East West Rail Environmental Impact Assessment Scoping

East West Rail is a nationally significant railway project which aims to deliver much-needed transport connections for communities between Oxford and Cambridge by:

- Upgrading an existing section of railway between Oxford and Bicester
- Bringing back a section of railway between Bicester and Bletchley
- Refurbishing existing railway between Bletchley and Bedford
- Building brand new railway infrastructure between Bedford and Cambridge

A project such as East West Rail needs consent to build and operate. Based on the scale of the proposals, the proposed activities, their location and the overall potential to give rise to significant effects on the environment, a detailed assessment of environmental impacts and identification of likely environmental effects is required. This information will be provided in an environmental statement (ES) which will be submitted as part of the application for consent.

EWR Co. is seeking a scoping opinion from the Secretary of State about the scope and level of detail of the information to be provided in the ES. The EIA Scoping Report provides the information to help the Secretary of State form that opinion.

As well as supporting the provision of a scoping opinion, the scoping process helps plan how the environmental impact assessment (EIA) for the Project should be undertaken. It helps establish the:

- issues that the EIA needs to address;
- relative importance to attribute to different issues;
- methods to apply in assessing them;
- way that potential adverse effects would be avoided or lessened; and
- way that the findings will be reported.

This information is provided in the EIA Scoping Report.

The report is supported by a series of method statements and approach documents that provide more detail on the scope and methods for assessments covered under their respective topic headings. Please click on the links overleaf to access the relevant information.

The report has been prepared for East West Railway Company by MWJV.

EIA Scoping Report

EIA Scoping Method Statements:

Air Quality

Agriculture and Soils

Biodiversity

Carbon

Climate Resilience

Communities

Flood Risk

Historic Environment

Human Health

Landscape and Visual

Land Quality

Material Resources and Waste

Socioeconomics

Sound, Noise and Vibration

Traffic and Transport

Water Resources

Other supporting documents:

Approach to BNG

Approach to CoCP

Approach to Equality Impact Assessment

Social Baseline

List of Figures

EWR-MWJV Technical Partner

Routewide - Environmental - EIA Scoping Report

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Abbreviations & definitions

Abbreviation	Definition
AADT	Annual average daily traffic
ALC	Agricultural land classification
ARN	Affected road network
BGS	British Geological Survey
BMV	Best and most versatile
BNG	Biodiversity Net Gain
BS	British Standards
CIEEM	Chartered Institute of Ecology and Environmental Management
CMP	Carbon management plan
CoCP	Code of construction practice
COMAH	Control of major accident hazards
CTMP	Construction traffic management plan
dB	Decibel
DCO	Development consent order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DoWCoP	Definition of waste code of practice
EA	Environment Agency
EIA	Environmental impact assessment
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EPUK	Environmental Protection United Kingdom
EqIA	Equalities impact assessment
ES	Environmental statement
EWR Co	East West Railway Company Ltd
EWRSHM	East West Rail Strategic Highway Model
FBI	Farm business interview
FRA	Flood risk assessment
GHG	Greenhouse gases
GWDTE	Groundwater dependent terrestrial ecosystem
HER	Historic environment record
HGV	Heavy goods vehicle
HRA	Habitats Regulations Assessment
HS2	High Speed 2
IAQM	Institute of Air Quality Management
ICNIRP	International Commission on Non-Ionizing Radiation Protection

Abbreviation	Definition
IEMA	Institute of Environmental Management and Assessment
IROPI	Imperative reasons of overriding public interest
ISO	International Organization for Standardization
LA	Local Authority
L_{Aeq}	A-weighted equivalent continuous sound pressure level
LCRM	Land contamination risk management
LGS	Local geological sites
LVIA	Landscape and visual impact assessment
MMP	Materials management plan
MSA	Mineral safeguarding areas
MWJV	Mott MacDonald WSP-Joint Venture
NCA	National character area
NH_3	Ammonia
NMU	Non-motorised users
NNNPS	National networks national policy statement
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NPS	National policy statement
NRMM	Non-road mobile machinery
NSIPs	Nationally significant infrastructure projects
OLE	Overhead line equipment
ONS	Office for National Statistics
PAVA	Public address and voice alarm
PEIR	Preliminary environment information report
PINS	Planning Inspectorate
PM_{10}	Coarse Particulate Matter (those with a diameter of 10 micrometres or less)
$PM_{2.5}$	Fine Particulate Matter (those with a diameter of 2.5 micrometres or less)
PRoW	Public rights of way
RCP	Representative concentration pathways
RUA	Route update announcement
SBR	Shepreth Branch Royston Line
SO_2	Sulphur Dioxide
SoS	Secretary of State
SPZ	Source protection zone
SRN	Strategic road network
TA	Transport Assessment
TUR	Transport Update Report
TWA	Transport and Works Act 1992

Abbreviation	Definition
UK	United Kingdom
UKCP18	United Kingdom Climate Projections 2018
WER	Water Environment Regulations
WFD	Water Framework Directive

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1 Purpose of this document

1.1 Overview

1.1.1 The infrastructure proposals for East West Rail comprise a new rail link that would connect communities between Oxford, Milton Keynes, Bedford and Cambridge. The proposals include the construction of a new railway between Bedford and Cambridge and associated works to upgrade the existing railway between Oxford and Bedford. Together these comprise the 'Project'.

1.1.2 The purpose of this document is to set out the proposed scope of and approach to the environmental impact assessment (EIA) for the Project. Consent to build and operate the Project will be sought through a development consent order (DCO).

1.1.3 Regulation 10(1) of the EIA Regulations[1] allows a DCO applicant to ask the Secretary of State (SoS) to give their written opinion as to the scope and level of detail of the information to be provided in the Environmental Statement (ES). This EIA Scoping Report provides the vehicle through which East West Rail Company (EWR Co) are seeking a scoping opinion on the Project from the SoS.

1.2 DCO and legal requirements

1.2.1 To deliver the Project, East West Rail Company (EWR Co) will apply for an order granting development consent - a DCO - under the Planning Act 2008. If granted, the DCO will provide the powers required for the construction, maintenance and operation of the Project.

1.2.2 The procedural requirements for applications for DCOs granting development consent are set out in the Planning Act 2008 and related secondary legislation. Applications for projects of a type listed in Annex I of the European Union's EIA Directive or listed in Annex II of the Directive that have not received a negative screening opinion from the SoS, should be accompanied by an ES. The process for EIA related to nationally significant infrastructure projects (NSIP) is set out in the Infrastructure Planning (EIA) Regulations 2017 (the EIA Regulations), including screening and scoping; notification and consultation; matters related to the production of Preliminary Environmental Information (PEI); and the preparation of the ES.

1.2.3 Regulation 10(1) of the EIA Regulations provides that a DCO applicant may ask the SoS to give their written opinion as to the scope and level of detail of the information to be provided in the ES. Regulation 10 sets out the required

[1] *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017* (2017) *Legislation.gov.uk*.

contents of the scoping request. Further guidance is set out in Planning Inspectorate's Advice Note 7 - EIA: Process, Preliminary Environmental Information and ES[2]. This scoping report provides the information required to support the request for a scoping opinion. The scoping process is undertaken by the Planning Inspectorate on behalf of the SoS.

1.2.4 The EIA Regulations (14/4) require that, in order to ensure the completeness and quality of the ES:

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

1.2.5 Mott MacDonald WSP-Joint Venture (MWJV) is responsible for the coordination, compilation and procedural review of the ES. WSP and Mott MacDonald are each registered under the EIA Quality Mark operated by the Institute of Environmental Management and Assessment (IEMA) which recognises our respective commitment to excellence in EIA activities. Both companies have continued to maintain their EIA Quality Mark registrations, following annual examinations by IEMA in relation to our ongoing products, staff, innovation and promotion of EIA within the industry. WSP and Mott MacDonald continue to support and lead nationally recognised guidance for EIA in the UK.

1.3 EIA and the requirements for scoping

1.3.1 EIA is required as part of the consenting process for certain projects depending on their size, activities, location or potential to give rise to significant effects on the environment. As a project involving either the "construction of lines for long-distance railway traffic[3]" or the construction of a railway which meets the thresholds in Schedule Two to the EIA Regulations, the Project is considered to qualify as EIA development.

1.3.2 EIA is a systematic and structured process for identifying and assessing the likely significant environmental effects (both beneficial and adverse) of a proposed development. It is an iterative process that runs in parallel with the design of the proposals thereby allowing environmental information to inform the design process, ensuring that opportunities for mitigation and enhancement to avoid, reduce or offset environmental impacts are identified and incorporated (where practicable) into the design at the earliest opportunity.

[2] *Nationally Significant Infrastructure Projects - Advice Note seven: Environmental impact assessment: Process, preliminary Environmental Information and Environmental statements* (2020) *GOV.UK*.
[3] *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 Schedule 1, 7(1)* (2017) *Legislation.gov.uk*..

1.3.3 Information about an EIA and its findings is presented within an ES. The ES is fundamental to the consenting process, allowing decision-makers to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential adverse effects form part of any permission and the powers inherent in it.

1.3.4 To plan how the EIA for the Project should be undertaken, a scoping exercise has been undertaken. This considers the issues the EIA needs to address; the relative importance to attribute to different issues; the methods to apply in assessing them; the way that potential adverse effects would be avoided or lessened; and the way that the findings will be reported. The scoping exercise for the Project has been completed and its findings and recommendations are presented in this EIA Scoping Report.

1.3.5 The role and utility of an EIA scoping report is set out clearly on the National Infrastructure Planning website[4]:

> *Regulation 10(1) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) allows a person who proposes to make an application for an order granting development consent (the Applicant) to ask the Planning Inspectorate (the Inspectorate), on behalf of the Secretary of State (the SoS), to state its written opinion (the Scoping Opinion) as to the scope and level of detail of the information to be provided in the Environmental Statement (the ES). The scoping request typically comprises a Scoping Report provided by the Applicant and setting out the information required under Regulation 10(1) of the EIA Regulations.*

1.3.6 Although EWR Co (the Applicant) is not obliged to seek a scoping opinion, where one has been sought through a scoping request "the Inspectorate (on behalf of the SoS) must adopt a Scoping Opinion within 42 days of receiving a scoping request. This is a fixed timeframe which cannot be extended".

1.3.7 Before adopting a scoping opinion, the SoS must consult the relevant consultation bodies defined in Regulation 3 of the EIA Regulations, which comprise various prescribed organisations and Local Authorities (LAs).

[4] *The Planning Act 2008: Environmental Impact Assessment: Scoping Process – Frequently Asked Questions (FAQ)* (2018) *National Infrastructure Planning*. Available at: https://infrastructure.planninginspectorate.gov.uk/application-process/frequently-asked-questions/scoping-process-faq/#1. (Accessed: 13 May 2024).

1.4 Relevant planning policy

1.4.1 Section 104 of the Planning Act 2008 provides that DCO applications must be determined in accordance with any relevant national policy statement. The National Networks National Policy Statement (NNNPS), designated in May 2024[5] and sets out sets out the need for, and government's policies to deliver, development of Nationally Significant Infrastructure Projects on the national road and rail networks in England. Accordingly, the SoS will use this NNNPS as the primary basis for the determination of the DCO application submitted by EWR Co for the Project.

1.4.2 National policy statements (NPS) contain the government's objectives for the development of nationally significant infrastructure in particular sectors including circumstances where it would be particularly important to address the adverse impacts of development. The EIA approach proposed in this EIA Scoping Report takes account of the requirements of the NNNPS in terms of the scope of the assessment of effects and mitigation. Where relevant the provisions of the NNNPS are cited within each environmental topic of this report.

1.4.3 The national planning policy framework[6] alongside other relevant national policies have also been considered in preparing this EIA Scoping Report where these could influence the sensitivity of receptors (and therefore the significance of effects) and any requirements for mitigation or influence on the methodology of the EIA. For example, a planning policy may require the assessment of a particular impact or the use of a particular methodology. Coverage of the Project's alignment with national and local policy will be addressed within the Planning Statement submitted with the DCO application.

1.5 Consultation

Previous consultation

1.5.1 EWR Co is committed to early and ongoing engagement on its proposals as they develop. Two rounds of non-statutory consultation have been undertaken, one in 2019 and one in 2021. In 2020 feedback was provided on the outcome of the 2019 consultation and in 2023, a route update announcement (RUA) was issued. Non-statutory consultation on the current proposals commenced in November 2024 and will conclude in January 2025. An *Environmental Update Report (EUR)* has been prepared in support of the

[5] *Department for Transport* (2024) *National Networks National Policy statement, GOV.UK*. Available at: https://www.gov.uk/government/publications/national-networks-national-policy-statement.
[6] *Housing and Communities Department for Levelling Up* (2023) *National Planning Policy Framework, GOV.UK*. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2.

non-statutory consultation, and readers may wish to refer to this and in particular its coverage of initial environmental information.

Table 1 – Consultation activity.

Date	Consultation activity
2019	Non-statutory consultation on five potential route options
2021	Public feedback on 2019 consultation including selection of preferred route option – issued as a You Said, We Did report
2021	Non-statutory consultation on Preferred Route Alignment and Design Options
2023	Public feedback on 2021 consultation – issued as a Consultation Feedback Report and a Route Update Announcement report
2024	Non-statutory consultation on current proposals commenced in November 2024 and will conclude in January 2025.

1.5.2 Details of all previous consultations and engagement can be found on EWR Co's website.

1.5.3 The topic method statements detail where consultation and engagement with stakeholders has been undertaken to inform their approach.

Consultation programme

1.5.4 The Planning Act 2008 sets out the statutory requirements for consultation. A statutory consultation on the proposals will be held prior to finalising the DCO application.

1.5.5 Alongside the statutory consultation EWR Co will be continuing its engagement with relevant statutory organisations and other defined interested parties.

1.5.6 Consultation and engagement are important in the EIA process and development of an optimal project design. They can provide sources of information to support the baseline study. Stakeholders - individuals and organisations who could affect or be affected by the Project or who exercise statutory functions with relevance to the Project - can also help identify local features, potential impacts and mitigation measures.

1.6 Report structure

1.6.1 Chapter 2 of this report (East West Rail and the environment) provides the context of the Project, the DCO application, and request for a scoping opinion for the EIA of the proposals.

1.6.2 Chapter 3 presents a description of the Project, respectively addressing each of the eight route sections, namely:

- Route section 1 – Oxford to Bletchley.
- Route section 2 – Fenny Stratford to Kempston (the Marston Vale Line).
- Route section 3 – Bedford.
- Route section 4 – Clapham Green to Colesden.
- Route section 5 – Roxton to east of St Neots.
- Route section 6 – Croxton to Toft.
- Route section 7 – Comberton to Shelford.
- Route section 8 – Cambridge.

1.6.3 Chapter 4 (EIA and the scoping assessments) sets out the overarching approach to the EIA, outlining the key assessment concepts and terms.

1.6.4 The mitigation strategy for the Project is provided in Chapter 5.

1.6.5 The way that each EIA topic will be assessed is summarised in Chapter 6. This information is underpinned by detailed topic method statements setting out the proposed approach to the detailed EIA topic assessment or "Approach to" documents that set out our approach to other assessments. The method statements each broadly address the following matters:

- Relevant standards and guidance;
- Establishing the baseline;
- Preliminary baseline description;
- Sources of impact;
- Potential impacts and effects;
- Assumed mitigation;
- Evaluating significance; and
- Scoping in and out.

1.6.6 A description of the other assessments that will support the DCO are described in Chapter 7.

1.6.7 Chapter 8 summarises the draft proposed structure of the ES.

1.6.8 Information on the alternatives considered is provided in Appendix A. Appendix B outlines indicative construction management methods to be used in mitigating potential impacts and effects.

2 The Project and its environmental context

2.1 East West Rail

2.1.1 The Project that is the subject of this scoping report forms part of the wider East West Rail proposals. These proposals are being promoted and brought into use in three connection stages:

Figure 1 – East West Rail three connection stages.

Stages of East West Rail

Connection Stage 1 enables services to run between Oxford and Milton Keynes. The first part of this stage, the link between Oxford and Bicester, is already in place. The work to extend services further north and east to Bletchley and Milton Keynes was given planning consent in 2020 by an order made by the Secretary of State under the Transport and Works Act 1992. Construction is well underway and passenger services will start running from 2025.

Connection Stage 2 work is ongoing to bring forward services between Oxford and Bedford from 2030. Planning consent for these works was also granted by the Transport and Works Act order in 2020.

Connection Stage 3 would complete East West Rail and enable passenger services to operate between Oxford and Cambridge via Bletchley and Bedford. To complete this work, we will need to apply for a Development Consent Order (DCO), which would grant consent to build the new railway between Bedford and Cambridge, as well as the other upgrades between Oxford and Bedford to deliver the full proposed East West Rail service.

2.2 Overview of the Project

2.2.1 This scoping report relates to the works required to deliver Connection Stage 3 (These are what comprise the Project, which us referred to throughout this report) that will be included in the proposed DCO application.

2.2.2 The Project includes the following:

- Construction of a new railway between Bedford and Cambridge, including the construction of new stations at Tempsford and Cambourne.
- Improvements to the existing railway between Oxford and Bedford and the approach into Cambridge.
- Works to upgrade existing stations along the route to ensure they can accommodate increased passenger numbers, including:
  - Remodelling Bedford station.
  - The potential consolidation or upgrade of stations on the Marston Vale Line.
  - Relocating Bedford St Johns station.
  - Works at Cambridge station.
- Building new infrastructure and upgrading existing structures, including viaducts, tunnels, bridges, cuttings and embankments.

- Improvements to or closure of level crossings and the provision of suitable replacement crossings.
- Works to enable the full or discontinuous electrification of the railway including the installation of overhead lines, substations and grid connections.
- Works to manage interfaces between the railway and existing highways, public rights of way, watercourses and utilities apparatus.
- Works to reduce the environmental impacts of our proposals, as well as to enhance and improve the environment in line with our commitment to biodiversity net gain.

2.2.3 A detailed description of the infrastructure works that form the Project is given in Chapter 3 (**Project Description**).

2.3 East West Rail's train services

2.3.1 New train services will be introduced at each of the three connection stages of East West Rail. First between Oxford and Milton Keynes in Connection Stage 1 from 2025; then between Oxford and Bedford in Connection Stage 2 from 2030; and then the full service between Oxford and Cambridge at Connection Stage 3. The service patterns for each stage are shown in Table 2.

