3.47 Wastewater in the study area is collected and treated by Anglian Water and foul water sewers are located under the proposed Development site. There are no Anglian Water Wastewater Treatment Works in the study area.

### Importance of Receptors and their Attributes

18.3.48

18.3.49 Table 18-9 provides a summary of the importance (or sensitivity) assigned to water receptors and their attributes. These have been assigned guided by the criteria presented in Table 18-3 and in LA113.

*Table 18-9 Summary of Value of Water Environment Receptors and their Attributes*

Receptor	Attribute	Description	Importance (Sensitivity)
Hobson's Brook	Flood flow storage and conveyance	Areas of EA mapped Flood Zone 2 and 3 within the study area, key land feature	High
	Water quality	Watercourse having a WFD classification shown in a RBMP and a Q95 flow of less than 1m <sup>3</sup> /s	High
	Water supply and dilution and transport of wastewater	Receives consented discharges including from a non-water company Wastewater Treatment Works. No recorded abstractions	Medium
North Ditch	Flood flow storage and conveyance	Areas of EA mapped Flood Zone 2 and 3 within the proposed Development boundary and serves a locally important land drainage function	Medium*
	Water quality	Watercourse does not have a WFD classification in the RBMP, inferred WFD class	Medium

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Receptor	Attribute	Description	Importance (Sensitivity)
		of 'Moderate' based on available monitoring data	
	Water supply and dilution and transport of wastewater	Receives consented discharges. No recorded abstractions	Medium
South Ditch	Flood flow storage and conveyance	Areas of Flood Zone 2 and 3 within the proposed Development boundary and serves a locally important land drainage function.	High
	Water quality	Watercourse does not have a WFD classification in the RBMP, inferred WFD class of 'Moderate' based on available monitoring data	Medium
	Water supply and dilution and transport of wastewater	Receives consented discharges. No recorded abstractions	Medium
Small watercourses and land drains	Flood flow storage and conveyance	Medium to high risk of surface water flooding, key to local land drainage regime	Medium
	Water quality	Watercourses do not have a WFD classification in the RBMP, inferred WFD class of 'Moderate' based on available monitoring data	Medium
	Water supply and dilution and transport of wastewater	Watercourses in the vicinity of the Cambridge Biomedical Campus receive consented discharges. No recorded abstractions	Medium
Ponds	Flood flow storage and conveyance	Waterbodies with low probability of flooding	Low
	Water quality	Watercourses do not have a WFD classification in the RBMP, inferred WFD class of 'Moderate' based on available monitoring data	Medium
Land drainage regime (including the Cambridge Biomedical Campus surface water drainage network)	Flood flow storage and conveyance	Key to local drainage, Biomedical Campus drainage network designed to attenuate runoff generated in the 1 in 100 year plus 20% climate change allowance storm event	High/Medium
Cam and Ely Ouse groundwater	Groundwater resource and groundwater quality	Principal aquifer providing a regionally important resource. Supports abstractions and over-abstraction recognised as a key management issue in the Anglian RBMP	Very High



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Receptor	Attribute	Description	Importance (Sensitivity)
(Principal Aquifer)			
River terrace deposits (Secondary A Aquifer)	Groundwater resource and groundwater quality	Aquifers providing water for agricultural or industrial use with limited connection to surface water, or unproductive strata	Medium

\* Hydraulic modelling of the North Ditch, details of which are included in the Flood Risk Assessment (Appendix 18.2) shows no out-of-bank flooding for the modelled events and suggests that flood risk from the North Ditch to the proposed Development is lower than indicated by the mapped Flood Zones in the EA Flood Map for Planning. Hence medium importance has been assigned.

## Future Baseline

18.3.50 Without the proposed Development, baseline conditions described herein would largely be expected to continue. By 2027, WFD objectives for Hobson's Brook are for the waterbody to achieve Good overall status, an improvement from its existing Moderate status. For the Cam and Ely Ouse Chalk groundwater body, the objectives and predictions for the status of supporting elements of the waterbody are the same as their existing status, except for the supporting elements linked to the surface waterbody which are predicted to improve from Poor to Good.

18.3.51 Climate change allowances were incorporated into the hydraulic modelling of the North Ditch, as summarised in the FRA. No out-of-bank flooding is predicted in the modelled events that account for climate change.

18.3.52 Other consented developments or those in planning in proximity to the proposed Development, also have the potential to influence the future baseline with potential effects on surface water and groundwater receptors. This is further discussed in the Assessment of Residual and Cumulative Effects in Section 18.5.

## 18.4 Design and Mitigation

18.4.1 Details of the design measures that would act to safeguard the existing hydrological regime, water receptors and their attributes are summarised below.

### Construction Approach and Mitigation of Construction Effects

18.4.2 A qualitative assessment of the effects on the water environment resulting from construction of the proposed Development has been undertaken. This has considered the types of construction activities involved, the duration of activities and their proximity to water features. When assigning magnitude to the impacts identified, in accordance with Table 18-4, the following measures and controls have been assumed to be in place.

18.4.3 To ensure the quality of the water environment does not deteriorate during construction, an outline Code of Construction Practice (CoCP Part A) (see Appendix 2.4 of the ES). This documents best practice construction methodologies and describes procedures for the management of environmental impacts during construction, including a Pollution Control Plan, to safeguard the quality of surface water and groundwater during the construction phase. Method statements would be prepared, and activities would be managed and monitored by the main contractor, to include the following best practice measures as part of a detailed CoCP (CoCP Part B):

- Avoiding the storage of any potentially polluting materials in close proximity to any waterbodies, including stockpiles of soil to reduce potential for sedimentation. Where this is not possible works would be undertaken in accordance with approved method statements and in accordance with environmental permitting requirements/restrictions in order to safeguard the water environment.



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- Soil stripping managed to ensure the minimum area of exposed soil at any one time.
  - Fuels and chemicals would be stored, and refuelling would take place within bunded areas to prevent leakage, and these would be located away from waterbodies. Drainage from these areas would incorporate an isolation facility such that the outlet could be sealed in the event of a spill.
  - Provision made for water treatment to remove sediment before discharge to a surface water feature.
  - Concrete would be laid only following the suitable preparation of the ground surface and temporary shuttering used to contain potential leaks.
  - Designated washing out areas would be set up for concrete lorries with impermeable liners to protect the soil and groundwater below.
  - Wastewater generated from the construction compounds would be disposed of via appropriate means, for example pumped out and removed from site by tanker.
- 18.4.4 An emergency spillage response plan in the CoCP Part B would document measures to be implemented to prevent pollutants infiltrating into the soils beneath the site and reaching surface water or groundwater receptors. Appropriate equipment (e.g. absorption mats) would also be made easily accessible on site to deal with accidental spillages and the plan would also provide a full list of protocols and communication channels with the EA in the event of a pollution incident. Should any pollution incidents occur, the EA incident hotline would be called immediately in tandem with dealing with any spillages.
- 18.4.5 The CoCP Part B will document how construction works with the potential to impact flow conveyance of local watercourses (e.g., works to extend Tibbets culvert) will be carried out to minimise the potential for increased fluvial flood risk from these watercourses during construction.
- 18.4.6 Drainage works will require excavation of new attenuation basins (SuDS) and outfalls prior to the commencement of the main construction works.
- 18.4.7 As a result of the sensitivity of the site in relation to the chalk and the location of Nine Wells, any piling will be undertaken in accordance with the recommendations from a piled foundation risk assessment (to be undertaken during detailed design), reducing the potential risk of creating contamination pathways as a result of piling during construction. This will be submitted for approval as part of CoCP Part B.
- 18.4.8 Excavation for the lift shaft during the construction phase would require dewatering. Depending on the quantities an environmental permit to discharge the water may be required. This will be confirmed during the detailed design (GRIP 4) stage, informed by ground investigation data. If dewatering activities are proven to be significant enough to fall under the permitting regime, additional assessments in accordance with EA methodologies would be undertaken to inform the consent application.
- 18.4.9 Any consenting requirements would be adhered to by the appointed contractor. This will reduce potential pollution risks to the receiving waterbody, as well as safeguard private supplies, Hobson's Brook and Nine Wells.