Table 2 – Proposed train service patterns[7]

Connection stage	Service pattern with MVL Existing Stations Option	
Connection Stage 1 Oxford to Milton Keynes passenger services introduced from 2025	2 x Oxford to Milton Keynes services in each direction per hour	
Connection Stage 2 Oxford to Bedford passenger services introduced from 2030	2 x Oxford to Milton Keynes services in each direction per hour 1 x Oxford to Bedford service in each direction per hour 1 x Bletchley to Bedford service in each direction per hour (existing)	
Connection Stage 3 Oxford to Cambridge passenger services introduced by mid-2030s	*Assuming the existing stations for MVL stations:* 2 x Oxford to Milton Keynes services in each direction per hour 2 x Oxford to Cambridge services in each direction per hour	*Assuming the consolidated stations for MVL stations:* 2 x Oxford to Milton Keynes services in each direction per hour 2 x Oxford to Cambridge services in each direction per hour

[7] Note there is a variation depending on the choice and location of of stations on the Marston Vale Line (MVL)

Connection stage	Service pattern with MVL Existing Stations Option	
	2 x Stewartby to Cambridge service in each direction per hour 1 x Bletchley to Bedford service in either direction per hour	1 x Stewartby to Cambridge service in each direction per hour 1 x Bletchley to Cambridge service in either direction per hour

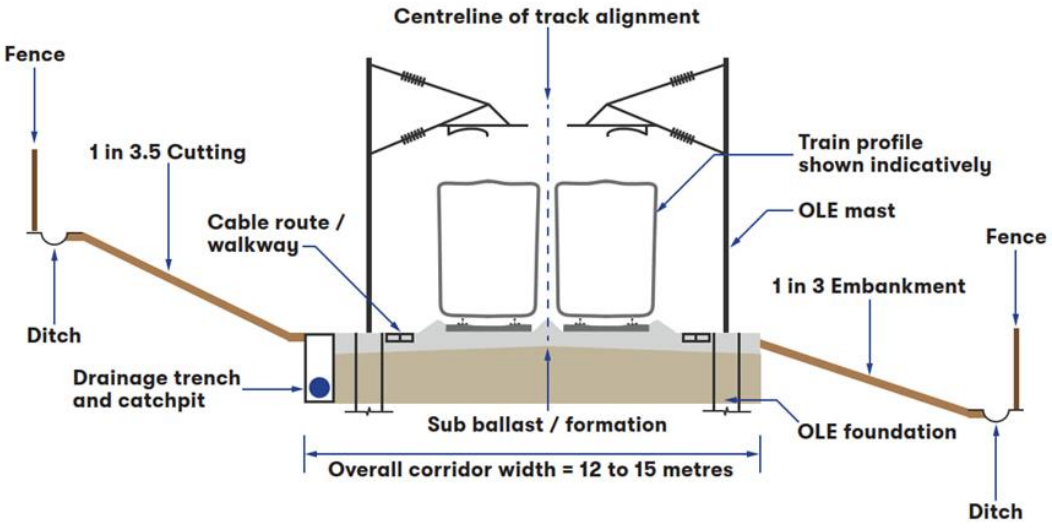
2.4 Aspects of the Project

Powering the trains

2.4.1 EWR Co has a strategic objective to enable net zero passenger journeys in line with the UK's commitments. The proposals included in the 2024 non-statutory consultation set out EWR Co's preference to use a system known as 'discontinuous electrification' combined with hybrid battery-electric trains. Further work is needed to confirm the suitability of discontinuous electrification for the route rather than full electrification, and the draft Order limits presented at this stage would allow for full electrification should this be identified as necessary during the next stages of design.

2.4.2 Discontinuous electrification uses a combination of electrification (through overhead line equipment, or OLE) along sections of the route, and batteries onboard the trains to provide traction power along section where there is no OLE. This approach could provide a sustainable and cost-effective solution which would support the ambition of zero emission passenger railway services along the East West Rail route.

Figure 2 – General cross section showing overhead line equipment along new railway



2.4.3 In providing an overhead electrification system, incoming power supplies would need to be provided from existing electricity grid supply points. These supplies would feed substations situated adjacent to the railway, which would then distribute power along the railway via the OLE. Indicative locations for these substations and associated utility works are included in the draft Order limits, although a range of options for traction power compounds are being considered at this stage.

2.4.4 In the short-term, some diesel-powered trains will run between Oxford and Bletchley/Milton Keynes when this section of the railway starts operating. EWR Co are working to accelerate the introduction of services from Oxford to Bedford before the railway to Cambridge is operational and OLE has been installed. As a result diesel-powered passenger trains may run on this section until all construction through to Cambridge is completed. This temporary solution would mean passenger services can start as soon as these sections of the line are built and deliver benefits to communities sooner.

2.4.5 The decision to adopt either a full or discontinuous overhead electrification system for East West Rail influences the choice of trains (rolling stock). EWR Co's current preference for discontinuous electrification would require hybrid battery-electric traction rolling stock. Full electrification of the route would mean a different type of rolling stock would be used.

Operational facilities

2.4.6 To support the operation of East West Rail, a variety of facilities and buildings would be needed across the route, including stabling and sidings for trains, depots to maintain trains, and areas that can be used to store material needed for maintaining the track and systems themselves. Staff car parking and welfare facilities would also be required at various locations.

2.4.7 The locations for these facilities are still being evaluated and the areas currently under consideration are presented as part of the 2024 non-statutory consultation. The proposals will be confirmed at the statutory consultation, after taking account of feedback received and following further design development.

Passing loops

2.4.8 A passing loop is an additional section of track laid parallel to the main line, with signalling and points that allow a train to enter and exit the loop at either end. East West Rail requires passing loops to enable trains of different length, type and speed to pass each other and to allow trains to be held whilst they are integrating with the busy national network routes. Passing loops also provide resilience for an operational railway, so that incidents or periods of delay can be managed.

2.4.9 The Project would include passing loops at a number of locations between Oxford and Cambridge, with some optionality remaining in the Ridgmont and Stewartby area.

Level crossings

2.4.10 Level crossings inevitably present a higher risk than bridge or underpass crossings for people crossing the line. They also result in delays for road users when barriers are down, and these would only increase at existing crossings as a result of the additional East West Rail services.

2.4.11 For existing sections of railway, EWR Co has carried out risk assessments to determine whether existing level crossings along the route can remain open (and if they can what works are required to upgrade them) or whether they need to be closed and, if they do, whether replacement crossings are needed.

2.4.12 The proposals for each level crossing along the route have been updated. More details are set out later in this Scoping Report with respect to specific crossings, as well as in the ***Technical Report.***

Freight

2.4.13 East West Rail's primary purpose is to provide connectivity between communities and support economic growth as a passenger railway. Alongside this, and noting that freight already runs on sections of the route, the previous government asked EWR Co to consider how the railway can maintain existing freight services that already run through commuter hubs including Oxford, Bicester, the Marston Vale and Bedford, and plan for increased future freight demand to enable wider economic growth.

2.4.14 EWR Co will continue to develop the proposals, considering potential freight demand and requirements for non-passenger services to inform the way forward and the overall assessment of the Project.

2.5 Construction

Overview

2.5.1 The proposals being presented as part of the 2024 non-statutory consultation outline how the Project would be constructed. EWR Co is at a very early stage of developing the construction approach. In developing the design for the Project and its construction, EWR Co has focused on key principles including connectivity along the route and access to and between new items of infrastructure. As designs progress, more detailed construction methods

will be developed and opportunities identified to complete the works quicker and more efficiently.

2.5.2 To deliver the Project, a series of temporary construction compounds would be established along the route. Main compounds and satellite compounds of various sizes would be used. Potential locations for temporary main construction compounds are identified on the plans provided as part of the 2024 non-statutory consultation. These have been located to allow both for efficient construction but also to lessen potential environmental impacts and disturbance to local people. For each compound the land usage, traffic route and access provisions will be carefully considered and further information presented at the statutory consultation.

2.5.3 Industry best practices to control noise, dust, vibration and light pollution at each compound would be applied and controlled through the Code of Construction Practice (CoCP). For further information about the draft CoCP, see Section 5.3 of this report.

2.5.4 At the subsequent statutory consultation, details will be provided on matters including the construction delivery programme, the strategic approach to managing and moving bulk earthworks material (mass haul), construction traffic routes, workforce numbers, and the general specification of construction equipment and working methods.

Timing and construction sequence

2.5.5 Construction works would start after the necessary approvals have been secured. Each of the route sections would have principal construction activities and dependencies that would drive the overall programme duration; these are described in Chapters 5-12 of this Scoping Report, which outline the Project and describe its potential environmental impacts and mitigation.

2.5.6 The general sequence of construction would be as follows:

- Site clearance and habitat protection works followed by archaeological investigations where needed, as well as early environmental mitigation works such as species relocations and early habitat creation.
- Creation of site compounds and undertaking of utility diversions if required.
- Construction of the main structures including embankments, cuttings, bridges, viaducts and drainage.
- For the sections of new railway, installation of track and rail systems would be undertaken in coordination across all route sections before the testing of the trains and systems.
- For existing railway, this testing would be done in stages throughout construction where modifications are made to enable the continued operation of the railway for existing train services.

Construction planning and logistics

2.5.7 Construction routes will be carefully assessed, and local highway and planning authorities consulted on logistics proposals. During design development, construction traffic will be assessed at each proposed compound and the impact on both the local and strategic road network would be reviewed.

2.5.8 To enable the efficient and safe construction of some elements of the new railway, it may be necessary to temporarily divert or close public highways and public rights of way (PRoW). EWR Co will take account of the needs of all users and consult and communicate proposals with the local authorities, National Highways and the emergency services, as well as with local communities to check that suitable options have been considered. This would include arrangements at any affected level crossings, which would be managed in conjunction with Network Rail.

2.5.9 EWR Co will develop a detailed mass haul strategy which would integrate with the design of the major earthworks and the proposed temporary haul routes. To support this, haul routes would be constructed alongside the proposed rail corridor where possible to reduce disruption to surrounding roads. The mass haul strategy would seek to balance the quantities of earthwork materials needed for embankments with materials excavated from cuttings and tunnel structures both to reduce construction traffic on the roads and for efficient use of materials.

2.5.10 To enable a more efficient construction programme and reduce environmental impacts associated with construction traffic, locations for a temporary logistics hub with a connection to the East Coast Main Line are being considered. The temporary logistics hub would enable materials to be delivered by rail to support the construction of the track and railway systems elements between Bedford and Cambridge. Further information on the proposed logistics hub can be found in Chapter 9 of this Scoping Report.

Working on the existing railway

2.5.11 The Project would interface with and impact several sections of the existing operational railway, as well as a number of stations. Works would be planned in consultation with Network Rail and the existing station operators to allow for continued safe access and to limit inconvenience for the travelling public. Where construction works would directly impact public areas and cannot be segregated, works may be undertaken outside station operational hours. This would generally take place at night or over weekends.

2.5.12 The Project would interface with several existing rail lines, including the Cherwell Valley Line at Oxford, West Coast Main Line at Bletchley, Midland

Main Line at Bedford, East Coast Main Line at Tempsford, and Shepreth Branch Royston Line (to London, King's Cross) and the West Anglia Main Line (to London, Liverpool Street) at Cambridge. At each of these interfaces, works would be required that would impact existing rail assets and require some level of disruptive access to the railway.

2.5.13 Access to the existing operational railway would generally be during non-operational hours or in planned possessions or blockades (when the railway, or parts of it, is closed to passenger services).

2.6 Environmental context and route sections

2.6.1 The environmental characteristics of the area through which the Project would pass represent different challenges and opportunities. These are likely to be most acute for the proposed new railway through and east of Bedford, but certain local interventions along the existing rail corridor between Oxford and Bedford, such as new stations and depots, would also need to take account of local environmental sensitivities. And throughout the route corridor, construction activities have the potential to cause concerns for local people and would need to be carefully managed.

2.6.2 Between Oxford and Bicester, the route along the existing rail corridor would cross low-lying flat fields created within the floodplains of the Cherwell and Ray rivers and their tributaries. The open landscape would allow extensive views of any new structures, although the area is quite sparsely populated.

2.6.3 The area falls within Natural England's Upper Thames Clay Vales NCA[8] which describes the areas consisting 'of open, gently undulating lowland farmland underlain by an expanse of heavy blue-grey Oxford Clay and Kimmeridge Clay. In many places, the clay is covered locally by gravel deposits marked by extensive workings and flooded pits. The rivers Coln, Ray and Cherwell flow through the area, and the associated open flood plain landscapes consist of a regular and well-ordered field pattern, with willow pollards and reedbeds along the watercourses'.

2.6.4 East of Bicester the route rises across the low-lying northern Chiltern foothills past Poundon, March Gibbon and the Claydons, crossing a network of narrow lanes and footpaths as the land rises gradually eastwards.

2.6.5 Through Bletchley and east of Milton Keynes the route would use the existing Marston Vale Line passing through built-up areas at the edge of Milton Keynes and along the M1 corridor. East of the M1, transport infrastructure remains prevalent within prominent road (A421) and rail (Marston Vale

[8] *Natural England*. (2014) *NCA profile:108 upper Thames clay vales - NE570, Natural England - Access to Evidence*. Available at: https://publications.naturalengland.org.uk/publication/5865554770395136.

Line and Midland Main Line) corridors, which converge in Bedford. The River Great Ouse meanders prominently through Bedford and is crossed three times by the route as it passes north through and out of the town.

2.6.6 The area from Milton Keynes through to Cambridge falls within Natural England's Bedfordshire and Cambridgeshire Claylands NCA[9], the profile for which includes the following description (paraphrased).

> *While predominantly an arable and commercially farmed landscape, a wide diversity of semi natural habitats are also present … The River Great Ouse and its tributaries meander slowly and gently across the landscape. The Marston Vale … areas have been subject to extensive clay extraction for brick making. Subsequent restoration has provided opportunities for recreation and biodiversity aided by new woodland planting and other green infrastructure initiatives. Extensive quarrying of sand and gravel within the river valleys has also left its mark with a series of restored and flooded waterbodies that benefit biodiversity and recreation. The majority of the … NCA is sparsely populated. Settlements are generally located along the river valleys and more recently along major road and rail corridors. A feeling of urbanisation is brought by the numerous large towns, including Milton Keynes, Bedford [and] Cambridge, and major transport routes, including the M1, A1 and A14 and the Midlands and East Coast mainline railways.*

2.6.7 North and east of Bedford, hills mark an ascent out of the town. The undulating but low-lying landscape is dominated by arable farmland though with scattered woodlands often crowning the horizon in long views across the level fields[10]. A number of tributaries of the River Great Ouse run west-east and north-south, their valleys forming a focus for settlement and tree cover. This is a quiet, rural area with a dispersed but regular pattern of scattered farmsteads and small villages with frequent historic earthworks and tall stone churches. Settlements are connected by a network of quiet rural lanes and rights of way.

2.6.8 The route would descend into the Great Ouse valley, a broad valley with open, gentle slopes and large-scale arable fields. The valley includes large areas of open water, the legacy of mineral extraction, now used for leisure and often with enclosing woodland. The course of the river is marked by narrow woodland belts and willow trees. There are smaller pastoral fields along the valley floor with historic parklands sited on the valley side slopes at Little Barford with scattered parkland trees and small woods.

2.6.9 Emerging east from the Great Ouse Valley the route would align with the existing transport corridor of the new A421 dual carriageway currently being constructed by National Highways as part of the A428 Black Cat to Caxton Gibbet improvements scheme, but would remain in an essentially rural

[9] *Natural England. (2014) NCA profile: 88 Bedfordshire and Cambridgeshire Claylands – NE555.* Available at: NCA Profile: 88 Bedfordshire and Cambridgeshire Claylands - NE555 (naturalengland.org.uk).
[10] *LUC* (2020) *Bedford Borough Landscape Character Assessment*, *Bedford.GOV.UK.* Available at: OpenDocument.aspx (bedford.gov.uk).

landscape that rises onto the low rolling gault clay ridge that extends east from St Neots towards Cambridge. The East of England Character[11] typology prepared by Landscape East describes this as 'a gently rolling, elevated landscape with ancient woodland blocks and small, nuclear villages … often [forming] an open landscape with long distance views, although woodland contains views particularly around settlements'.

2.6.10 As the route bears south beneath the A428, it would continue across undulating farmed and sparsely wooded landscape, descending from the ridge into the broad valleys and lower lying land that have been eroded by the main rivers west of Cambridge, including the Cam, Granta, Rhee and Bourn Brook. Landscape East describes the area as 'low lying, but gently rolling arable landscape … dissected by small streams and [with] a distinctive pattern of nucleated villages and patchwork of woodlands and shelterbelts'.

2.6.11 The approach into Cambridge takes the route past the villages that have developed along the A10, such as Harston and Shelford, which have expanded, leading to a more suburban context on the approaches to the city through this area. The route joins existing rail corridors that enter the city passing by Addenbrooke's and Royal Papworth hospitals and the Cambridge Biomedical Campus.

[11] *Landscape East* (2024) *Wooded Village Farms.* Available at: http://www.landscape-east.org.uk/lct/wooded-village-farmlands.

3 Project Description

3.1 Oxford to Bletchley

Summary

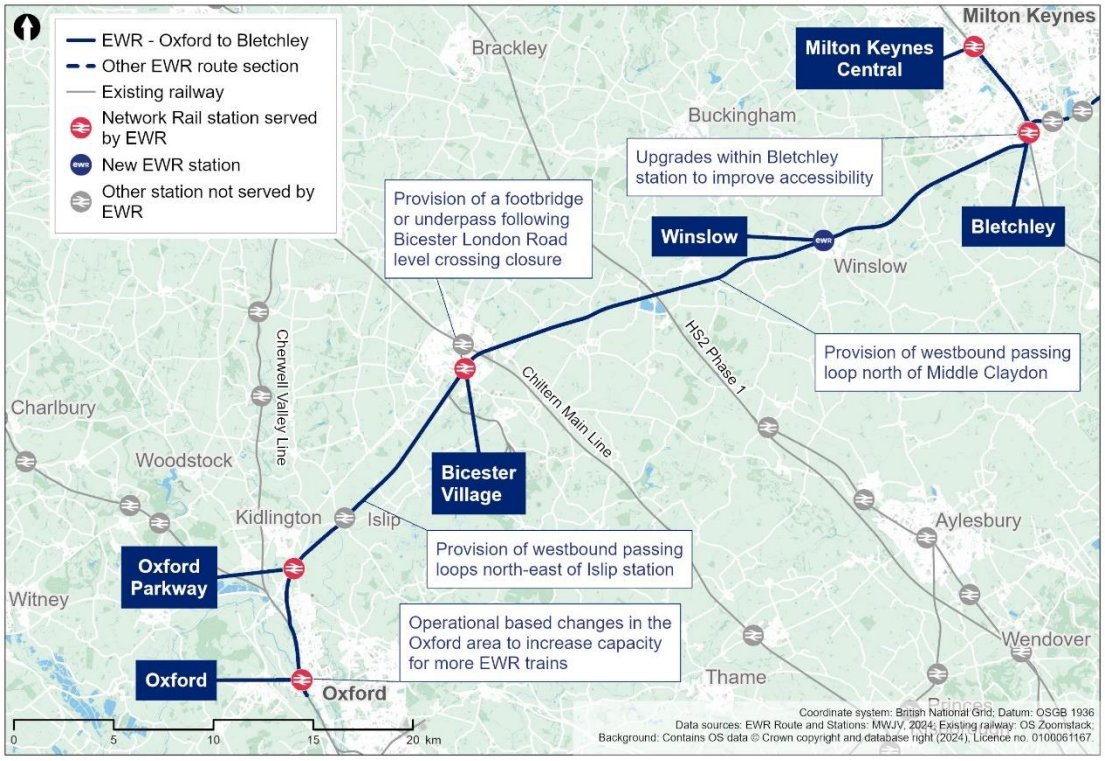
3.1.1 The Project between Oxford and Bletchley would use the existing railway. Services already operate between Oxford and Bicester, and the upgrade of the section from Bicester to Bletchley is currently under construction as part of East West Rail Connection Stage 1, which will introduce a passenger service between Oxford and Milton Keynes in late 2025. To accommodate the full East West Rail passenger service and freight services, alongside existing services, further works are required along this 48km (30 mile) section of railway.

3.1.2 The proposed works are summarised below:

- Track upgrades at Oxford.
- Potential alterations and upgrades at Oxford, Oxford Parkway, Bicester Village, Winslow, and Bletchley stations to accommodate increased East West Rail passenger numbers. The changes required would depend on the results of passenger demand forecasting and pedestrian modelling, as well as other future operational requirements.
- Closure of the level crossing at Bicester London Road and the construction of an accessible replacement crossing for pedestrians, cyclists and other users of the crossing, either via a footbridge or an underpass.
- Widening of the rail corridor to the east of Islip and at Middle Claydon to create passing loops, resulting in the demolition and reprovision of existing footbridges at both locations to maintain public rights of way (PRoW).
- Utility and traction power works to accommodate overhead line equipment (OLE) across the route, with the largest two diversions to electrical infrastructure at Oxford Parkway station and Verney junction.
- Connections with the Quainton substation or the East Claydon substation, to provide power for East West Rail trains.

3.1.3 Under the full East West Rail service, this section would accommodate four passenger trains per hour and one freight train per hour in each direction. These services would be in addition to the existing two trains per hour in each direction on Chiltern services between Oxford and Bicester (continuing to London Marylebone).

Figure 3 – Proposed route of the Project between Oxford and Bletchley



Project proposals

Oxford

3.1.4 The East West Rail alignment would start south of Oxford station, heading north on existing tracks. To accommodate the full East West Rail services it is likely that a combination of changes to the track layout, such as crossovers or turnbacks, along with operational changes would be required. Ongoing discussions with Network Rail and other rail industry stakeholders will help determine the appropriate solution.

3.1.5 To accommodate increased passenger numbers, alterations may be required at Oxford station. These may include changes to the station layout, such as to stairways and platform access.

Oxford Parkway

3.1.6 To accommodate increased passenger numbers, alterations may be required at Oxford Parkway station. These may include minor changes to the station layout, such as changes to the gate barriers and entrance ways, the potential enlargement of the station car park and associated upgrade to the car park entry junction on Oxford Road. New and larger drainage ponds would also need to be provided.

3.1.7 Options are currently being considered regarding how best to power trains. If the route between Oxford and Bletchley is electrified with OLE, diversion of

3.2 Fenny Stratford to Kempston

Summary

3.2.1 This route section covers approximately 23km (14 miles) of the existing Marston Vale Line (MVL) between Saxon Street dual carriageway and Ampthill Road in Kempston. The MVL, which runs between Bletchley and Bedford, is currently used by London Northwestern Railway passenger trains and freight trains and includes nine existing stations.

3.2.2 Two alternative options for the stations along the MVL are being presented at the 2024 non-statutory consultation as summarised in Table 3:

Table 3 – MVL station options

Concept 2 (Consolidated Stations Option)	Concept 1a (Existing Stations Option)
The nine existing stations between Fenny Stratford to Kempston would be consolidated into four new stations (Woburn Sands, Ridgmont, Lidlington and Stewartby). The other five would be closed.	All nine of the existing stations will be retained with minor enhancements and upgrades as necessary.

3.2.3 The initial environmental information in this route section is based on the Consolidated Stations Option as this would have potentially larger environmental impacts than the Existing Stations Option due to associated landtake, introduction of structures and activities.

3.2.4 The proposed works for the Consolidated Stations Option are summarised below:

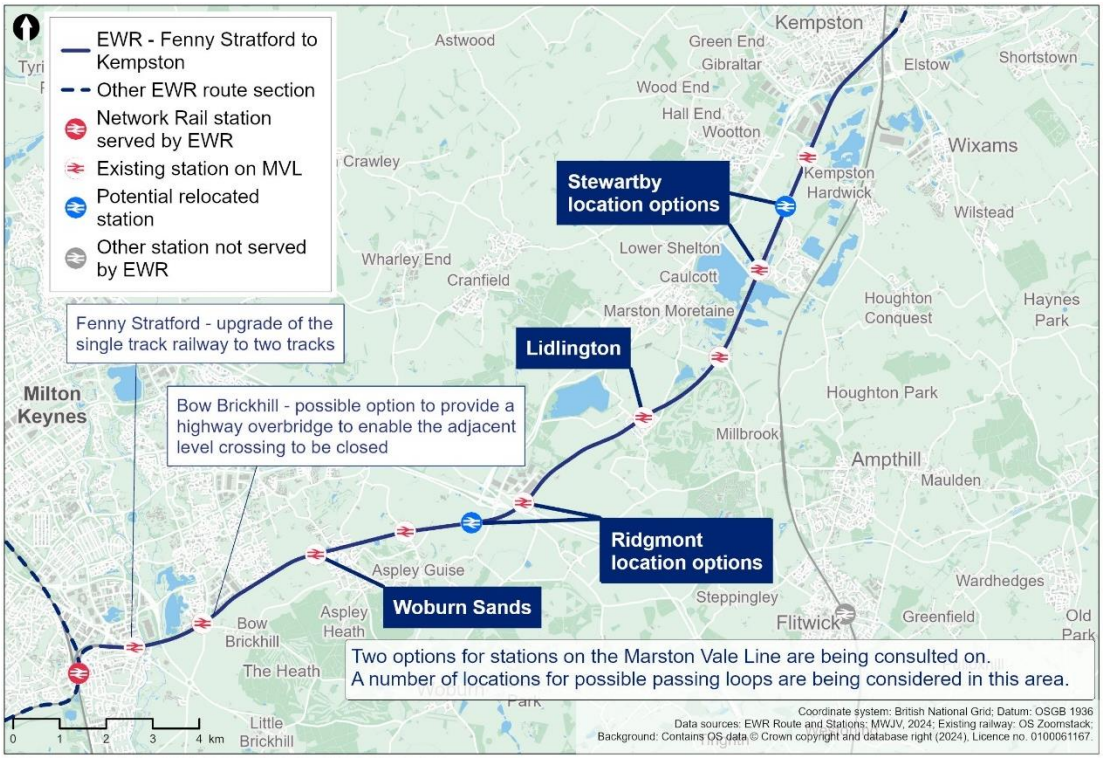
- Existing stations at Woburn Sands, Ridgmont, Lidlington and Stewartby would be replaced by four new enlarged stations to accommodate East West Rail services.
- Five existing stations at Fenny Stratford, Bow Brickhill, Aspley Guise, Millbrook and Kempston Hardwick would be closed.
- Upgrading the existing single track to two track over about 1.7km approximately between Saxon Street and the A5.
- Improved or new access roads for track maintenance at various locations across the route section.
- Changes to level crossings in this area which would be: retained; upgraded; closed and diverted; closed and replaced by bridge crossings

and associated diversions of rights of way; or closed without alternative provision.

- Installation of various drainage and water storage ponds (referred too as balancing ponds) along the route section.
- Various utility diversions including overhead power lines and below ground gas pipes.
- Upgrades to existing railway signalling, telecommunications and traction power facilities.
- Passing loops to allow faster passenger trains to overtake slower trains (see Table 6).

3.2.5 The proposed East West Rail passenger train service pattern between Bletchley and Bedford would be three trains per hour in each direction. Line speed would increase from 60mph to 75mph for passenger trains under the Consolidated Stations Option.

Figure 4 – Proposed route of the Project between Fenny Stratford and Kempston



Project proposals

Fenny Stratford

3.2.6 The existing railway runs east from Saxon Street and through Fenny Stratford station on a single track. An additional track, mostly within the existing railway corridor, is proposed as part of the Project to accommodate the new East West Rail services. The new track would start just west of Saxon Street bridge and join the railway just east of the A5, from where it would then join the existing two-track alignment. To accommodate two tracks, the southern bridge that carries the railway over Saxon Street would be demolished and replaced with a wider bridge and the current level crossing on Simpson Road would be widened. The northern bridge over Saxon Street would remain. The railway embankment between Bletchley station and Saxon Street would also need to be widened on the south side of the railway. Between Saxon Street and Watling Street retaining walls may be required between the railway and commercial properties to the north and south to avoid impacts to existing buildings.

3.2.7 Under the Existing Stations Option, Fenny Stratford would be trained, with minor enhancements including construction of a second platform.

3.2.8 Under the Consolidated Stations Option, Fenny Stratford station would be closed. The existing level crossing on Simpson Road would be widened to accommodate both tracks. East of the existing station, minor modifications to the existing Grand Union Canal bridge to allow for the additional track and additional structures would be required to support the two tracks over the River Ouzel and the A5.

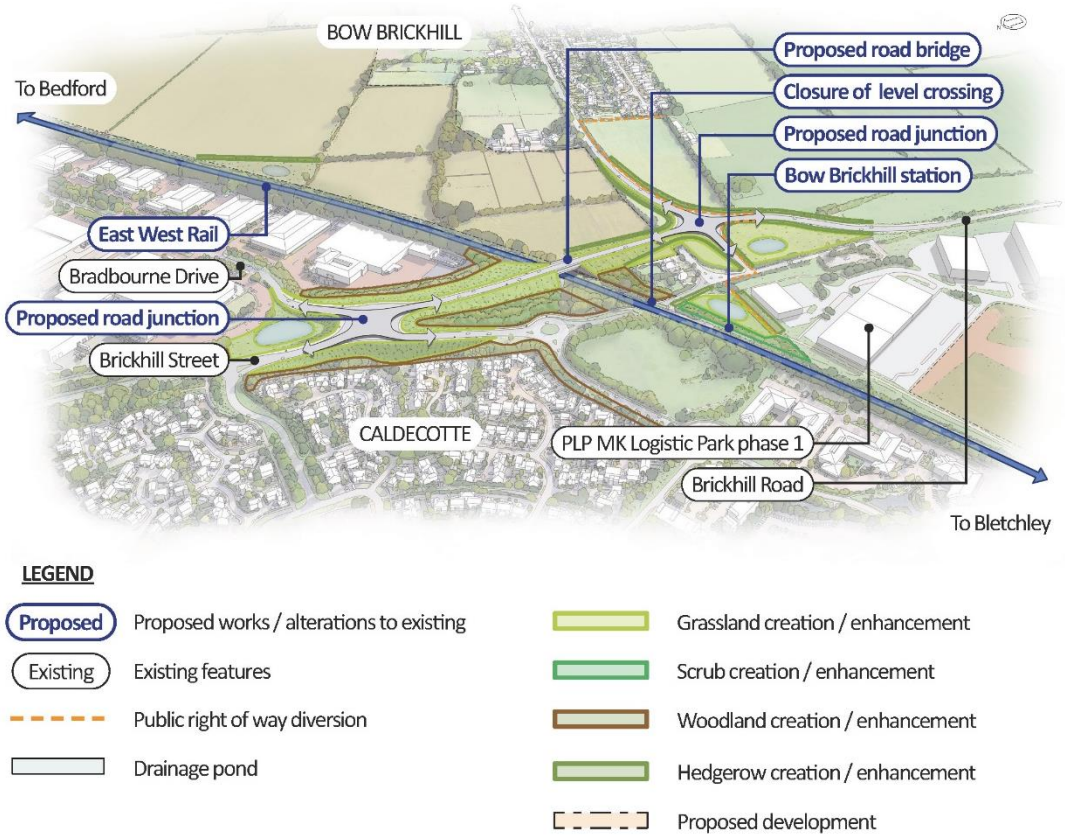
Bow Brickhill

3.2.9 Under the Existing Stations Option, Bow Brickhill would be retained, with minor enhancements.

3.2.10 Under the Consolidated Stations Option, Bow Brickhill station would be closed. The level crossing may need to be closed and replaced with a new highway overbridge to the east of the crossing (see Figure 5).

3.2.11 Browns Wood footpath level crossing would be closed, with users diverted onto a new section of public footpath south of the railway to the Pony bridleway level crossing to the east. The Pony bridleway level crossing would be upgraded to include a miniature stop light to improve safety.

Figure 5 – Indicative illustration of Bow Brickhill level crossing closure and new bridge crossing



Woburn sands

3.2.12 Under the Existing Stations Option, Woburn Sands station would be retained in its location, and the platforms extended for the EWR service.

3.2.13 Under the Consolidated Stations Option, the existing Woburn Sands station would be closed and a new station to replace it constructed to the west of its current location. The station and car park would be located north of the railway within the area of the South East Milton Keynes Strategic Urban Extension proposal (SEMK). The existing level crossing at Station Road/Newport Road would remain open. The other four level crossings in this area would be closed:

- Woodleys Farm, a private track and level crossing would be closed with access to be discussed with the relevant landowners.

- Fisherman's Path footpath level crossing would be closed and users diverted via Drayhorse Crescent south of the railway and the proposed new station access road north of the railway to Woburn Sands level crossing.
- Mill Farm footpath level crossing would be closed and users diverted via existing footpaths to Woburn Sands level crossing.
- Sewage Farm footpath level crossing would be closed and users diverted via a section of new footpath between Mill Farm and Sewage Farm crossings to the south of the railway to Woburn Sands level crossing, creating a circular walking route.

Aspley Guise

3.2.14 Under the Existing Stations Option, Aspley Guise would be retained, with minor enhancements.

3.2.15 Under the Consolidated Stations Option, Aspley Guise station would be closed. The level crossing on Salford Road would remain open. The other three level crossings in this area would be closed:

- Old Manor Farm footpath level crossing to the east of Aspley Guise would be closed with users diverted to the Aspley Guise level crossing along a new access track and footpath that would be built on the north side of the railway.
- Berry Lane level crossing, a private user-operated crossing located east of Old Manor Farm, would be closed and users diverted to Aspley Guise level crossing using the access track on the north side of the railway.
- Long Leys level crossing, a private farm crossing, would be closed and users diverted to Aspley Guise (Station Road) level crossing using the access track and footpath on the north side of the railway and via Berry Lane south of the railway.

Ridgmont

3.2.16 Under the Existing Stations Option, Ridgmont would be retained, with minor enhancements and platform extensions.

3.2.17 Under the Consolidated Stations Option, Ridgmont station would be redeveloped, although the location is still to be determined (see Table 4). The Bedford Borough Council Local Plan 2030 includes a proposal for a waterway between Bedford and Milton Keynes, which would run alongside the railway in this area. If Option 1 for the station is built, the proposed route of the waterway would need to be diverted around the station area.

3.2.18 The station option chosen would affect the level crossings in this area, so two options are still under consideration for Station Road level crossing (see Table 4). An access track between Berry Lane and Bedford Road would be constructed, and would provide access to the new western station, if chosen.

Table 4 – Ridgmont Station options

Proposed intervention	Option 1	Option 2
Ridgmont station and level crossing	New station to the west of Bedford Road with station and car park located to the north of the railway. Level crossing to be retained.	Upgrade station in its current location with a new car park south of the railway. Station Road level crossing to be closed, with traffic re-routed.

3.2.19 Three level crossings in the area would be closed:

- Husborne Crawley 6 footpath level crossing would be closed and users diverted via Ridgmont station footbridge (with station Option 1) or via Bedford Road (with station Option 2).
- Matey Boys level crossing, a private farm crossing, would be closed with no diversion.
- Husborne Crawley 10 footpath level crossing would be closed and the footpath extinguished north and south of the railway. An alternative route for existing users is available via Mill Road with users diverted via Ridgmont level crossing (with station Option 1) or via Ridgmont station footbridge (with station Option 2).

3.2.20 Depending on which option is selected for Ridgmont station, a passing loop is proposed with new tracks either side of the railway between Aspley Guise and Ridgmont stations. The chosen options for the passing loops are still to be determined (see Table 4).

Lidlington and Millbrook

3.2.21 Under the Existing Stations Option, Lidlington would be retained, with minor enhancements and platform extensions.

3.2.22 Under the Consolidated Stations Option, Lidlington station would be replaced with a new station east of its current location into an area of land to the north of the village that is part of the Marston Valley development. Access to the station would be from the north via a new road between Station Road and Marston Road.

3.2.23 Under the Existing Stations Option, Millbrook would be retained and given minor enhancements.

3.2.24 Under the Consolidated Stations option, Millbrook station would be closed.

3.2.25 There are seven level crossings in this area. Three of them would be closed with diversions provided to alternative crossings. These are each described below:

- Broughton End footpath level crossing and the adjacent Forty Steps footpath level crossing (both public rights of way; PRoW) would both be closed. Users would be diverted to the existing Playing Field footpath level crossing (via a new footpath between Forty Steps and Playing Field to the north of the railway), which would remain open and be upgraded with a miniature stop light system.
- The existing level crossing at Lidlington on Station Road/Church Street would remain open.
- Piling Farm South footpath level crossing would be closed and the path diverted to the new Lidlington station footbridge.
- The level crossing on Marston Road is assumed to be closed by Network Rail with a new overbridge. If this does not happen, it would be kept open and upgraded to a full barrier crossing.
- Millbrook (Station Lane) level crossing by Millbrook station would remain open.

Stewartby

3.2.26 Under the Existing Stations option, a third platform would be required at Stewartby station to accommodate the two proposed services that would operate between Stewartby and Cambridge under this option. Because of this, under this option, Stewartby station may need to move from is existing location. Further work is required to confirm this.

3.2.27 The existing Stewartby station would be replaced with a new station. The preferred location of the new station is still to be determined (see Table 5). The road and adjacent level crossing at Green Lane would remain open, as well as the level crossing further north at Wooton Broadmead (Broadmead Road).

Table 5 – Stewartby station options

Proposed intervention	Option 1	Option 2
Stewartby Station	New station option north of Green Lane with the station and car park located to the east of the railway and access via Green Lane.	New station option north of Broadmead Road with the station and car park to the east of the railway and access via Broadmead Road.

3.2.28 Stewartby Brickworks level crossing, used as a PRoW and formerly by users of the brickworks, would close with no alternative provided.

3.2.29 Four passing loop options are proposed in the vicinity of Stewartby and Kempston Hardwick stations (see Table 6), with the preferred option still to

be determined. The passing loop location would depend on the location of the new station.

Kempston Hardwick and Kempston (Bedford)

3.2.30 Under the Existing Stations option, Kempston Hardwick would be retained and given minor enhancements.

3.2.31 Under the Consolidated Stations option, Kempston Hardwick station would be closed. Wootton Village footpath level crossing would be closed and users diverted by new paths east and west of the railway to the level crossing at Kempston Hardwick (Manor Road). The level crossing on Manor Road is assumed to be closed by Network Rail and replaced by a new overbridge. If this does not happen, it would be kept open and upgraded to a full barrier crossing. The Woburn Road footpath level crossing is assumed to be closed by Network Rail and replaced by a new footbridge. If this does not happen, it would be kept open and upgraded with a miniature stop light system.

Options

3.2.32 Table 6 shows where options remain for passing loops in the Fenny Stratford to Kempston route section. For each intervention, one of the options would be selected. Further technical work will be carried out alongside consideration of consultation feedback to determine which option is most suitable.

Table 6 – Fenny Stratford to Kempston route section passing loop options

Proposed intervention	Option 1	Option 2	Option 3
Passing loops westbound	North of the railway, between Berry Lane level crossing and Bedford Road overbridge.	West of the railway, south of Green Lane.	West of the railway, north of Broadmead Road.
Passing loops eastbound	South of the railway, between Berry Lane level crossing and Bedford Road overbridge.	East of the railway, south of Broadmead Road and opposite the former brickworks sidings.	East of the railway, north of Broadmead Road.

3.3 Bedford

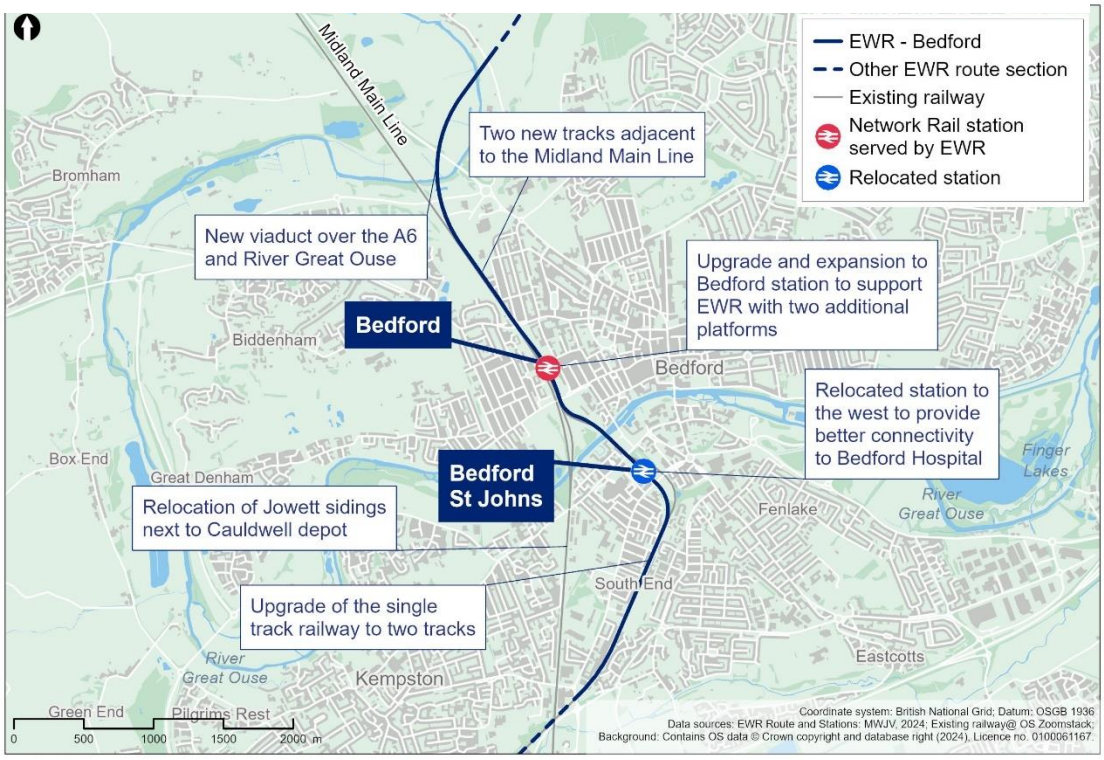
Summary

3.3.1 The proposed route through Bedford is approximately 5.4km (3.4 miles) long, extending north between Ampthill Road in Kempston, and Clapham Road south-east of Clapham village, next to the River Great Ouse. The proposed works include:

- New two-track railway to be constructed in the existing rail corridor between the Sandhurst Road footbridge and Bedford station that would remove the existing single MVL track between these two points (see Figure 6).
- New relocated station at Bedford St Johns closer to Bedford Hospital to replace the existing station, which would be removed.
- New sidings at Cauldwell Walk to replace those displaced at Jowett Sidings to make space for the railway tracks as they approach Bedford station.
- New railway infrastructure at Bedford station to allow East West Rail passengers to interchange with other train services, such as a new station plaza, new footbridges and replacement car parking.
- Two new tracks alongside the Midland Main Line (MML) north from Bedford station, which would then diverge east to follow a new rail corridor using a new viaduct over Paula Radcliffe Way and the River Great Ouse.
- Works to roads in the area to enable the railway to be built and operated, including the realignment of Ampthill Road, Cauldwell Street, Ford End Road, Bromham Road and A6 Great Ouse Way.
- Drainage and water storage ponds (referred to as balancing ponds) along the route section.
- Diversions of various utilities, including overhead power lines.