## Scheme Design and Mitigation of Operational Effects

- 18.4.10 The assessment of the operational effects of the proposed Development has been both qualitative and quantitative in some respects. For example, calculations have been undertaken to quantify the effects on surface water runoff and these have been used to inform the Surface Water Drainage Strategy, as detailed in the FRA (Appendix 18.2).
- 18.4.11 The FRA provides an overview of flood risk to the proposed Development from all sources, with the assessment of fluvial flood risk being informed by a hydraulic assessment of the North Ditch and Tibbets culvert. The hydraulic model of the North Ditch predicts no out-of-bank flooding in all of the modelled events, including those that consider climate change over the development lifetime (currently assumed to be 120 years). The model results suggest that the proposed Development is at lower risk of fluvial flooding than indicated by the EA Flood Map

for Planning mapped flood zones. Given these findings, measures to mitigate fluvial flood risk during operation are not considered necessary.

- 18.4.12 The proposed Development would result in an increase in impermeable area which could result in an increase in surface water runoff rates and volumes. It is considered that the potential increase in surface water runoff due to an increase in impermeable area can be adequately managed through implementation of the drainage proposals which are described in the following paragraphs. The drainage proposals would therefore mitigate surface water flood risk to the proposed Development and the surrounding area.
- 18.4.13 SuDS would be utilised to manage surface water from the proposed Development, in terms of both water quality and quantity. Swales and attenuation basins will be used to receive and attenuate surface water runoff, as described in the FRA. An SIA assessment (as detailed in 'The SuDS Manual (C753)') has been undertaken to provide a high-level assessment of water quality pollution risks from the operation of the proposed Development and is included in Appendix 18.4. The SIA assessment shows that the proposed swales and attenuation basins are sufficient for mitigating total suspended solids and metals, but some additional hydrocarbon mitigation would be required. This additional hydrocarbon mitigation would be accounted for in the detailed drainage design (to be undertaken at subsequent design stages) and may include measures such as installing vortex separators at the outfalls of the attenuation basins. The SIA assessment concludes that subject to their detailed design, sufficient SuDS measures are included to protect the water quality of receiving watercourses.
- 18.4.14 The drainage design proposals have adopted a plus 40% allowance for climate change in line with LLFA guidance (see Section 18.2 and Table 18-1) and will be sympathetic with the existing drainage arrangements that serve the Biomedical Campus. The proposed attenuation ponds have been sized to ensure a discharge rate no greater than 2 litres per second per hectare. The calculations undertaken to determine the attenuation requirements for the proposed Development are detailed in the FRA.
- 18.4.15 Network Rail will be responsible for the maintenance and management of the surface water drainage system for the proposed Development. Maintenance will be carried out in accordance with the Network Rail Drainage Systems Manual (Ref 18.42). The Manual covers general drainage maintenance, maintenance of railway drainage, maintenance of culverts and sets out standards for undertaking drainage inspections and surveys.
- 18.4.16 Where the proposed Development requires works to existing drainage structures or installation of new structures (such as Tibbets culvert), they will be designed and sized appropriately to ensure there is no increased flood risk from this source and no detriment to the local drainage regime. Typically, ordinary watercourse consent would need to be obtained from the LLFA prior to construction works for new culverts or extending culverts under the Land Drainage Act (Ref 18.7). However, for the proposed Development, the TWAO will cover requirements of the Land Drainage Act and demonstrate that:
- The design of watercourses crossings, culvert extensions and modifications would cause no detriment to the flow regimes of watercourses and no increase in flood risk either upstream or downstream.
  - Access to the Hobsons Brook and any ordinary watercourses (e.g. the North and South Ditches) for maintenance and future improvement would not be prejudiced.
- 18.4.17 Where sewer connections are required as part of the development of the new station, these connections will be sized appropriately and will be undertaken in consultation with Anglian Water. Consent from Anglian Water would be sought for any new sewer connections.
- 18.4.18 Habitat improvements in the riparian corridor proposed as part of the biodiversity enhancements include minor changes to vegetation and no in-stream works are proposed. Therefore, this is not assessed further in this chapter. For more detail on the proposed biodiversity enhancements reference should be made to Chapter 8: Biodiversity.