3.3.2 Depending on which East West Rail passenger train service pattern is taken forward as outlined in Table 2, Bedford will see up to five trains per hour per direction from the south, and four trains an hour per direction from the north. This is in addition to current and future freight services.

Figure 6 – Proposed route of the Project through Bedford



Project proposals

South Bedford and Bedford St Johns

3.3.3 The Project requires the construction of a new two-track section of railway starting at Sandhurst Road footbridge and continuing through a new and relocated two platform station at Bedford St Johns. The existing Marston Vale Line (MVL) would be realigned to the south-west to allow for the new tracks and station. The existing Ampthill Road and Cauldwell Street overbridges, respectively south and north of Bedford St Johns station, may need to be raised to accommodate required clearances for overhead line equipment (OLE). To reduce the extent of highways improvements in this area, the tracks may also need to be lowered. Minor modifications are also proposed to Britannia Street and Prebend Street due to the realignment of Cauldwell Street.

3.3.4 The new tracks would join the existing MVL north of Cauldwell Street before crossing over the Great Ouse on an existing bridge. The track would pass

through Jowett Sidings and under Ford End Road, requiring removal of five stabling sidings and reconfiguration of three maintenance sidings. At the adjacent Bedford carriage sidings, track realignments and junction modifications would also be required.

3.3.5 Operation of the existing crossing under Ford End Road, where access to the sidings is currently provided, would be impaired by the increased number of trains. It is proposed to introduce a new at-grade crossing of the proposed new railway within the Jowett Sidings site.

3.3.6 The existing Cauldwell Sidings on the MML south of Kempston Road would be enlarged to replace the stabling sidings displaced at Jowett Sidings, resulting in the acquisition of businesses at Cauldwell Walk.

Bedford station

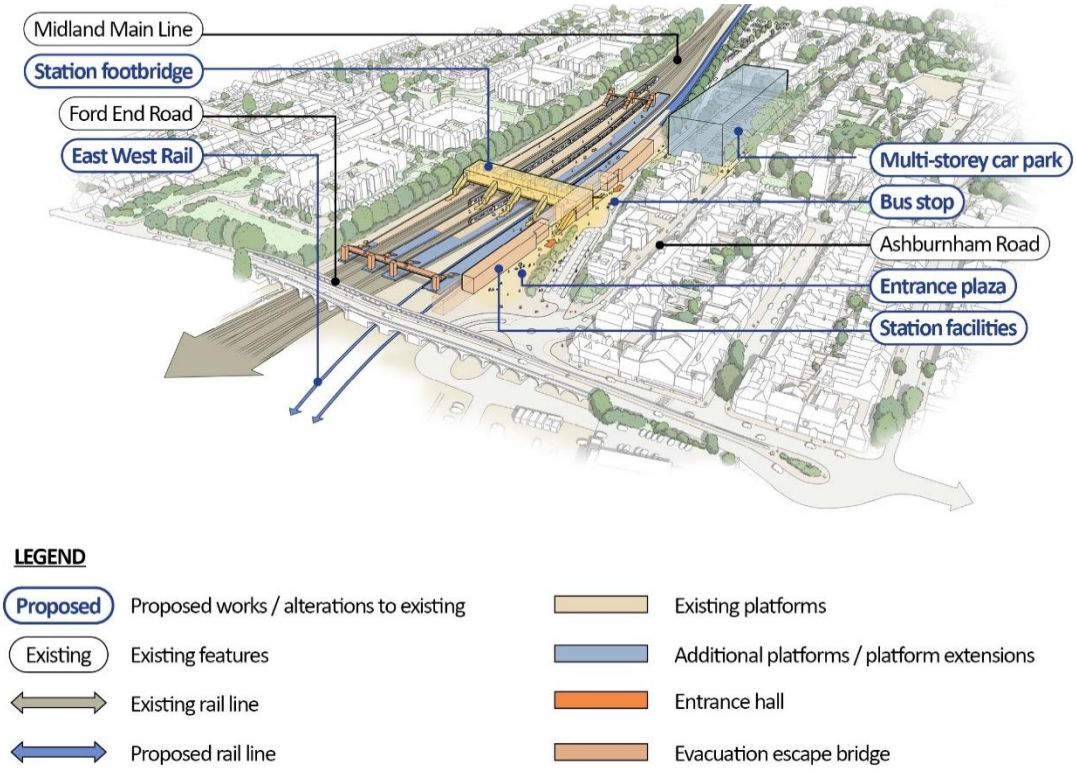
3.3.7 The existing Bedford Station would be remodelled to include two new platforms to the east of the current platforms. The two new platforms would be approximately 200m long and accommodate through-services. Under normal operation 106m of the platform would be in use, however the longer length is proposed to ensure that in scenarios where services are disrupted trains can be split and joined. The existing platform 1A would be widened and lengthened to create a platform for Thameslink.

3.3.8 The new station building would be constructed at ground level on the existing Ashburnham Road car park and would be accessible both from the south via Midland Road, and from the proposed car park to the north.

3.3.9 A new footbridge would be constructed to provide access to and circulation between the new EWR platforms and the existing platforms at the station. An additional footbridge at the south end of the existing platforms is proposed to enhance interchange opportunities and passenger connectivity between platforms whilst also providing a secondary means of escape in emergency situations. A further footbridge to provide a secondary means of escape is proposed at the northern end of the existing platforms.

3.3.10 A new multi-storey car park would be provided on Ashburnham Road above the current station car park, along with provision for taxi and public transport connections. A pedestrian plaza would be located in front of the station entrance.

Figure 7 – Indicative illustration of Bedford station



North Bedford

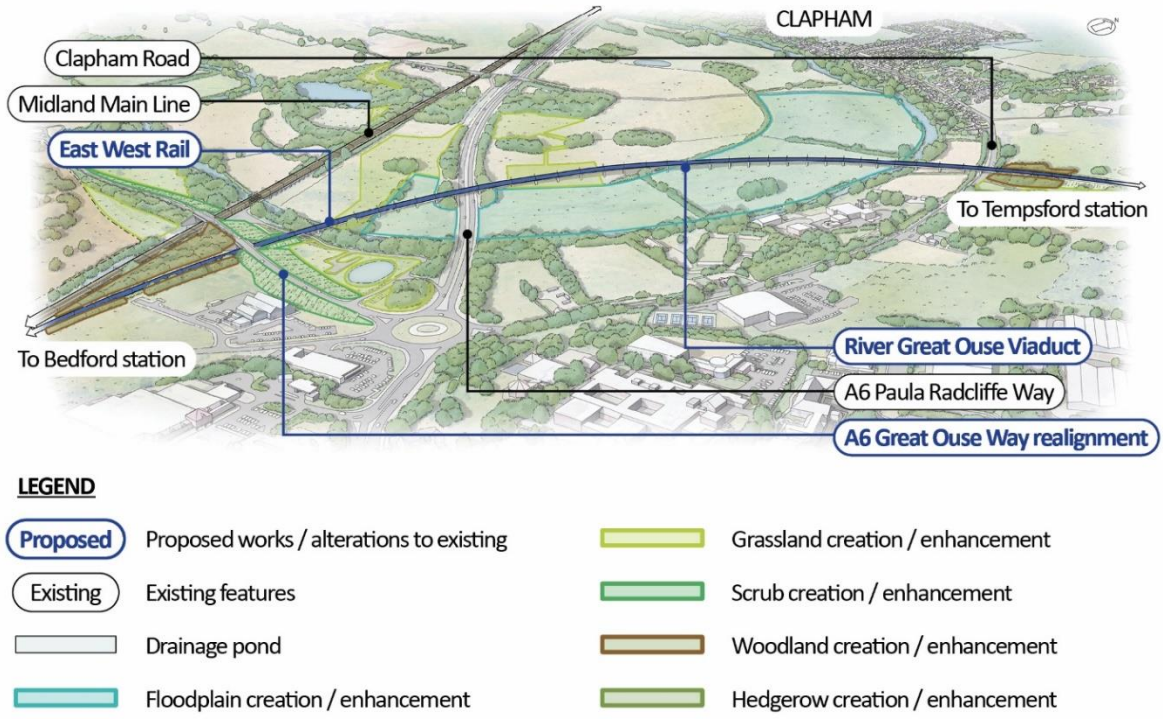
3.3.11 North of Bedford station the new two-track railway would continue up to Bromham Road and pass beneath the road. From here the new railway would run parallel with the existing four-track MML, creating a six-track corridor for approximately 900m through the Poets areas as far as Cut Throat Lane. Works to extend the existing Bromham Road overbridge would be carried out to the east to allow for the two additional new tracks to pass underneath.

3.3.12 The proposed works to widen the existing rail corridor in this area include highway works on Chaucer Road, Spenser Road, Milton Road, Sidney Road, Milne Row and Chesterton Mews. These works are expected to require the acquisition and/or demolition of several residential and commercial properties in this area.

3.3.13 The new two-track railway would diverge from the MML at the UK Power Networks substation on Cut Throat Lane before passing under the A6 Great

Ouse Way. The A6 Great Ouse Way would require realignment to separate the railway and the A6. Once north of the A6 Great Ouse Way, the railway could continue to rise on a new 1.1km long viaduct to cross twice over the River Great Ouse and its flood plain, as well as the A6 Paula Radcliffe Way. The existing electricity transmission lines would be re-routed.

Figure 8 – Indicative illustration of River Great Ouse viaduct



3.4 Clapham Green to Colesden

Summary

3.4.1 Between Clapham on the northern edge of Bedford and Colesden west of Wyboston, a new section of railway and associated infrastructure would be constructed. Along this 12km (7 mile) route section the railway would cross the rolling countryside north and east of Bedford using a mixture of new embankments, cuttings and short viaducts.

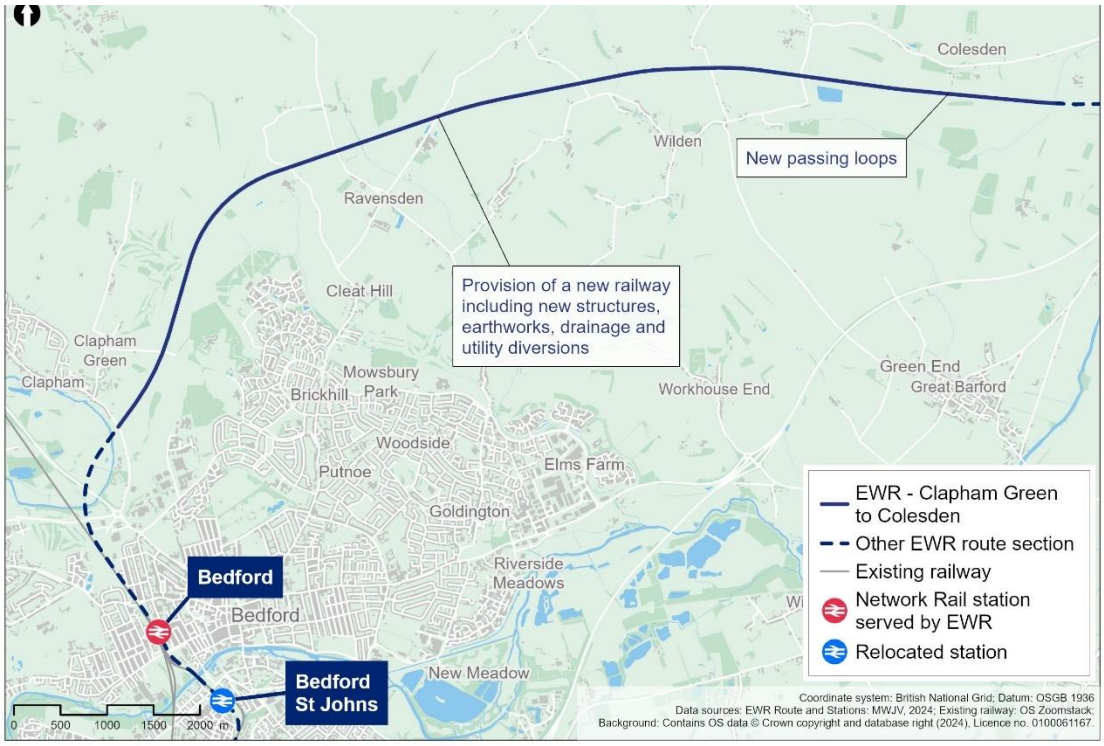
3.4.2 The proposed works include:

- New two-track railway with associated embankments, cuttings, viaducts and track infrastructure.
- New overbridges and underbridges for road, track and path crossings, culverts and overbridges for watercourses, and associated diversions where necessary.
- Two passing loops near Colesden so that faster passenger trains could overtake slower trains.

- Provision of drainage and water storage ponds (referred to as balancing ponds) to manage flood risk.
- Utility diversions along the route, including overhead electricity transmission lines.

3.4.3 The passenger train service pattern between Bedford and Cambridge stations would be four trains per hour in each direction.

Figure 9 – Proposed route of the Project between Clapham Green and Colesden



Project proposals

Clapham, Ravensden and Wilden

3.4.4 The railway route in this section would bear north and east from Bedford on a new viaduct. Crossing Clapham Road south of the villages of Clapham and Clapham Green, the new railway would continue from this viaduct onto an embankment up to around 10m high. It would enter a cutting and cross beneath Carriage Drive between Clapham Green and Clapham Park, continuing in cutting up to about 14m deep to the east of the Bedford and County golf club. Several public rights of way (PRoW) would be diverted onto new bridges over the route, including Carriage Drive, Clapham Footpaths 5 and 6 and Brickhill Bridleway 54. Clapham Footpath 9 would be closed with users diverted to Clapham Footpaths 8 and 24.

3.4.5 The new railway would pass to the north of Brickhill in cutting before turning east past Highfield Farm and Gray's Hill Farm, crossing over a stream which

would be culverted beneath. Graze Hill Road would require a new road bridge to pass over the railway. Continuing on embankment, the railway would pass over a realigned Thurleigh Road and Ravensden Brook on new bridges. There are several PRoW in the Graze Hill and Thurleigh Road area which are proposed to be modified to maintain connectivity, comprising Ravensden Bridleway 4, and Ravensden Footpaths 5, 46 and 47.

3.4.6 A series of embankments and cuttings would be needed as the railway passes to the north of Ravensden. The railway would pass in cutting with Sunderland Hill Road north of Grange Farm requiring a new bridge over the railway on a similar alignment to the existing road.

3.4.7 The new railway would rise onto embankment as it continues eastwards over Shrubbery Lane. It would pass over the narrow valley of South Brook West on a short (approximately 250m) viaduct before entering cutting through Chequers Hill north of Wilden.

3.4.8 Several existing PRoW would be diverted across the new railway on new bridges or underpasses beneath the railway to maintain connectivity. The impacted PRoW would be Ravensden Byway 61, Ravensden Footpath 35, and Wilden Footpaths 16, 22 and 33. The North Bedfordshire Heritage Trail long distance path (Wilden Footpath 27) would pass over the route on a new footbridge. An additional farm access track would also be provided in this area.

3.4.9 The new railway would continue in cutting passing beneath Chequers Hill and Colesden Road. A new bridge would be constructed to take Chequers Hill over the railway and accommodate a diversion of Wilden Footpath 24. Colesden Road would also be diverted to take it over the railway.

Colesden

3.4.10 To the east of the Colesden Road bridge, the new railway would continue on a series of embankments across the western edge of the River Great Ouse Valley. Two new passing loops would be constructed in the Colesden area. A new overbridge would be built south of Colesden Road to accommodate diversions to several bridleways, PRoW and a farm access track. The railway would cross over South Brook on a short viaduct, where this route section ends.

3.5 Roxton to east of St Neots

Summary

3.5.1 This section of the Project comprises the construction of a new railway over approximately 10km (6.2 miles), between South Brook west of Roxton, and

where the B1428 Cambridge Road joins the existing A428 at the roundabout east of St Neots.

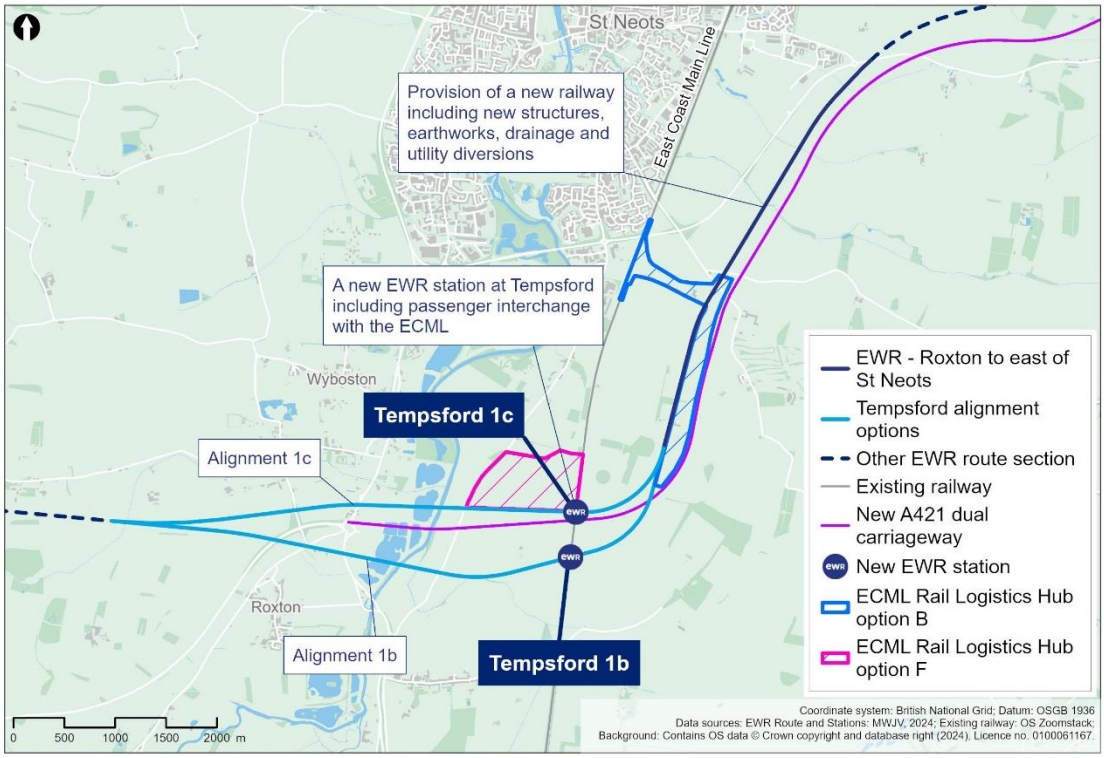
3.5.2 The proposed works include:

- New two-track railway and associated infrastructure, including two possible alignments to cross the Great Ouse valley, each comprising long viaducts linked by embankment, as described separately below.
- A new station at Tempsford that would provide an interchange with the East Coast Main Line (ECML) and serve existing communities and new communities within potential new developments south of St Neots and in the Tempsford area.
- Two options for a temporary logistics hub connecting with the proposed East West Rail alignment and the ECML to be used to support construction, with land reinstated post-construction. The two options being considered for the logistics hub are described below.
- New overbridges and underbridges to support the railway as it crosses roads, tracks and paths, culverts and overbridges for watercourses, and associated diversions where necessary.
- Provision of drainage and water storage ponds (referred to as balancing ponds) along the route section.
- Utility diversions along the route including overhead electricity transmission lines.

3.5.3 The passenger train service pattern between Bedford and Cambridge stations would be four trains per hour in each direction.

3.5.4 This route section would interact with the new A421 dual carriageway, currently being constructed by National Highways as part of the A428 Black Cat to Caxton Gibbet improvements scheme at the time of writing and due to open in 2027.

Figure 10 – Proposed route of the Project between Roxton to the east of St Neots



Project proposals

Ouse Valley

3.5.5 To the east of South Brook, the railway would remain on embankment using one of two alignments, as described below.

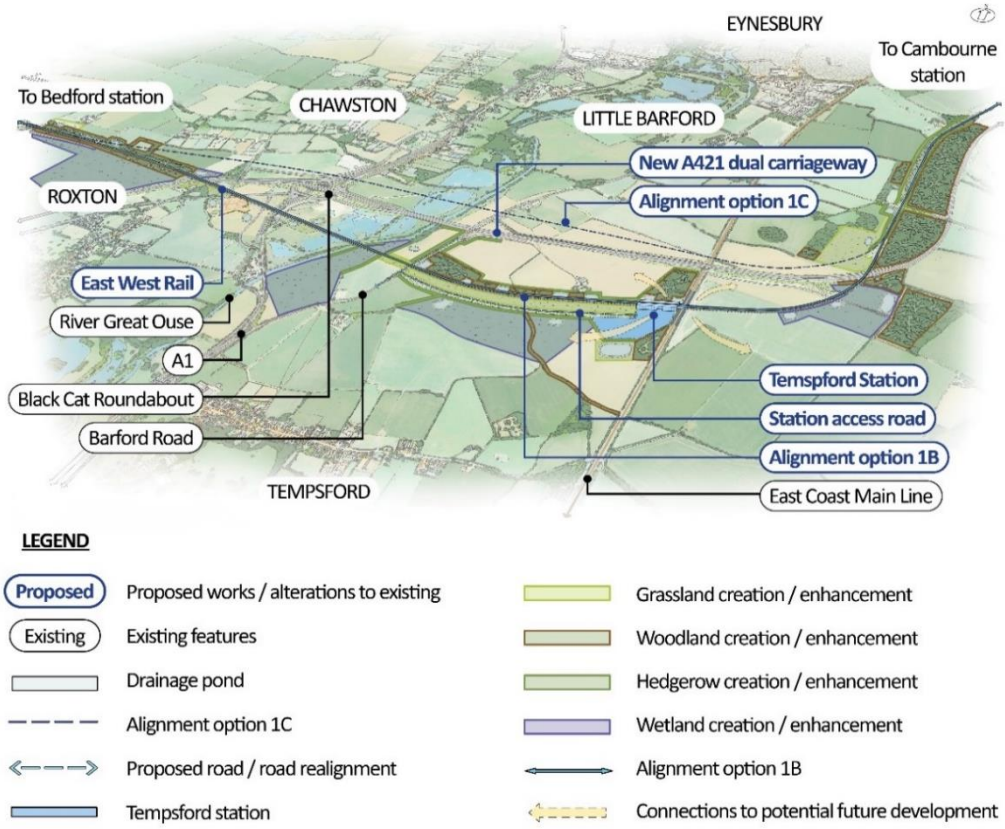
Alignment 1b

3.5.6 This alignment option runs to the south of the Black Cat roundabout and the existing and the new A421 dual carriageway. It would continue on embankment up to 17m high until it reaches the A421, which it would cross on a viaduct. It would remain on viaduct to cross over Bedford Road to the north of Roxton and the A1 Great North Road, south of Black Cat roundabout. It would pass over or close to Roxton Garden Centre, a residential property (Green Acres) and a scrap yard. The railway would continue over the River Great Ouse on viaduct before continuing on

embankment beneath the electricity transmission line, which would be diverted.

3.5.7 It would then resume on viaduct over Barford Road, which would be realigned beneath the new railway. The viaduct would continue south-eastwards, passing over the ECML where Tempsford station would be constructed. The railway would then head north-east over the new A421 dual carriageway and onto embankment. The new A421 dual carriageway would be on embankment approximately 9m above ground level at this point, requiring the East West Rail railway to be up to 24m high.

Figure 11 – Indicative illustration of Tempsford Alignment 1b

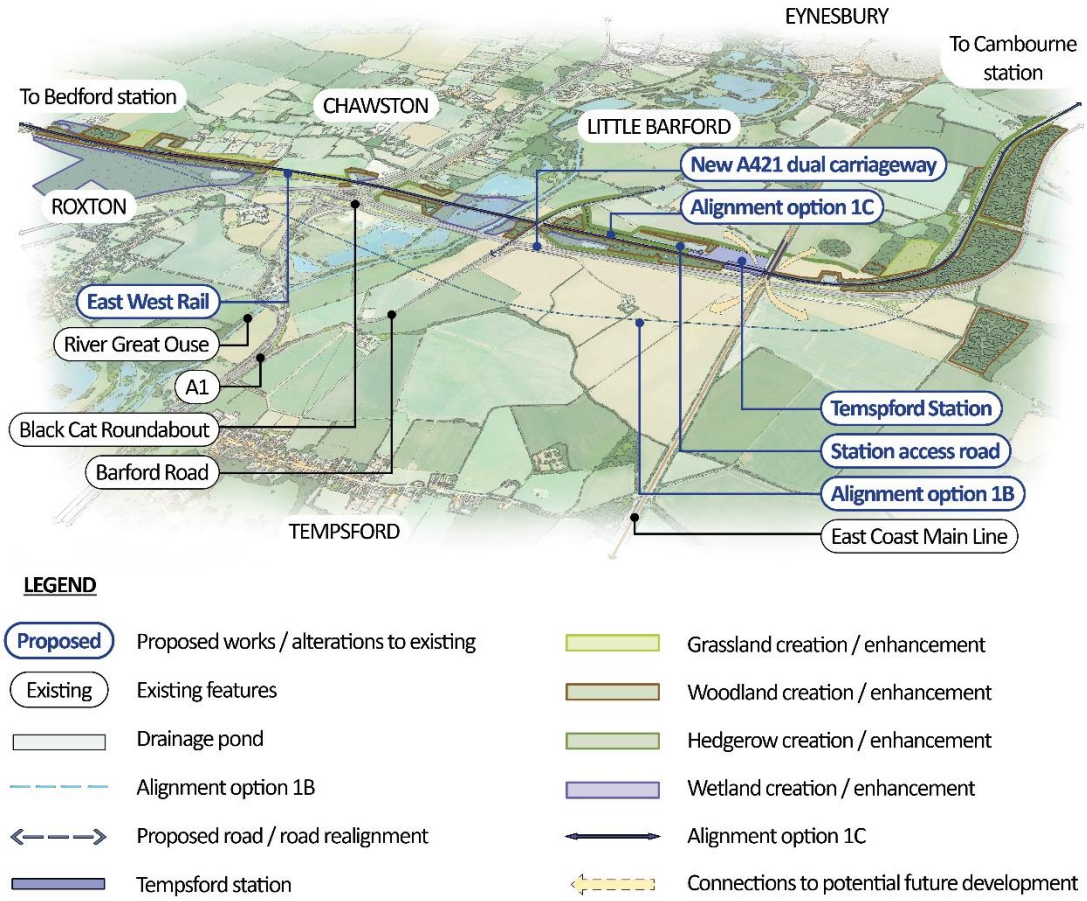


Alignment 1c

3.5.8 This alignment option would run to the north of the Black Cat roundabout, the existing A421 and the new A421 dual carriageway. It would continue on embankment up to 15m high until it reaches Roxton Road, which it would cross on a viaduct up to around 15m high. The Wyboston Chawston and Colesden Footpath 10 (linked to Footpath A10) would be diverted around the embankment and under the viaduct at this point. The railway would remain

on viaduct to cross over the A1 to the north of Black Cat roundabout and the River Great Ouse, parallel with the new A421 dual carriageway, before crossing under a raised Barford Road close to ground level. It would rise on an embankment up to a height of around 8m before returning to a viaduct around 10m high to accommodate the new Tempsford station and crossing of the ECML before returning to embankment and heading north. EWR Co are considering options for this alignment.

Figure 12 – Indicative illustration of Tempsford Alignment 1c



Tempsford station

3.5.9 Both proposed railway Alignments 1b and 1c would include a new station to serve existing communities and potential future development in the Tempsford area. The station would include two East West Rail platforms and two ECML platforms, with a station building and passenger connections between the two railways. Step free access would be provided throughout the station, along with an active travel hub including cycling facilities, bus facilities and a car park.

3.5.10 For both proposed alignments, the railway tracks would be elevated on a new viaduct in the location of the proposed station. The proposed station associated with Alignment 1b would be approximately 22m above ground level and the station associated with Alignment 1c would be approximately 9m above ground level. In both options the station would be accessed from a realigned Barford Road.

East Coast Main Line construction logistics hub

3.5.11 A temporary logistics hub would be introduced between the proposed route alignment and the ECML to support the construction of the new railway. The proximity of the ECML would enable ballast, sleepers and track to arrive by rail and be distributed along the route. This would make the delivery of construction materials more efficient and lessen the potential impacts from heavy goods vehicle (HGV) traffic on the environment and communities. The location and connection with the ECML is relatively central and so could support work on the Project towards both Bedford and Cambridge. The hub would include sidings, facilities for bulk storage of track ballast, and various construction plant and trains for delivering and installing sleepers, ballast and steel rail.

3.5.12 There are two locations currently being considered for the hub, both of which support Alignment option 1c:

- Option B – East of Little Barford and the ECML, which would support either Alignment 1b or 1c.
- Option F – On the north side of the new A421 dual carriageway and west of the ECML, which would support Alignment 1c only.

3.5.13 The site for Option B would be approximately 1.5km long and 150m wide with connections to the ECML via the southbound slow line. Highway access would be provided to the north of the site via the newly diverted B1046 St Neots Road. The site for Option F would be approximately 1km long and 500m wide with connection to the ECML via the northbound slow line. Highway access would be provided to the west of the site via Barford Road.

Tempsford to east of St Neots

3.5.14 Across the Ouse Valley, Alignments 1b and 1c would both run along the western side of the new A421 dual carriageway past Little Barford, initially on embankment before entering cutting. A traction power connection would be made between Little Barford power station and the railway.

3.5.15 In a cutting around 9m deep, the railway would pass beneath the B1046 St Neots Road, which would require a new bridge over the railway (replacing the one currently being constructed over the new A421 dual carriageway), though it would remain close to existing ground level.

3.5.16 Continuing north, the route would rise onto a viaduct over Hen Brook, followed by a short embankment and a new bridge to cross the tributary of Fox Brook before going into a shallow cutting beneath a new footpath overbridge. The railway would continue in cutting beneath Cambridge Road that links with the new A421 dual carriageway. Cambridge Road would be diverted slightly to the north.

3.6 Croxton to Toft

Summary

3.6.1 This 19km (12 mile) route section includes a new railway beginning at the roundabout east of St Neots, running north of Cambourne and the new A421 dual carriageway and A428, before crossing the A428 and ending at the B1046 between Toft and Comberton.

3.6.2 The proposed works include:

- New twin-track track railway and associated infrastructure.
- Passing loops between Brockley Road and Cambourne.
- New station at Cambourne.
- Cut and cover tunnel beneath the A428, the proposed Bourn Airfield development and Highfields Caldecote, with associated temporary diversions of the A428 and other local roads.
- Overbridges and underbridges for road, track and path crossings, bridges and culverts for watercourses, and associated diversions where necessary.
- Various drainage and water storage ponds (referred to as balancing ponds) along the route section.
- Utility diversions along the route including overhead electricity transmission lines.

3.6.3 The passenger train service pattern between Bedford and Cambridge stations would be four trains per hour in each direction, with provision for up to two freight trains per day in each direction.

Figure 13 – Proposed route of the Project between Croxton and Toft

Project proposals

Croxton

3.6.4 The railway would enter the Croxton to Toft route section in cutting heading north-east. It would then pass to the north of the junction between the new A421 dual carriageway, passing beneath the realigned A428 immediately to the north of this new junction, which would need to be realigned on a new overbridge. Abbotsley Bridleway 18 would be diverted onto a new 7m high overbridge to cross over the railway. The route would then cross over the Gallow Brook and return to cutting around 4m deep to cross beneath Toseland Road, which will have been realigned by the A428 scheme, and a new bridge would be constructed to take the road over the railway. It would continue at-grade north of and parallel with the new A421 dual carriageway.

Eltisley and Cambourne

3.6.5 The route would rise onto a low embankment to pass over West Brook and a diverted footpath, and then resume at-grade beneath St Ives Road (B1040), which would be realigned onto a new bridge. It would remain at-grade, passing beneath Ermine Street. St Neots Road and Brockley Road which would each be realigned on new bridges over the railway.

3.6.6 The route would continue along a straight section north of Cambourne and the existing A428. Passing loops would be constructed between Brockley Road and the new Cambourne station, with the station sited north of the town and the A428. The station would include a station building to the south of the proposed railway, two platforms, a bridge with stairs and lifts over the railway, along with an active travel hub including cycling facilities, bus facilities and a car park. Vehicular access would be via St Neots Road and a new footbridge would be provided crossing over the A428 and St Neots Road, connecting into Cambourne.

3.6.7 Various farm tracks and public rights of way (PRoW) would be diverted onto bridges over the railway along this section north of Cambourne, including Knapwell Footpath 5 and Elsworth Bridleway 4. Knapwell Footpath 8 would cross the railway via a new footbridge and a new footpath to the south of the railway would then link Knapwell Footpath 8 to Cambourne station. The route would then enter cutting, passing beneath Knapwell Wood Road, which would be realigned over a new bridge.

Bourn Airfield and Hardwick

3.6.8 East of Cambourne and Knapwell Wood Road, the railway would drop into a cutting to enter a tunnel under St Neots Road, the A428, Wellington Way, the proposed Cambourne to Cambridge busway, the north-east corner of the proposed Bourn Airfield development, and Highfields Road. The tunnel, which would be constructed using a cut-and-cover method would be approximately 1.5km long. This would require the temporary diversion of roads, including the A428, and a number of utilities. A tunnel services building, housing operational and maintenance equipment, would be required at each end of the tunnel. The tunnel would also require an emergency escape route via shafts towards the middle of the tunnel within the northern side of the Bourn Airfield development site.

3.6.9 The route would emerge from the tunnel in cutting – requiring diversion of the Harcamlow Way/Wimpole Way long distance path onto a new footbridge which would be designed as a green bridge – and then briefly run at-grade before entering cutting once again. Hardwick Road would be realigned onto a new bridge over the railway just west of Asplins Farm.

3.6.10 The railway would continue across this undulating landscape, dropping into cutting to pass beneath the B1046 Comberton Road which would be realigned to the north of the current road on a new overbridge. The new overbridge would be designed as a green bridge.

3.7 Comberton to Shelford

Summary

3.7.1 This 14.3km (8.9 mile) section of the route extends between the B1046 Comberton Road to Addenbrooke's Road, Shelford. The project would require new rail infrastructure along much of the route but would use an existing section of railway from a proposed grade-separated junction (called Hauxton Junction), where it joins the existing Shepreth Branch Royston Line (SBR), which serves trains between Cambridge and London King's Cross.

3.7.2 North of Great Shelford, the project would reconfigure the existing Shepreth Junction that connects to the West Anglia Main Line (WAML), which serves trains between Cambridge and London Liverpool Street. Two new tracks would be introduced alongside the existing two-track WAML corridor through the new Cambridge South station (which is under construction at time of writing) and into Cambridge station, although some of this will have been introduced as part of the Cambridge South works.

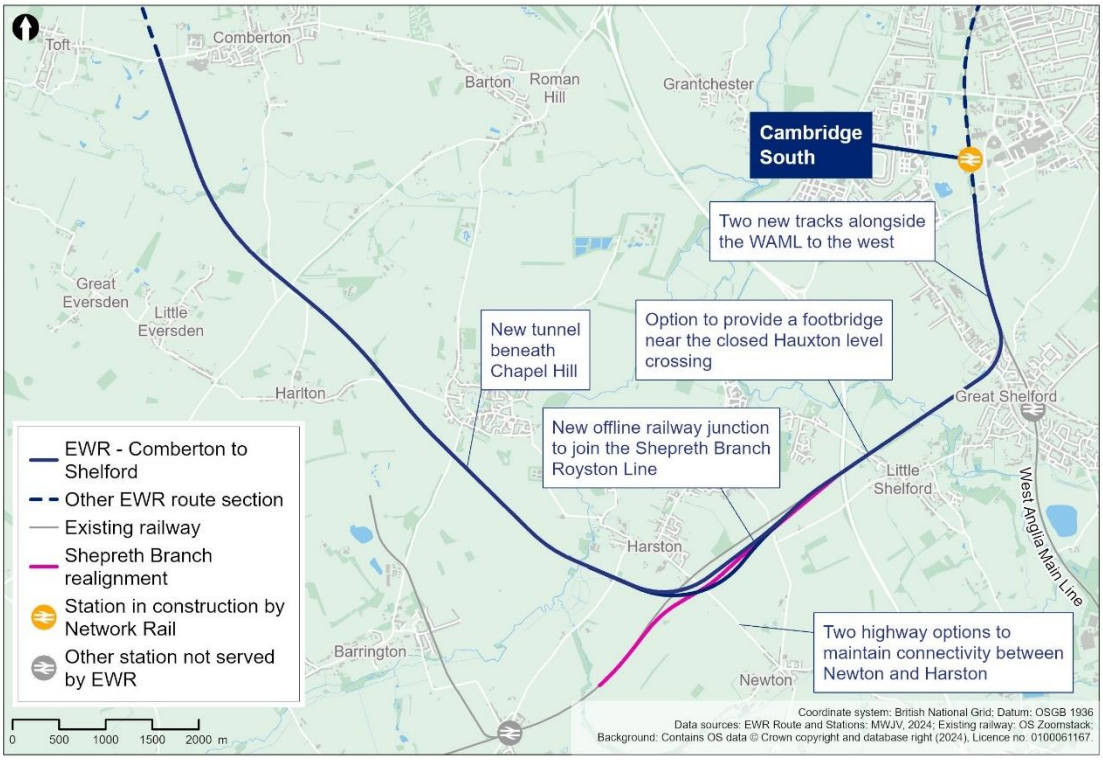
3.7.3 The proposed works include:

- New two-track railway with associated infrastructure between Comberton and Hauxton Junction east of the A10 Royston Road.
- Various watercourse culverts, as well as two viaducts over Bourn Brook to the south of Comberton, and the Rhee/Cam to the west of Harston.
- Tunnel beneath Chapel Hill, south of Haslingfield.
- Realignment of the SBR south of Harston and creation of the new Hauxton Junction west of the M11, where East West Rail joins the existing SBR.
- Realignment of the A10 onto a bridge over the new East West Rail line.
- Closure of two level crossings at Harston and Hauxton with road diversions introduced via new bridge crossings; closure of a footpath level crossing at Harston; and closure of a farm track level crossing at Great Shelford. There are two options for maintaining road access across the railway at Harston, which are described below with a comparison of their environmental impacts in Table 16.
- Provision of passing loops at Hauxton Junction to allow fast trains to overtake slower trains.
- Provision of various drainage and water storage ponds (referred to as balancing ponds) along the route section.
- New overbridges and underbridges for road, track and path crossings, as well as diversions and realignments.
- Modifications to existing roads and introduction of new maintenance access roads.