## 18.5 Assessment of Residual and Cumulative Effects

### Residual Effects from Construction

## Water Quality

- 18.5.1 The construction phases of the proposed Development would require earthworks to take place, including excavation, transportation, stockpiling and backfilling of material. Erosion and subsequent mobilisation of this material, by wind or water, and its transportation via surface water runoff to surface watercourses has the potential to result in sedimentation. There is also the potential for accidental spillages of oils, chemicals, cement and fuels from the movement of construction traffic across the site and in association with chemical storage facilities. However, given the implementation of the control measures outlined in the CoCP Part A (to be detailed further in the CoCP Part B by the contractor prior to construction) and the embedded design measures outlined in Section 18.4, it is considered that there would be impact of negligible magnitude on the water quality attributes of surface water features. This would result in an overall Slight Adverse significance of effect for Hobson's Brook (high importance) and the North Ditch, South Ditch, small watercourses and land drains and ponds (medium importance). This is therefore judged to be **Not Significant**.
- 18.5.2 During the construction of new structures along watercourses (new accommodation bridge over Hobson's Brook adjacent to Addenbrooke's Road and works to extend Tibbets culvert on the North Ditch) there is a higher risk of temporary impacts on surface water quality through the disturbance of the banks of the watercourses and through works being undertaken in closer proximity to them. There is also a higher risk of temporary impacts on surface water quality where construction compounds are located in proximity to surface water receptors. However, measures outlined in the CoCP Part A (and detailed in the CoCP Part B) for avoiding pollution when working adjacent to watercourses or in channel, would be implemented. The effect of these construction activities on the water quality attributes of surface water receptors is therefore considered to be minor and would have an overall Slight Adverse significance of effect for Hobson's Brook (high importance) and the North Ditch, South Ditch, small watercourses and land drains and ponds (medium importance). This is therefore judged to be **Not Significant**.
- 18.5.3 Degradation of groundwater quality is possible during shaft excavation and piling activities which increase the risk of creating contamination pathways and hence increase the potential for pollutants to enter groundwater. However, measures outlined in the CoCP Part A (and detailed in the CoCP Part B) for safeguarding groundwater quality during these activities would be implemented. Where any dewatering is required for excavation of the lift shaft, the quantities will be assessed in line with EA methodologies where required (informed by ground investigation data) and any permitting requirements would be adhered to. The effect of these construction activities on Cam and Ely Ouse groundwater (very high importance) and river terrace deposits (medium importance) would therefore be negligible, with an overall Slight Adverse significance of effect. This is therefore judged to be **Not Significant**.

## Flood Risk and Drainage

- 18.5.4 Construction activities would result in the creation of additional impermeable surface areas within the proposed Development boundary. Increased rates and volumes of surface water runoff would be generated from these areas, with the potential for increased surface water flood risk onsite and in the surrounding area. However, work site runoff would be managed in accordance with best practice protocols, secured in the CoCP Part B. This would result in a negligible magnitude of impact on the conveyance properties of local watercourses (assigned high importance for Hobson's Brook and South Ditch and medium importance for North Ditch and small watercourses and land drains) and the overall baseline land drainage regime which has been assigned high/medium importance. Therefore, this would result in an overall Slight Adverse significance of effect. This is therefore judged to be **Not Significant**.
- 18.5.5 There is potential for temporary residual flood risk effects on the proposed Development during construction from Hobson's Brook (high importance), North Ditch, South Ditch and small watercourses and land drains, all assigned as having medium value for their flood flow and storage attributes. However, the footprint of the development within the floodplain has been minimised and the CoCP Part B would document how the works would be carried out to minimise the potential for increased fluvial flood risk from these watercourses during