3.7.4 The proposed East West Rail passenger train service pattern between Bedford and Cambridge stations would be four trains per hour in each

direction. This is in addition to the non-East West Rail services that run on the SBR and the WAML, including both passenger and freight services.

Figure 14 – Proposed route of the Project between Comberton and Shelford



Project proposals

Comberton

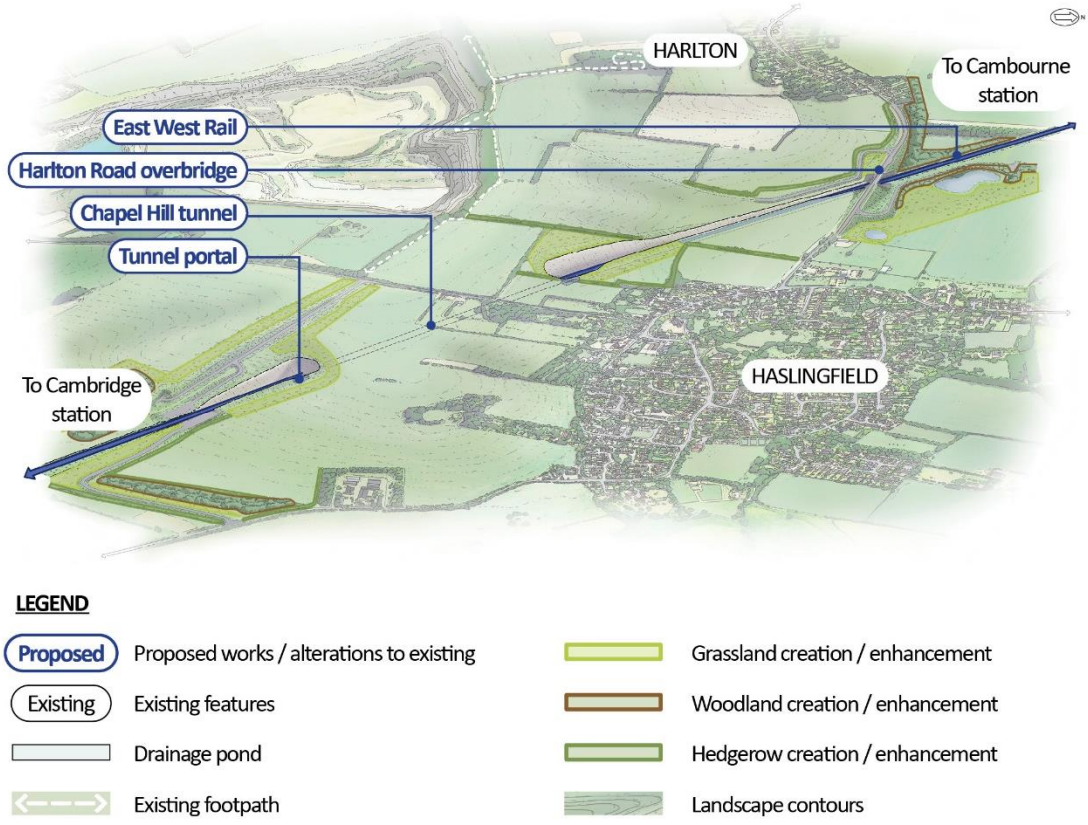
3.7.5 The railway would go under the B1046, which would be realigned to the north of the current road on a new overbridge to the east of Cambridge Meridian golf club. The railway would remain in cutting past Comberton with a new footbridge constructed to allow Toft Footpath 16 to cross over the railway. Emerging from cutting south of the B1046 Comberton Road, the route would rise onto embankment and continue on a short viaduct to cross Bourn Brook. The route would remain on embankment up to about 11m high as it passes to the south-west of the Mullard Radio Astronomy Observatory. Great and Little Eversden Footpath 26 would cross under the railway through an underbridge structure at existing ground level. Still on embankment, the route would pass over the A603 Cambridge Road on a new bridge, requiring minor diversions of Comberton Road and Washpit Lane, and new junctions with the A603 created for each. The railway would then pass over Long Brook on a bridge.

Harlton and Haslingfield

3.7.6 The route would drop gradually, crossing under Harlton Road, which would be slightly realigned to the south on a new bridge. As the land rises relatively steeply southwards up to Chapel Hill and Money Hill, the route would enter a 700m long tunnel. Cuttings would be built at the approaches to the tunnel, and a tunnel services building housing operational and maintenance equipment would be required at each end of the tunnel.

3.7.7 After the tunnel, the railway would rise onto embankment up to 7m high as it passes south of Penn Farm and Charity Farm. A farm access track would be diverted under the railway at Thriplow Farm.

Figure 15 – Indicative illustration of Chapel Hill tunnel



Harston

3.7.8 The route would then cross the River Rhee on a viaduct, passing immediately south of Harston Mill. The route would continue at grade beneath the A10 Cambridge Road, which would be diverted on a new bridge over the railway. The route would continue around the southern edge of Harston and would converge with the SBR as part of the proposed changes

(referred to as Hauxton Junction) which would see the SBR being diverted over the East West Rail westbound lines. The new railway would continue north and join the existing SBR just west of the M11, returning to a two-track railway.

3.7.9 East West Rail services would use the two existing SBR tracks continuing all the way through to Shepreth Junction, where the SBR merges with the existing WAML.

3.7.10 Two passing loop tracks would be constructed as part of the Hauxton junction. The westbound passing loop would be located from south of Chapel Hill to Hauxton and would join the SBR to the west of the existing M11 crossing. The eastbound passing loop would start approximately halfway between the existing Newton Road and London Road, joining the SBR again to the west of the existing M11 crossing.

3.7.11 The Newton Road/Station Road level crossing in Harston would need to be closed and the road diverted via a new connection to maintain links between Harston and Newton. Two options are under consideration with the preference being to link Newton to Harston via London Road. North of the realigned highways overbridge, a new road connection would use the route of the former Shepreth Branch Line track to connect to Station Road, south of Harston. This would provide an active travel route for pedestrians and cyclists (Option 4). The alternative (Option 1) would divert Newton Road to the south-west of the existing road, passing over the SBR via a new bridge in its new location before heading west to join the realigned A10. A new footbridge for pedestrians and cyclists could be provided in both scenarios, maintaining connectivity between Newton and Harston.

3.7.12 Due to changes to the existing railway associated with Hauxton Junction two further level crossings would need to be closed: Hayes level crossing situated to the west of the proposed Hauxton Junction and level crossing No.37 located between Newton Road and London Road on the SBR. Users of level crossing No.37 would be diverted east to London Road. Non-motorised users would also be able to connect to the new overbridge if constructed.

Figure 16 – Indicative illustration of potential connectivity solution between Newton and Harston (Option 1)

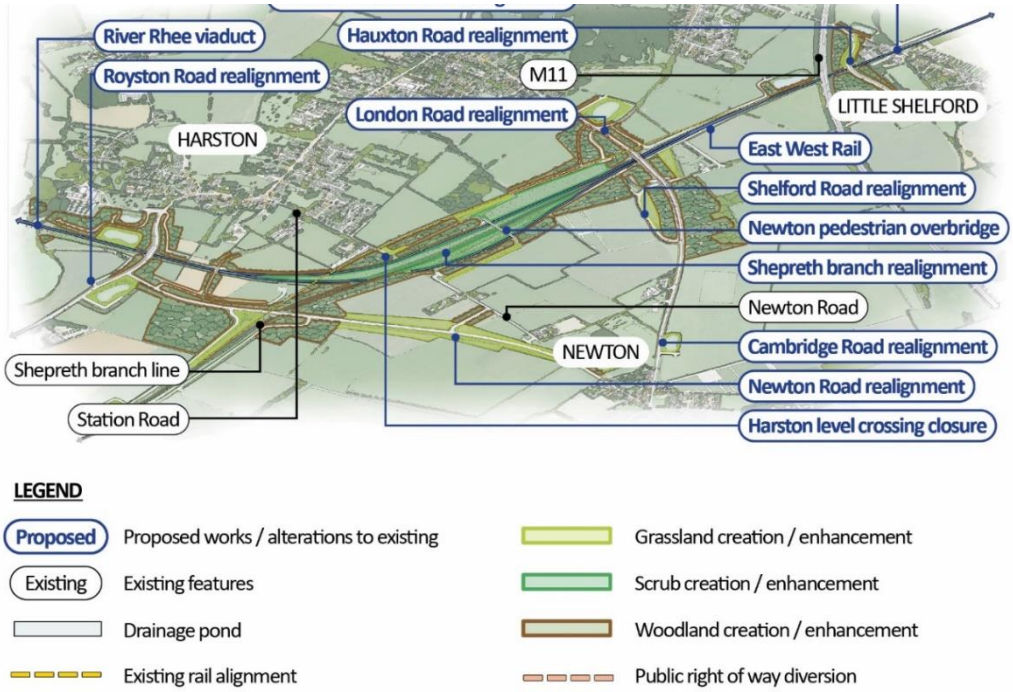
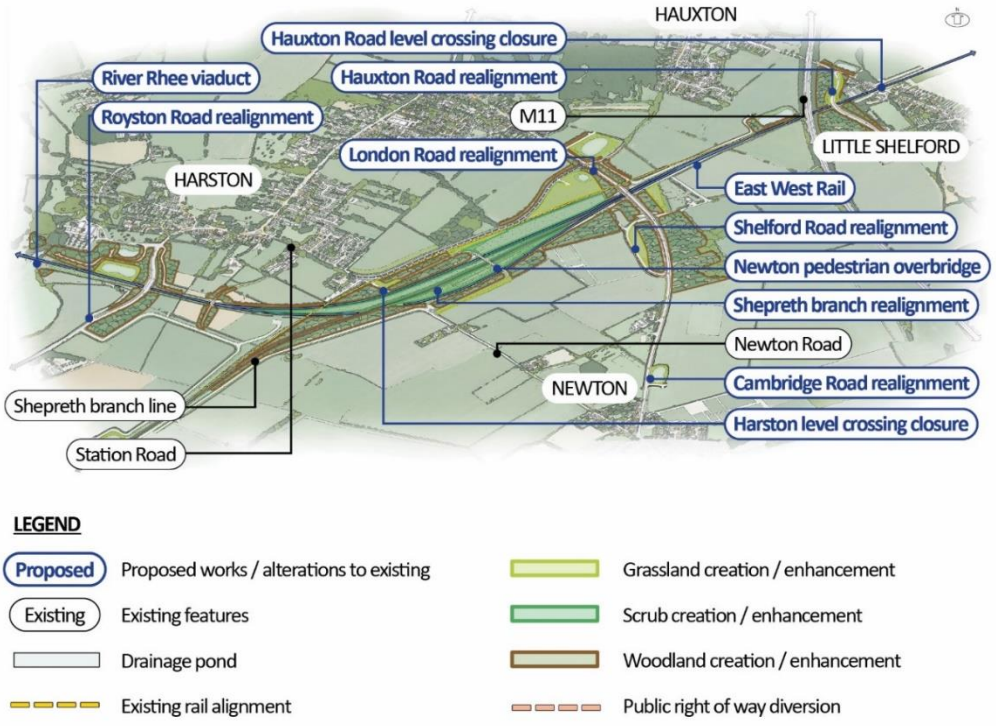


Figure 17 – Indicative illustration of the preferred connectivity solution between Newton and Harston (Option 4)



3.7.13 London Road provides a second link across the existing railway between Newton and the A10 to the north-east of Harston. London Road would be realigned onto a new overbridge over the East West Rail/SBR lines.

The Shelfords

3.7.14 The SBR passes beneath the M11 and continues along the northern edge of Little Shelford on its existing alignment. Hauxton Road level crossing would be closed with a new road bridge provided over the railway west of Little Shelford, linking High Street with Newton Road. Pedestrians, cyclists and other users of the existing crossing would also be able to use this road bridge. The current proposals also include the option of providing a separate ramped access footbridge to the east of the level crossing which could be used by pedestrians, cyclists (dismounted) and others in addition to the road bridge.

3.7.15 East of Little Shelford, the railway would continue along its existing route. A private level crossing for Rectory Farm would be closed, although the existing footpath would be retained using an underpass beneath the railway.

Aligning with the WAML (Shepreth Junction)

3.7.16 North of Great Shelford, the existing Shepreth Line joins the WAML at Shepreth Junction. The capacity of the existing two-track WAML is insufficient to accommodate the additional East West Rail services, so the section from Shepreth Junction northwards would be increased to four tracks, with the additional tracks running alongside the west side of the existing alignment. The existing Shepreth Junction would be remodelled. The Cambridge South project (located in the Cambridge route section), due for completion in 2025, is providing some additional track on the WAML in the Nine Wells area, partly accommodating the East West Rail proposals.

3.7.17 Providing two new tracks to the west of the WAML would require other interventions. The existing footbridge carrying Great Shelford Footpath 1 across the railway would be replaced and the underbridge at Nine Wells would be widened to accommodate two additional tracks. A new balancing pond would be required south-east of Shepreth Junction and a new rail systems compound would be provided to house equipment supporting the widened railway.

Options

3.7.18 Table 7 shows the options for proposals in the Comberton to Shelford route section, which concern the solution for maintaining access across the railway following closure of the Station Road level crossing in Harston. Further work is required to determine which option is most suitable.

Table 7 – Comberton to Shelford route section proposed interventions and options

Proposed intervention	Option 1	Option 4
Retained vehicle access between Harston and Newton	Diversion of Newton Road to the south-west of the existing road, passing over the SBR via a new bridge and continued connection with the realigned A10.	New road from Station Road along a now redundant section of SBR corridor and connecting with London Road.

3.8 Cambridge

Summary

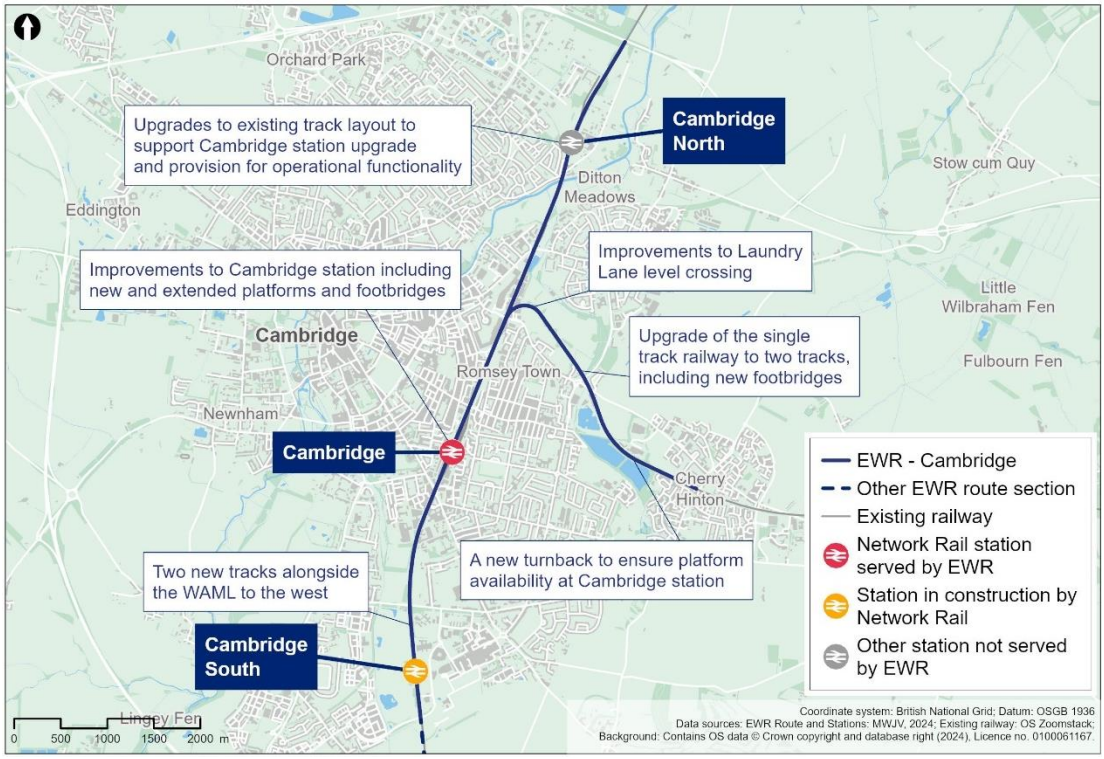
3.8.1 This 8km (5 mile) section of the route would run from Addenbrooke's Road bridge over the existing West Anglia Main Line (WAML) north of Great Shelford, to the A14 bridge north of Cambridge North station and to Yarrow Road in Cherry Hinton to the east of Cambridge.

3.8.2 The proposed works include:

- Two new tracks that run adjacent to the existing twin-track WAML from Addenbrooke's Road, joining the existing four tracks at Cambridge South station (under construction at time of writing) and continuing into Cambridge station.
- Demolition of the road overbridge at Long Road and reconstruction of a new bridge to accommodate the widened rail corridor.
- A new platform, extensions of two existing platforms, new foot bridges, building upgrades and railway systems modifications at Cambridge station.
- New train turnback facility at Cherry Hinton east of Cambridge and an additional track to a section of the existing Newmarket Line.
- Safety improvements to the existing level crossing at Laundry Lane in Cambridge.
- Reconstruction of two footbridges at Coldham's Common and The Tins footpath to allow for the electrification of the railway and the addition of a second track.
- Reprovision of two existing sidings that would be lost due to works at Cambridge station to Chesterton Sidings at Cambridge North station.
- Modifications to track layout works at Cambridge North station to allow some existing train services from the north to terminate there during our construction works.
- Several drainage and attenuation ponds along the route section.

3.8.3 The passenger train service pattern between Bedford and Cambridge stations would be four trains per hour in each direction. This is in addition to the non-East West Rail services that run on the route into Cambridge, as well as the other services that run north and east from Cambridge.

Figure 18 – Proposed route of the Project in Cambridge



Project proposals

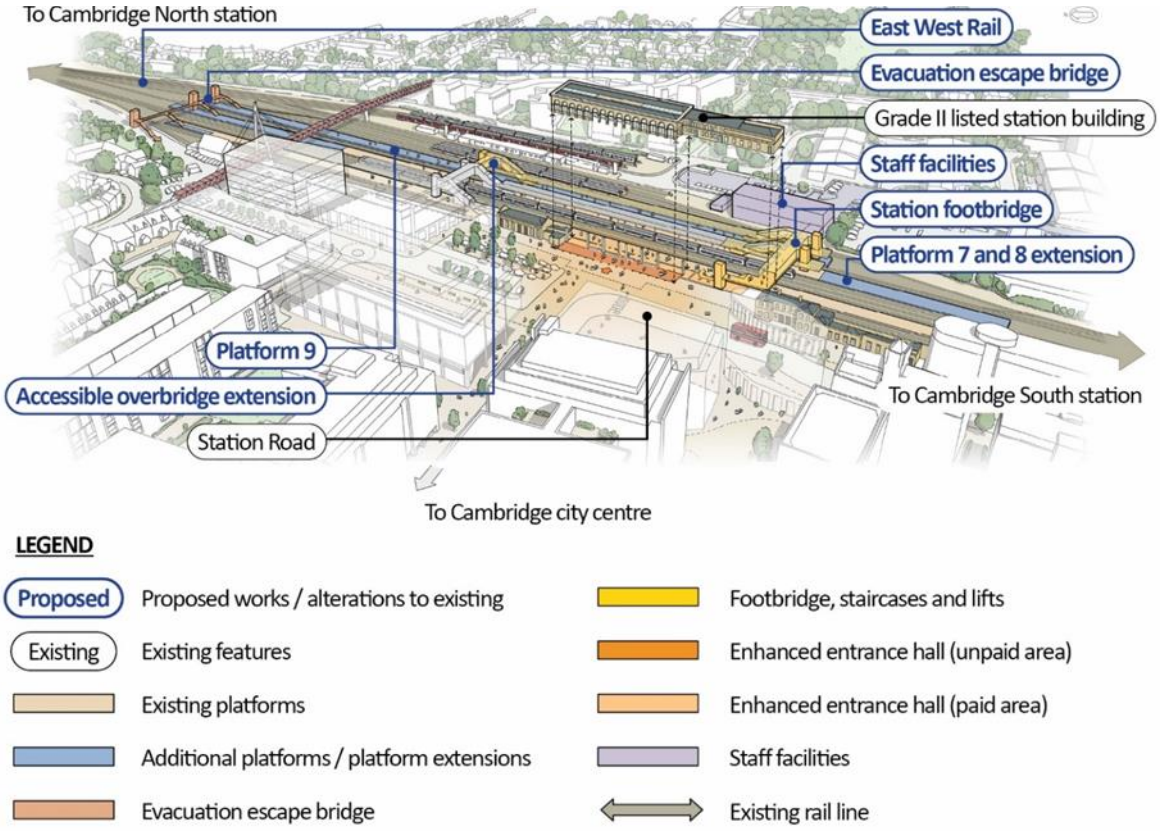
Entering Cambridge

3.8.4 Two new tracks would pass north from Addenbrooke's Road and tie-in with the planned station layout for Cambridge South station, which is currently under construction by Network Rail. New tracks would continue north along the edge of sports fields between the existing railway and the guided busway, mostly within the current Network Rail boundary. The route would pass beneath Long Road, a major arterial route. To accommodate the two new tracks, the existing road bridge would be demolished and replaced with a new longer bridge, during which time alternative access would need to be provided. The new tracks would continue within the existing railway corridor to the east of the Cambridgeshire Guided Busway and Darien Meadow.

3.8.5 Approaching Cambridge station, the new tracks would pass beneath Hills Road using the existing railway corridor without altering the existing bridge and connect into the existing four-track arrangement south of Cambridge station.

3.8.6 At Cambridge station, a new platform 9 would be provided on the eastern side of the station, with platforms 7 and 8 being extended at both ends. Additional rail infrastructure, such as track, signalling and other rail systems would also be provided. There would be modifications within the existing station building off Station Road to improve user access and the station concourse would be upgraded. Other changes include extending the existing footbridge to serve the new platform 9, relocating staff areas for train crew and other operators, and building two new footbridges for passenger use and emergency evacuation.

Figure 19 – Indicative illustration of proposed changes at Cambridge station



North of Cambridge station

3.8.7 Construction work is proposed at Cambridge North station to modify the track layout. This is to support delivering the modifications to Cambridge station and provide a potential location for some replacement sidings where they are removed at Cambridge station. The new layout would also provide the flexibility to allow services to terminate at Cambridge North station should this be decided in the future.

3.8.8 One emerging possible location has been identified for the replacement sidings at Chesterton Sidings at Cambridge North station which could be upgraded and brought back into service to provide replacement sidings.

Cambridge East

3.8.9 A new train turnback facility is proposed at Cherry Hinton to the east of Cambridge, so that East West Rail passengers could alight at Cambridge and trains could continue to Cherry Hinton to turn around. This would reduce the amount of space required to provide turnbacks within the station and reduce the amount of time trains are occupying platforms.

3.8.10 To provide a new train turnback facility east of Cambridge station, an additional track would be provided to the existing section of the Newmarket Line between Coldham's Lane Junction and Cherry Hinton High Street level crossing. It is currently assumed that the new track could be built within the existing rail boundary using the alignment of the currently disused former twin-track corridor.

3.8.11 Two footbridges along this section of the line, one on Coldham's Common and one on The Tins footpath, would be reconstructed to allow for electrification of the railway and the addition of a second track. Improvements to Laundry Lane level crossing would also be required.

4 EIA and scoping the assessments

4.1 Context

4.1.1 This chapter sets out what EIA is, and how it will be approached for the Project, setting out the principles, techniques and concepts that will be applied.

4.1.2 By considering the characteristics of a project and the likely environmental impacts and effects it may cause, and through an appreciation of the baseline environment, scoping allows the experts who compile the ES to:

- Determine which topics to include in the assessment, and which to omit;
- Distinguish the relative importance of each assessment topic, to ensure key issues are prioritised for informing consultation and decision making; and
- Decide the relative importance of different aspects.

4.1.3 Fourteen assessment topics are being considered for the EIA (see Chapter 6) and will themselves be supported by related studies (see Chapter 7) on arboriculture, flood risk assessment (FRA), the Water Framework Directive (WFD), climate change and resilience, Biodiversity Net Gain (BNG), Habitats Regulations Assessment (HRA), equalities impact assessment (EqIA) and transport assessment (TA). The approaches to BNG, EqIA, as well as the CoCP, are elaborated in separate notes describing the approaches to these matters.

4.1.4 The identification and assessment of environmental impacts (as part of the EIA process) is being undertaken by a multi-disciplinary team covering all the required specialisms, and in consultation with various organisations, as well as drawing on feedback from public consultation. This has helped shape proposals that, where practicable, avoid or minimise negative effects, and that deliver environmental improvements.

4.1.5 Different strands of the assessment, each addressing specific environmental issues, will seek to identify and assess potential impacts and to evaluate their effects. As these are determined, the assessment team will work as part of the design team to propose measures to mitigate the effects and to embed them into the Project proposals.

4.1.6 Where there remains uncertainty in the final design solution this EIA Scoping Report has considered the likelihood of significant effects occurring from the options, and has scoped in assessments where any remaining option has the potential to result in significant effects. Where uncertainty remains at the time of the DCO application the ES will report on the likely significant effects of the options within clearly defined parameters (the ‘Rochdale Envelope’

approach) in accordance with Planning Inspectorate guidance Advice Note 9[12].

4.1.7 Decommissioning of the Project will not be assessed in the EIA because there is currently no intention to decommission the Project at any point in the future as the project lifespan is over 100 years. It is more likely that further upgrades would be undertaken as required, to maintain the railway in perpetuity. Within this period, mechanical and electrical equipment would however require maintenance and as such, some components may need replacement. This is considered in the method statements for *Carbon Emissions* and *Materials Resources and Waste* (see 6.14 and 6.16 and the respective method statements for more information).

4.2 Defining the environmental baseline

Overview

4.2.1 Establishing and characterising the environmental baseline conditions is a critical step in the EIA process and is achieved through gathering information from a number of sources. Initially, desk-based resources are used to establish key aspects of the baseline. Where there are gaps in information, or more detailed or accurate information is necessary, site visits and surveys are undertaken to ensure precise and robust data is obtained.

4.2.2 Surveys are conducted throughout the year and, depending on the type of survey, sometimes multiple times to ensure the gathered data are robust. Surveys can be either intrusive (requiring excavation of boreholes and trenches, for example) or non-intrusive, but most require landowner access to be agreed.

4.2.3 Approximately 6,450 surveys and site visits have been completed since 2020 to support the development of the proposals and inform the ongoing EIA process. Further surveys have taken place during 2024 and will continue through 2025.

Desk-based information

4.2.4 Desk-based information can be gathered from a wide-range of sources. This includes publicly available information from local authorities and other government agencies, such as data relating to air quality management areas, local ecological and historical records, and protected sites. Understanding the location of sensitive environmental features is essential to the application of the Mitigation Hierarchy and is fundamental as a first stage in informing what further study is required.

[12] *Nationally Significant Infrastructure Projects - advice note nine: Rochdale envelope* (2018) *GOV.UK.*.

4.2.5 Other information that is gathered includes high-resolution satellite imagery, geological data and topography models. This information is used for a number of topics and is sometimes as the basis for detailed modelling, such as for noise or visibility impacts.

4.2.6 EWR Co has also worked with other projects, such as National Highways' A428 Black Cat to Caxton Gibbet improvements scheme (with the new A421 dual carriageway currently under construction) and the Greater Cambridge Partnership's Cambourne to Cambridge guided busway and active travel projects, to share information gathered from surveys and studies undertaken.

People-focused surveys

4.2.7 There are several EIA topics that need information collected through surveys to enable an understanding of the project and its relationship to the people living and working along the route and surrounding area.

4.2.8 As well as having collected existing air quality data from local authorities, NOx monitoring to understand the baseline air quality conditions has been undertaken at approximately 65 locations. The results will be analysed and fed into impact modelling presented in the ES.

4.2.9 For traffic and transport, surveys include traffic count surveys (both automatic and manual) to record road use, car parking surveys of current patronage, and monitoring of usage of public rights of way (PRoW) to inform impact assessment and diversion needs. So far approximately 1080 surveys relating to traffic have been completed across the route.

4.2.10 Baseline noise surveys are used to establish the existing noise levels and around 60 noise surveys have been completed to date. Some background vibration monitoring may also be needed for certain sensitive users along the route.

4.2.11 Farm business interviews (FBI) are currently underway to understand how the project and its construction could impact farming practices. Both soil resource surveys and Agricultural Land Classification (ALC) surveys will be carried out to understand soil types and the quality of farmland affected by the project. Much of this can rely on existing survey data undertaken for other projects, with further surveys planned.

Nature-focused surveys

4.2.12 Surveys of ecological receptors are required to characterise the status and distribution of habitats and certain species or groups of animals. These include aquatic surveys, habitat mapping, and fauna surveys for bats, badgers, otters and others. Bird surveys record species present, and

walkovers inspect for insects and other terrestrial invertebrates and veteran trees will be recorded across the route.

4.2.13 Since 2020 approximately 4,500 ecological surveys have been carried out with further surveys planned.

4.2.14 These surveys are continuing to provide additional data on the likely presence and distribution of protected and notable habitats and species. As more information becomes available, and as the project design and construction phasing plans develop, mitigation plans will evolve, following the Mitigation Hierarchy. Further information about the Mitigation Hierarchy can be found in Chapter 5 of this report.

4.2.15 Water and flood risk surveys will be used to identify groundwater dependent terrestrial ecosystems and identify private water supplies across the study area, whilst Water Framework Directive (WFD) surveys will consider the river morphology, and river and ditch conditions for watercourses across the route. The majority of these surveys will be undertaken in 2024 and 2025.

4.2.16 In addition, the project will undertake ground investigation to include contamination testing of soils, groundwater and surface water to confirm the ground conditions, groundwater regime and any surface water groundwater interaction.

Landscape and historic environment surveys

4.2.17 Landscape surveys are required to help understand the character of the landscape or townscape, identifying key features that contribute to character. Photographs are used to illustrate the landscape and visual baseline assessment and to establish the likely visibility of the project. The surveys will be informed by desk-based research using published landscape character assessment, mapping and aerial photography. Since 2020, around 900 surveys have been completed.

4.2.18 The majority of locations selected for the field surveys are on PRoW and other publicly accessible places such as public roads, footways, car parks and open space. In inaccessible areas where access cannot be agreed with the landowner, the land or premises are private, or there are no nearby suitable PRoW, professional judgement is used to describe the likely landscape/townscape character of the area or the likely view from these locations.

4.2.19 For the historic environment, an evaluation phase has started to establish an enhanced understanding of the historic character and development along the route. The evaluation phase will include a range of desk-based investigation and analysis and field surveys. The results of archaeological, geoarchaeological, historic landscape, and built environment surveys will be

brought together to develop a fuller understanding of the historic environment as a whole and allow for a combined approach to the assessment.

4.2.20 A range of field surveys supported by desk-based investigation will be undertaken to understand the potential for surviving archaeology and how important that archaeology is likely to be in contributing to wider knowledge of the area. Some surveys have already started, with geophysics and remote sensing surveys in progress in some areas. Following these surveys and additional desk-based research, a suite of targeted intrusive surveys, including trial trenching, will be developed in collaboration with stakeholders to allow for a detailed and robust baseline to inform the assessment and design development.

4.2.21 Geoarchaeological character will be investigated by using existing borehole data and data gained from ground investigation surveys carried out for the project to develop a deposit model.

4.2.22 Surveys will be undertaken to understand the historic environment along the route. These surveys will be informed by desk-based research using online and archive materials. Walkover surveys will also be carried out to identify key heritage assets, both designated and non-designated, and to get an understanding of the varied historic character along the route and its level of survival.

4.2.23 The assessment is continuing to investigate and understand the historic development of the area crossed by the project to inform the EIA work and to help manage the historic and cultural environment as part of design and mitigation work.

Modelling

Transport modelling

4.2.24 The East West Rail Strategic Highway Model (EWRSHM) has been developed and used as an interim tool to assess traffic impacts. The preliminary results are presented in the ***Transport Update Report (TUR)***[13]. The model has provided information on baseline and future traffic flows, providing predictions on how these could change with the introduction of the project construction traffic and then consequently as a result of the operation of the new East West Rail services. Further information is available in the TUR.

4.2.25 Following the 2024 non-statutory consultation additional transport modelling will be undertaken using a new and bespoke corridor-wide model, before the

[13] The TUR has been published as part of the EWR Non-Statutory consultation which commenced in November 2024 to provide an initial overall of project transport issues and considerations.

proposals for the project are finalised, and the results presented in a *Transport Assessment* (TA) to accompany the DCO application.

Air quality and noise and vibration

4.2.26 Where operational traffic flows exceed screening criteria, an assessment of the effects of vehicle exhaust emissions on local air quality will be undertaken. This will use pollution dispersion modelling (using the ADMS-Roads air pollution model), drawing on outputs of the transport model. Further information is provided in the *Air Quality Method Statement.*

4.2.27 Similarly, noise impacts from trains and road traffic will be assessed using noise models to calculate temporary and permanent noise levels at receptor locations.

Flood modelling

4.2.28 Flood models are developed to reflect baseline conditions as closely as possible before potential impacts of new infrastructure can be modelled and the effects understood, which can then be used to inform approach to avoid impacts, manage impacts or mitigate them.

4.2.29 Initial development of existing baseline flood models was undertaken in 2021 to support earlier stages of the project development. These addressed 11 watercourses crossed by the proposed new alignment between Bedford and Cambridge.

4.2.30 Further development of these models, as well as others between Oxford and Bedford, is underway and will utilise existing Environment Agency models, new survey data and models and models developed for the new A421 dual carriageway.

4.2.31 As the project design develops, further modelling will be undertaken where required to inform flood risk assessments that support the project. This modelling will be undertaken in consultation with the Environment Agency (responsible for flood risk management activities on Main Rivers), Lead Local Flood Authorities (responsible for managing local flood risks from surface water, ordinary watercourses and groundwater) and other risk management authorities as appropriate.

4.3 Assessment concepts

4.3.1 With knowledge of the baseline environment and of the changes that the Project will impose on it, the assessments can then evaluate how important these changes will be. This is a fundamental step in determining the **significance of the environmental effects**.

4.3.2 The techniques used by each topic to characterise the baseline and to assess and evaluate the changes to it are set out in *EIA Scoping Report Chapter 6,* as well as in their respective method statements.

4.3.3 This chapter sets out the terms and the approaches used in environmental assessment for EIA. Each topic will be assessed by specialists following industry best practice. Detailed descriptions of the assessment methods and criteria that will be used for each topic are provided in the topic method statements which have been provided for information for technical audiences such as regulatory bodies.

Impacts and effects

4.3.4 Two words fundamental to EIA are 'impact' and 'effect'. These are subtly different and are explained here.

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

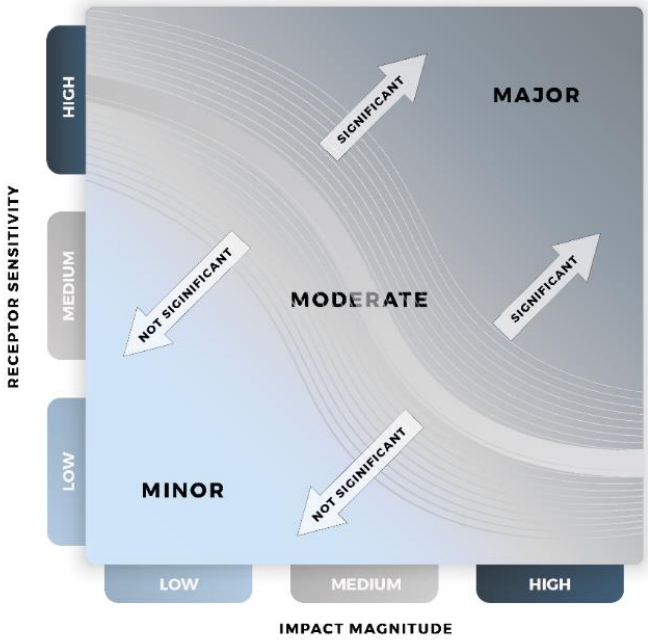
4.3.5 The examples above generally infer adverse change, though impacts can also cause beneficial effects by enhancing the quality of life and the environment.

Defining significance

4.3.6 The ES is only required to report those effects that are both likely and significant. Depending on the extent or size of the impact (referred to as its magnitude) and the sensitivity of the affected resources or receptors to the impact, environmental effects can vary in their consequence. The environmental assessment will take these matters into account in assessing the importance of the effect and ascribing it as being significant or not significant. The EIA defines a significant effect as **one that the assessment team believe should be considered by the decision makers in granting development consent**.

4.3.7 Evaluation criteria are helpful in distinguishing a significant effect from a not significant effect. Taking account of both the magnitude and the resource/receptor sensitivity, different criteria are used by each assessment topic to help evaluate effects. Effects will be determined as being major, moderate or minor. In general, a major or moderate effect will be deemed significant.

Figure 20 – Model for determining the significance of an environmental effect.



4.3.8 Used on their own, however, evaluation criteria may not always reflect the more subtle and specific sensitivities or tolerances of a local community or environmental resource to a particular impact, and professional judgement can make an important contribution in concluding significance. For example, a visual impact in certain urban settings may be deemed more acceptable to local people than an equivalent impact in a rural environment.

4.3.9 Other factors that can influence the significance of an effect include the duration of an impact and the number of people, resources or receptors affected. Different topics each ascribe their own methods to evaluating environmental effects, often in accordance with their own industry professional bodies. These are set out in the *EIA Scoping Report Chapter 6* and the ES method statements.

Spatial context

4.3.10 The geographical context for the environmental assessment will vary for different topics. Each topic will define one or more study areas, within which significant effects could occur. Further detail on the topics to be assessed and their scope including study area is given in Chapter 6.

4.3.11 For some effects, these will be confined to the draft Order limits which contain the land to be acquired or used for the Project and the area within which the authorised development may be carried out. Beyond these areas, further zones of interest are defined by each study to accommodate, for example, possible views, noise effects, bird disturbance or heritage setting.

Impacts caused by greenhouse gas (GHG) emissions are considered at a national scale.

Temporal context

4.3.12 It will be important for the ES to identify when effects will be experienced. Construction is assumed to take place from 2028, with the year of opening in 2034 and the first full year of operation in 2035. The impacts causing effects may occur in either the construction or operational phases, but more important is identification of when they will likely take effect, and for how long. The EIA requirements refer to the need to address “short-term, medium-term and long-term, permanent and temporary” effects. For the purposes of the EIA, effects will be distinguished as being either temporary construction effects or permanent and operational effects. For the latter, where there is considered to be a finite period beyond which effects dissipate for whatever reason, this period will be stated. For example, ‘permanent’ landscape effects are considered at year 1 and year 15 intervals to reflect the role of maturing vegetation in mitigating the effect.

Environmental issues

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

- Population and human health;
- Biodiversity;
- Land, soil, water, air and climate;
- Material assets, historic environment and the landscape; and
- The interaction between these factors.