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construction. Residual fluvial flood risk impacts are therefore considered to be negligible and would result in a Slight Adverse significance of effect. This is therefore judged to be **Not Significant**.

- 18.5.6 Construction compounds (CC1 and CC2, shown in Figures 4-7 and 4-8 of Chapter 4: The Site and the Proposed Development) would be located in relatively close proximity to Nine Wells, where disturbance of topsoil and superficial deposits could result in increased infiltration into the chalk aquifer leading to higher groundwater levels down the hydraulic gradient. Measures would be incorporated into the CoCP Part B to reduce the potential for disturbance of topsoil and superficial deposits and the land within the construction footprint would be reinstated to its current condition. Therefore, residual impacts from increased infiltration during construction on the Cam and Ely Ouse groundwater (very high importance) are considered to be negligible, with a Slight Adverse significance of effect overall. This is therefore judged to be **Not Significant**.

### Water Resources

- 18.5.7 Water use during construction for activities such as wheel washing could result in increased pressure on water resources. Measures will be incorporated into the CoCP Part B to ensure that water required for construction is sourced and re-used appropriately to ensure no residual impact from increased water usage for construction activities. Therefore, no change to the Cam and Ely Ouse groundwater or river terrace deposits receptors, assigned very high importance and medium importance respectively, is anticipated. This would result in a Neutral overall significance of effect that is judged to be **Not Significant**.
- 18.5.8 Foul water generated during the construction phase by construction staff would be dealt with appropriately to ensure there would be a no impact on the Cam and Ely Ouse groundwater (very high importance) or river terrace deposits (medium importance) receptors. This would result in an overall Neutral significance of effect on the water environment, that is judged to be **Not Significant**.

## Residual Effects from Operation

### Water Quality

- 18.5.9 The proposed Development would be served by a range of SuDS that would collect, convey and provide treatment of surface water runoff prior to discharge to receiving watercourses, namely North Ditch and South Ditch (which discharge to Hobson's Brook). During the operational phase, any typically small-scale accidental spills in parking/storage areas would be contained in line with standard operational practice. Given the implementation of the embedded design measures during operation, it is considered that there would be negligible magnitude of impact on the water quality attributes of surface water receptors (of high and medium value for the Hobsons Brook and other water features in the study area respectively), with an overall Slight Adverse significance of effect, that is judged to be **Not Significant**. This is supported by the SIA assessment of water quality pollution risks during operation included in Appendix 18.4 and Figure 18.1 of Appendix 18.1.
- 18.5.10 No operational activities have been identified which increase the potential for pollution of groundwater compared to the baseline. Therefore, no change to the groundwater receptors is anticipated as a result of the proposed Development.
- 18.5.11 It is anticipated that the proposed Development will not prevent current and future WFD objectives being met for surface waterbodies and groundwater bodies.

### Flood Risk and Drainage

- 18.5.12 The modifications to the Hobson's Brook culvert (near Shepreth Branch Junction) are not anticipated to impact baseline fluvial flood risk from the Hobson's Brook. Potential effects on baseline fluvial flood risk are associated with the extension of culverted reaches of watercourses (North Ditch and a small land drain) which have the potential to change their existing flow regimes. However, these culverts will be designed in line with best practice to avoid localised hydraulic effects in accordance with LLFA requirements covered under the TWAO. Except for the culvert modifications, which require in-channel works, construction

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would be avoided in areas at existing risk of fluvial flooding. No material loss of floodplain storage would result due to the proposed Development. This will reduce effects such that overall, the significance is judged to be Neutral, and **Not Significant**.

- 18.5.13 The new accommodation bridge over Hobson's Brook, adjacent to Addenbrooke's Road, will be designed, as a clear span structure with appropriate soffit level, to ensure it does not impact the baseline flow or flooding regime of the Hobson's Brook. Through design, potential effects on baseline flood risk will therefore be avoided, such that overall the significance is judged to be Neutral and **Not Significant**.
- 18.5.14 Any potential increase in surface water runoff (due to the increased impermeable area) during operation would be managed in accordance with the Surface Water Drainage Strategy (see the FRA, Appendix 18.2).
- 18.5.15 As a result of the design of the culvert modifications, and the sustainable management of surface water runoff from the proposed Development, there would be a negligible magnitude of impact on the flood flow storage and conveyance attributes of local watercourses (assigned high importance for Hobson's Brook and South Ditch and medium importance for North Ditch and small watercourses and land drains) nor on the overall land drainage regime (assigned high/medium importance). Therefore the overall effect is assigned Slight Adverse significance, which is judged to be **Not Significant**. This conclusion is supported by the FRA included as Appendix 18.2.

## Water Resources

- 18.5.16 Where connections to the sewer network are required, they will be designed appropriately in consultation with Anglian Water to ensure there is no detriment to the proposed Development, nor to the wider network. Therefore, it is considered that there would be no residual impact on local water resources from increased wastewater discharges from the station facilities.
- 18.5.17 No residual effects are anticipated on the potential for surface watercourses within the study area to transport and dilute waste water discharges as no detriment to their water quality is anticipated and no new consumptive water uses are proposed.
- 18.5.18 The demand for potable water to service the proposed station during operation is expected to be minimal in the context of the Cam and Ely Ouse Chalk WFD groundwater body and the existing groundwater abstractions (see Section 18.3). An assessment of the proposed station's water-consuming components will be undertaken at later design stages. Water-saving measures such as efficient sanitary facilities and using recycled water for flushing would be considered and included in the designs for the station buildings where possible. Therefore, no impact on local water resources due to operation of the water-consuming components of the station is anticipated.

## Cumulative Effects

- 18.5.19 The cumulative effects of the proposed Development have been addressed with reference to the development schemes listed in Appendix 2.3. The assessment considers those schemes that have been consented within the Greater Cambridge District and that have the potential to have a cumulative impact on the water environment by being situated in the same hydrological catchment as the proposed Development (the Hobson's Brook catchment). Eight schemes have been identified in the catchment, details of which are provided in Table 18-10.

Table 18-10 Committed Developments Included in Cumulative Assessment

Appendix Map ID	Local Planning Authority	LPA Reference No.	Reason for inclusion in cumulative assessment
ID1	SCDC	16/0653/REM	Within the zone of influence and of sufficient development scale to generate 'in-combination' cumulative effects
ID2	SCDC	16/1078/OUT	As above

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Appendix Map ID	Local Planning Authority	LPA Reference No.	Reason for inclusion in cumulative assessment
ID3	SCDC	19/1070/REM	As above
ID7	SCDC	16/0165/FUL	As above
ID8	SCDC	16/0176/OUT	As above
ID16	SCDC	S/4279/19/FL	As above
ID28	SCDC	19/1168/OUT	As above

18.5.20 There is the potential for developments that drain the same hydrological catchment as the proposed Development to have a cumulative impact on flood risk, through the generation of increased runoff. However, in line with local policy requirements, described in Section 18.2, it is considered that other developments would also incorporate SuDS (including best practice construction methods) to manage impacts on water quality and runoff quantity during their construction and operation. It is therefore considered that there would be Neutral cumulative effects on these attributes of the surface water environment within the study area, and thus **Not Significant** effects.

18.5.21 Similarly, to achieve policy compliance, other developments would incorporate measures to safeguard the quality of shared underlying groundwater resources. It is also expected that water use efficiency measures would be embedded in these other developments, reducing the potential for cumulative effects on the quantitative status of groundwater resources.

### CSET Scheme

18.5.22 Aspects of the construction programme for CSET overlap with the construction programme for the proposed Development. For example, the earthworks required for CSET at the junction of the guided busway and Francis Crick Avenue would coincide with the earthworks required to the south of the guided busway for the proposed station. CSET construction activities would be subject to water quality and pollution control measures, aligned to those proposed to manage the effects of construction of the proposed Development. These controls would be documented in a CoCP or similar, specific to CSET. Compliance with the respective CoCPs and coordination of the construction programmes would ensure no cumulative effects on shared water environment receptors (the North Ditch, Hobsons Brook, the South ditch) during construction.

18.5.23 During operation, the aspect with most potential for cumulative effects is the management of surface water runoff, as CSET and the proposed Development are partially located in the same drainage catchments.

18.5.24 The Outline Surface Water Drainage Strategy drawings for the CSET scheme have been reviewed and key interactions are noted at the junction of the guided busway and Francis Crick Avenue (in the vicinity of the proposed station forecourt) and between Addenbrooke's Road and Nine Wells. The CSET surface water drainage proposals for Francis Crick Avenue and its junction with the guided busway are to discharge to the existing CBC north attenuation basin, with no discharges required to the proposed CSIE middle attenuation basin. Between Addenbrooke's Road and Nine Wells the CSET alignment runs parallel to the railway line and drainage proposals include for a CSET new pond to provide the necessary attenuation of surface water runoff.

18.5.25 The review has concluded that the surface water drainage proposals for the proposed Development and CSET are compatible and complimentary. Where watercourse crossings are required as part of the CSET proposals, these would be designed appropriately to ensure no impact on the flood flow storage and conveyance attributes of local watercourses. Therefore, it is anticipated that there would be Neutral cumulative effects on flood risk and



drainage attributes of the surface water environment within the study area during operation, and thus **Not Significant** effects.

- 18.5.26 The implications of CSET on the need for the proposed middle attenuation basin will be accounted for in the future design stages of the proposed Development.
- 18.5.27 SuDS features have been incorporated into the CSET proposals and will provide treatment of surface water runoff. Combined with the proposed Development's SuDS features, these will ensure no detriment to surface water and groundwater quality. Therefore, during operation cumulative effects on the water quality attributes of the water environment are anticipated to be Neutral and thus **Not Significant**.
- 18.5.28 No cumulative effects are anticipated on the potential for surface watercourses within the study area to transport and dilute waste water discharges as no detriment to their water quality is anticipated and no new consumptive water uses are proposed.

## 18.6 Assessment Summary

- 18.6.1 This assessment has concluded that the effects from the construction and operation of the proposed Development on the water environment can be minimised through the design and mitigation measures described in this chapter. The proposed station building and forecourt will be located in an area shown to be at low risk of fluvial flooding by site-specific hydraulic modelling. Where works within watercourses are required, structures will be designed and constructed appropriately to avoid localised hydraulic effects and ensure no increased flood risk or detriment to the local drainage regime. SuDS measures will be incorporated into the drainage proposals to manage surface water runoff quality and quantity.
- 18.6.2 It is considered that any residual effects of the proposed Development on attributes of the water environment receptors during the construction phase would be limited to negligible and minor adverse. Any minor adverse impacts during the construction phase would be temporary and no long-term detrimental impact is expected. During operation of the proposed Development, it is considered that residual impacts on the water environment would be limited to negligible, with an overall significance classified as Slight Adverse.
- 18.6.3 It is therefore concluded that the proposed Development is considered to cause no effects on the water environment deemed significant with regard to the EIA Regulations. It is anticipated that there would be no detriment to the WFD status of the surface waterbodies and groundwater bodies in the study area or to the future objectives set for these waterbodies.
- 18.6.4 It is considered that the additional pressures that the proposed Development would put on water supply and foul water treatment infrastructure would be sustainably managed to ensure no overall adverse impacts on local water resources.
- 18.6.5 Table 18-11 **Error! Reference source not found.** provides an assessment summary of the likely effects of the proposed Development with respect to water resources and flood risk and how they have been addressed.

*Table 18-11 Assessment Summary*

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Ponds	Pollution with fuel, oils, cement or concrete	C	A CoCP Part B would be produced and implemented. This would document procedures for managing environmental impacts during construction and would include a Pollution Control Plan.	Slight Adverse <b>Not Significant</b>
	Silt pollution		An emergency spillage response plan would also be prepared to document measures to be implemented to prevent pollutants reaching receptors.	Slight Adverse <b>Not Significant</b>
Cam and Ely Ouse groundwater (Principal Aquifer) River terrace deposits (Secondary A Aquifer)	Piling	C	Groundwater would be safeguarded through measured secured in the CoCP Part B, including a Pollution Control Plan.	Slight Adverse <b>Not Significant</b>
	Excavation and dewatering		Where required, dewatering quantities would be assessed in line with EA methodologies and any permitting requirements would be adhered to.	
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Land drainage regime	Increase in surface water flood risk – increased surface water runoff from impermeable areas and due to soil compaction/disturbance regime	C	Drainage from the proposed Development during construction would be managed appropriately in accordance with best practice measures which will be documented in the CoCP Part B.	Slight Adverse <b>Not Significant</b>
Hobson's Brook North Ditch South Ditch Small watercourses and land drains	Increase in fluvial flood risk – construction works to structures within watercourses (e.g. Tibbets culvert)	C	The footprint of the proposed Development within the floodplain has been minimised and the CoCP Part B would document how the works would be	Slight Adverse <b>Not Significant</b>



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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
			carried out to reduce the potential for increased fluvial flood risk from these watercourses during construction.	
Cam and Ely Ouse groundwater (Principal Aquifer)	High groundwater levels from increased infiltration due to creation of construction compounds	C	Measures would be incorporated into the CoCP Part B to minimise the potential for disturbance of topsoil and superficial deposits which could lead to increased infiltration.	Slight Adverse <b>Not Significant</b>
	Increased water demand for construction activities	C	A CoCP Part B would be produced and implemented. This would document procedures for using water efficiently and reducing water consumption, as well as for managing foul water during construction.	Neutral <b>Not Significant</b>
	Foul water generated during construction			
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Ponds	Pollution from operational surface water runoff and accidental spills in parking/storage areas	O	SuDS would be used to promote good water quality standards and provide treatment of surface water runoff prior to discharge to local watercourses.  Accidental spills in parking/storage areas would be contained in line with standard operational practice.	Slight Adverse <b>Not Significant</b>
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Land drainage regime	Changes in flow conveyance and/or local hydraulics of watercourses	O	The culvert extensions and modifications would be designed and sized appropriately to ensure there is no increased flood risk and no detriment to the local drainage regime.	Slight Adverse <b>Not Significant</b>
	Increase in flood risk – increased surface		The footprint of the proposed Development within	

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Receptor	Potential Significant Effect	Phase (Construction (C), Operation (O))	Mitigation Measure	Residual Effect Significance
	water runoff from impermeable areas and due to permanent increase in impermeable land cover		the floodplain has been minimised.  SuDS would be included in the drainage proposals to manage surface water quantity and provide attenuation of surface water runoff from the proposed Development.	

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**18.7 References**

Reference	Title
Ref 18.1	European Parliament and Council (2000). The Water Framework Directive 2000/60/EC. [Accessed July 2020 at: <a href="http://ec.europa.eu/environment/water/water-framework/index_en.html">http://ec.europa.eu/environment/water/water-framework/index_en.html</a> ]
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