4.3.14 These matters have been addressed through the topic assessments, described in Chapter 6, which have method statements appended namely:

- People and communities, which includes:
  - Agriculture and soils;
  - Air quality;
  - Communities
  - Health and wellbeing;
  - Land quality (including contamination);
  - Socio-economics;
  - Sound, noise and vibration; and
  - Traffic and transport (addressing journeys and access).
- The **natural environment**, which includes:
  - Biodiversity; and
  - Water resources and flood risk.
- Landscape and the historic environment, which includes:

    - Historic environment (including built heritage and archaeology); and
    - Landscape and visual.
- **Route wide issues**, which includes:
    - Carbon (greenhouse gas) emissions; and
    - Material resources and waste.

4.3.15 This EIA Scoping Report also considers major accidents and disasters and electromagnetic interference (EMI). Climate resilience is integrated throughout and across all topics, as described in the *Climate Resilience Method Statement* and in 7.4.

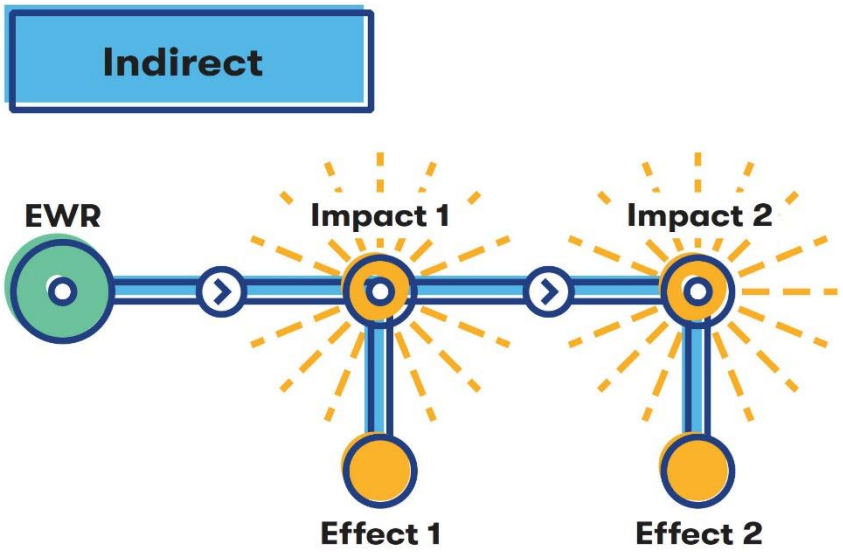
4.3.16 There are aspects of the Project that, while outside the scope of EIA, are related to and supportive of wider environmental assessment and many of the EIA workstreams. These comprise assessments:

- For BNG;
- Under the Habitats Regulations';
- Of climate resilience;
- Under the Equality Act;
- Of flood risk;
- Under the Water Framework Directive; and
- For arboriculture.

Impact interaction

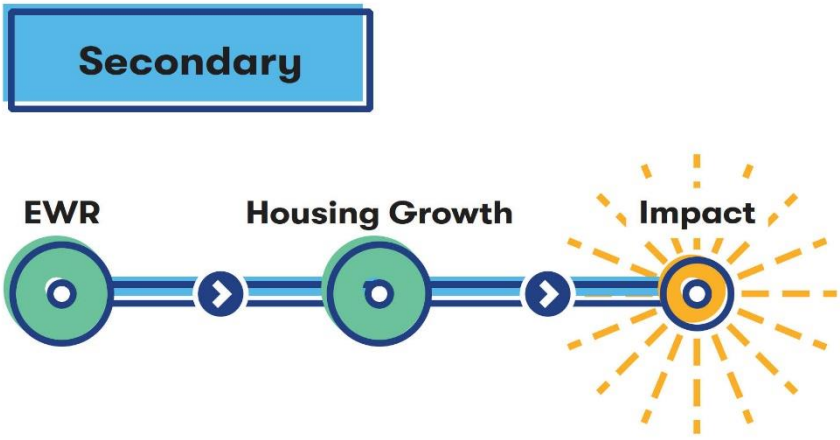
4.3.17 While an impact may result directly in an environmental effect, the pathway can sometimes be more complex. One impact may result in a second or even a third impact, each giving rise to their own environmental effects. These are referred to as indirect impacts.

Figure 21 – Indirect impacts and effects.



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

Figure 22 – Secondary impacts and effects.



4.3.19 The different assessments will determine these indirect and secondary impacts and effects where they are able to do so with a reasonable degree of confidence.

4.4 Combined effects

4.4.1 The environmental assessment will consider how separate impacts from the Project might cause an overall combined effect. For example, significant noise, traffic and visual impacts at one location could result in a general combined significant disturbance effect for local residents; or several separate impacts on hedgerows could together result in a significant depletion of habitat. The Environmental Statement (ES) refers to these as combined effects and they will be reported under the topic headings for which they are relevant.

4.4.2 The distinction of combined effects from cumulative effects (discussed below) is supported by advice published in September 2024 by the Planning Inspectorate (PINS) on this matter, which states "Cumulative effects with 'other existing and, or approved development' are separate from an assessment of interrelationships between aspects for the proposed NSIP"[14].

4.4.3 It goes on to the state: "These factors are normally assessed as part of the specialist aspect chapters, as combined effects".

4.4.4 This is the approach to be adopted for the EIA of the Project.

4.5 Wider development and cumulative effects

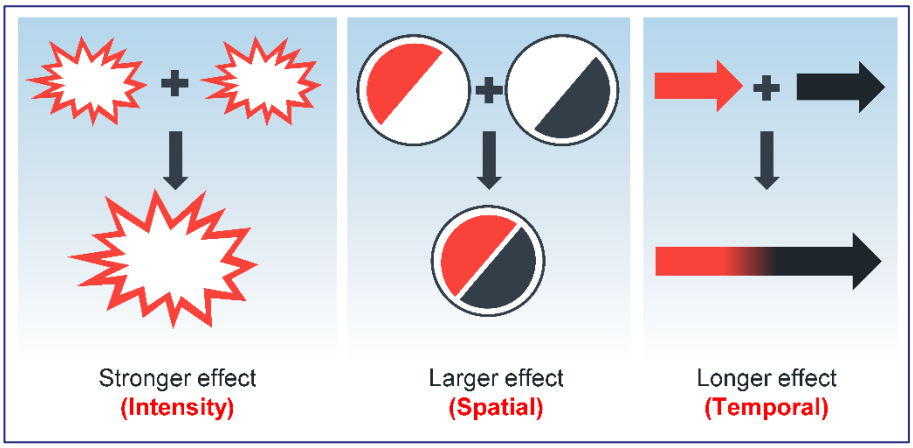
Context

4.5.1 The EIA Regulations stipulate the consideration of, amongst other things, the cumulative effects of the development with other projects. Schedule 4 paragraph 5(e) of the EIA Regulations requires the ES to include a description of the likely significant effects of the development on the environment resulting from *"the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources".*

4.5.2 The ES will describe likely significant cumulative effects, where impacts from unrelated projects are experienced together with those from the Project. These might be additive; for example, due to construction traffic from two or three projects occurring simultaneously. They might be spatial; for example, where an area is impinged by more than one development. Or they may be temporal, where a sequence of consecutive developments prolongs the overall effect.

[14] Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment - GOV.UK (www.gov.uk)

Figure 23 – Environmental effects from different projects can be cumulative in different ways



4.5.3 Several matters will be considered in undertaking the assessment of cumulative effects, namely:

- the potential for other developments to give rise to environmental impacts in their own right;
- how those impacts from other developments might interact cumulatively with those from the Project, which will vary for different environmental aspects;
- the availability and detail of information about the impacts of other development which will inform the cumulative assessment;
- the certainty and assumed timing of other developments; and
- any assumptions about 'existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources' which is required to provide the focus of the assessment.

Planning Inspectorate's advice

4.5.4 The EIA for the Project will follow the September 2024 PINS advice on cumulative effects assessment[15].

4.5.5 The Advice suggests a four-stage approach to the assessment of cumulative effects. The staged approach consists of:

- Stage 1: establishing the long list of other existing and/or approved development.
- Stage 2: establishing the short list of other existing and/or approved development.
- Stage 3: information gathering.
- Stage 4: assessment.

[15] Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment - GOV.UK (www.gov.uk)

Defining other developments and monitoring area (Stage 1)

4.5.6 Under the Stage 1 heading, PINS advice states: "*To establish which other existing and, or approved developments should be included in the assessment, the applicant should define and document the* ZOI *for each environmental aspect considered within the Environmental Statement*". The ZOI refers to a project's 'broad spatial and temporal zone of influence' (see September 2024 PINS guidance) within which cumulative effects potentially occur.

4.5.7 The contribution that other development would make to the cumulative effects with the Project will depend on their scale, characteristics, proximity, certainty and timing. For example, smaller developments that are close to the Project could have greater cumulative effects than larger, more distant developments. The assessment of the Project plans substantially to use GIS to record the location and characteristics (attributes) of other existing and/or approved developments, which will allow the application of different filters.

Development scale

4.5.8 Different search criteria (development filters) will be applied respectively within three search zones (distances to be measured from the Order limits), namely:

- 0-5000m: Developments of national significance that are under national governance (nationally significant infrastructure projects (NSIPs) under the Planning Act 2008 and projects seeking authorisation by means of an order under the Transport and Works Act 1992 (TWA)).
- 0-1500m Strategic developments and those above.
- 0-500m: Major developments and those above.

4.5.9 Major developments are defined within the Town and Country Planning (Development Management Procedure) (England) Order 2015 as:

- Mineral extraction.
- Waste development.
- Residential development of 10 or more dwellings.
- Residential development on a site area of 0.5 ha or more and the number of dwellings is unknown.
- Development of floorspace of 1,000 sq m or more.
- Development on sites over 1 ha or more.

4.5.10 Strategic development is not recognised by Government, and different local authorities use different criteria. For example, The Town and Country Planning (Mayor of London) Order 2008 sets out those planning applications of 'potential strategic importance' that must be referred to the Mayor. Drawing on its definitions for large scale projects outside central London, as well as

other categories generally, as a guide for defining strategic development in the UK in terms of town planning, the following categories will be used here:

- Major transport, energy, and water infrastructure projects not covered by other national governance regimes.
- Residential development of 150 or more dwellings.
- Development of floorspace (other than development which only comprises residential dwellings) of 15,000sqm or more, including large-scale mixed-use developments that include housing, retail, offices, leisure, and other uses, creating new urban quarters or town extensions.

4.5.11 Projects of national significance means any project using the DCO regime, either as an NSIP or by a direction under section 35 of the Planning Act 2008. The definition of NSIPs is primarily based on their scale and type, and they must meet specific thresholds or characteristics that qualify them as nationally significant as set out in the Planning Act 2008. This category will also include projects under the TWA regime, as well as any projects being promoted through a hybrid bill.

4.5.12 Using this triple zoning approach, the assessment specialists in reviewing the potential cumulative developments identified therein, will be engaged to determine whether this fully covers their scope and the potential for likely cumulative significant effects as it affects their respective topic areas. This may then determine the need to refine the proposed zones and development categories. Some discretion may be applied in defining the boundary between the zones, and in specifying the developments to be considered.

Development planning and timing (assigning certainty)

4.5.13 The EIA Regulations (Schedule 4, para 5e) as well as the 2024 PINS guidance, require assessment “with other existing and/or approved projects”. PINS guidance states that existing projects which are expected to be completed before construction of the proposed NSIP should be considered as part of the future baseline rather than as a source of cumulative effects. The cumulative assessment will keep under review the expected completion dates of other projects and may need to apply some flexibility as to whether they should be treated as part of the future baseline or within the cumulative assessment. This is discussed in more detail below under *Cumulative effects versus future baseline*.

4.5.14 Other phasing categories to be included as part of the long listing process are recorded below. These build on the PINS guidance and its allocation of Tier 1, Tier 2 or Tier 3 projects based on their maturity within the development planning life cycle.

- Completed at full EWR opening (currently assumed to be 2034), although these may be considered only as part of the future baseline, noting comments above.
- Constructing at full EWR opening.
- Consented at time of assessment (construction not yet commenced).
- Application submitted but not yet determined.
- Rejected but in appeal.
- NSIPs on the Planning Inspectorate's programme of projects that have submitted an EIA scoping report.
- Allocated in a development plan or identified in an emerging plan with appropriate weight given.
- On other plans and programmes that set the framework for development
- NSIPs that are on the Planning Inspectorate's programme of projects but with no EIA scoping report yet.

4.5.15 Based on the three-zone approach and the varying certainty of development, the long list would include the following cumulative developments.

Table 8 – Proposed model for assigning long list development

Development confidence	0-500m	500-1500m	1500-5000m
NSIP and TWA			
Existing at 2034	✓	✓	✓
Constructing at 2034	✓	✓	✓
Consented	✓	✓	✓
Application submitted	✓	✓	✓
Appeals	✓	✓	✓
On PINS's programme	✓	✓	✓
On PINS's programme without scoping report	✓	✓	✓
Strategic developments (TCPA and SDOs)			
Existing at 2034	✓	✓	
Constructing at 2034	✓	✓	
Consented	✓	✓	
Application submitted	✓	✓	
Appeals	✓	✓	
On strategic development plan at or near adoption	✓	✓	
Other plans and programmes that set the framework for development	✓	✓	
Major development (DMPO 2015)			
Existing at 2034	✓		
Constructing at 2034	✓		
Consented	✓		
Application submitted	✓		
Appeals	✓		Tier 1
On strategic development plan at or near adoption	✓		Tier 2
Other plans and programmes that set the framework for development	✓		Tier 3

Defining the shortlist (Stage 2)

4.5.16 Stage 2 will focus on reducing the longlist and identifying only those developments that have the potential to result in significant cumulative effects. This will continue to take account of the five issues referred to earlier of scale, characteristics, proximity, certainty and timing, but will be informed both by the specific characteristics of the Project (construction, design and operation) and of the people and environment potentially affected.

4.5.17 The short listing will take account both of project confidence (certainty of development) and of the views of the assessment team (informed through consultation) as to any projects that can be eliminated from consideration. It is possible that Tier 3 projects may be eliminated at this stage due to their greater uncertainty and the lack of sufficient information to allow their assessment.

4.5.18 Early involvement of the assessment specialists would entail a scoping exercise drawing on the professional judgements of the team as to those developments unlikely to give rise to cumulative effects based on the five assessment considerations.

4.5.19 Once this is confirmed, the shortlist and details of the relevant developments will be re-issued to the Project's assessment specialists who will use the information gathered on each application (Stage 3) to determine if there are likely significant cumulative impacts and effects (Stage 4).

Presentation by route sections

4.5.20 Given the overall length of the Project, the potential for cumulative effects will be described for each of the eight route sections. Some considerations, such as water scarcity or agricultural land resource, will be presented for the Project as a whole.

4.5.21 In addition, the scope of the assessment has been differentiated between sections of existing route and new route. For route sections 1, 2 and 8, where the alignment mostly uses the existing permanent way and infrastructure and the scale of interventions will be relatively small, the potential for likely significant cumulative effects will be low. Accordingly, the assessment for this section will consider other developments within the inner, 500m buffer.

Environmental priorities

4.5.22 In line with EIA Requirements, the search areas will be characterised in terms of their existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources. Informed by relevant assessment specialists, these characteristics

will be established for each route section, but are likely to include national priorities including:

- Water scarcity, which is a critical issue in this part of the UK, so could be exacerbated by cumulation of projects each with their own demands on potable water supplies.
- Water quality, based on pressing concerns on the quality of water due to uncontrolled sewage discharges, agricultural runoff, and over-abstraction causing river levels to fall.
- Biodiversity emergency, where reduced biodiversity is a critical issue in the UK as a whole, evidenced by decline in various groups of animals and priority habitats.
- Food security, where cumulative loss of productive agricultural land may have implications for the country to feed itself.
- Effects of cumulative development on the environment resulting from their vulnerability to climate change.

4.5.23 In addition, certain route sections will have their own environmental priorities based on, for example, landscape sensitivity, the agglomeration of heritage assets or vulnerable habitats. General environmental quality - as determined by prevailing noise, air quality, traffic and visual characteristics – will be considered for all route sections, in order to capture the potential likely effects on the amenity, welfare and health of people living in affected areas resulting from cumulative impacts, particularly during construction.

Information gathering and assessment (Stage 3 and 4)

4.5.24 The information used to inform the cumulative assessment will be highly variable. Some larger cumulative developments will have been accompanied by environmental statements or specific environmental appraisal studies and, where available, these can be used to inform the assessment. However, it is likely that this information will be inconsistent in terms of breadth and quality, or not available at all, and the assessments will be highly reliant on the Project assessment teams' knowledge of the baseline environment and on their expertise in making a qualitative comment on the potential for likely significant cumulative effects.

4.5.25 The cumulative assessment will make substantial use of GIS by allocating assessment indices for different environmental topics, which will in turn enable graphical representation of potential cumulative effects by single or combined topics.

Cumulative effects versus future baseline

4.5.26 The September 2024 note from PINS advises that some existing or approved projects should be treated as part of the future baseline, rather than as part of the cumulative assessment, although this depends on whether the effects of such development are yet fully realised. Such recently completed

developments will be considered on a case-by-case basis to determine how they should be treated in the assessment, but with the presumption that existing development will be deemed part of the baseline.

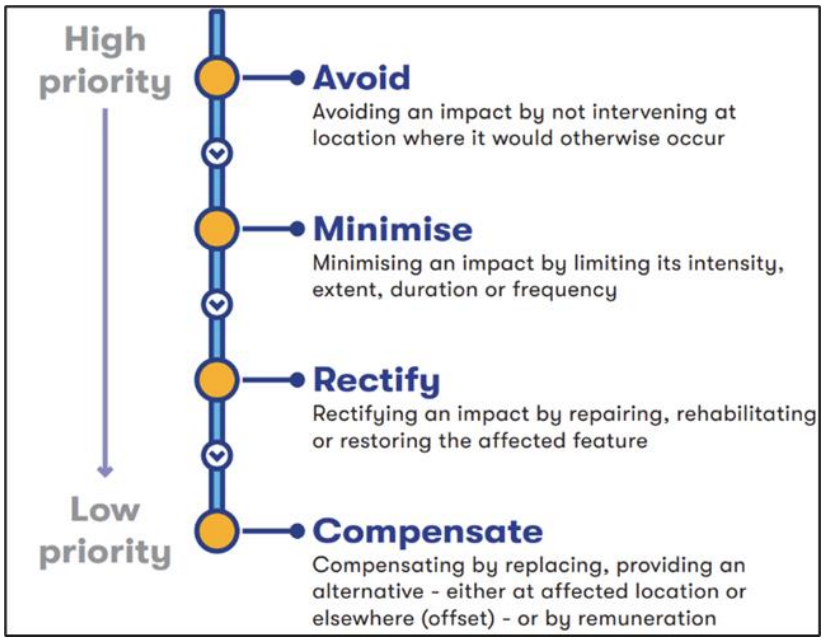
5 Mitigation strategy

5.1 Mitigation principles

5.1.1 The EIA Regulations require that the ES provides "a description of the measures envisaged to avoid, prevent, reduce and, if possible, offset likely significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements ... and should cover both the construction and operational phases."

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

Figure 24 – The mitigation hierarchy.



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

5.1.4 Where a likely significant effect has been identified during the course of the assessment, a mitigation measure is proposed where possible, that will render the effect not significant. If the measure is deemed feasible, practicable and effective, it will be adopted within the Project design. At this

point it is referred to as embedded mitigation. The proposals described in the ES will assume this mitigation as an integral part of the Project, and its impacts will be assessed on this basis. To ensure that these measures are retained through subsequent stages of design and implementation, they will be set out explicitly and in a schedule of mitigation and secured through the DCO as appropriate.

5.1.5 Where the effect cannot be mitigated such that it is not significant, the remaining effect will be reported as a likely significant effect. The mitigation strategy will ensure that the effect is as low as reasonably practicable.

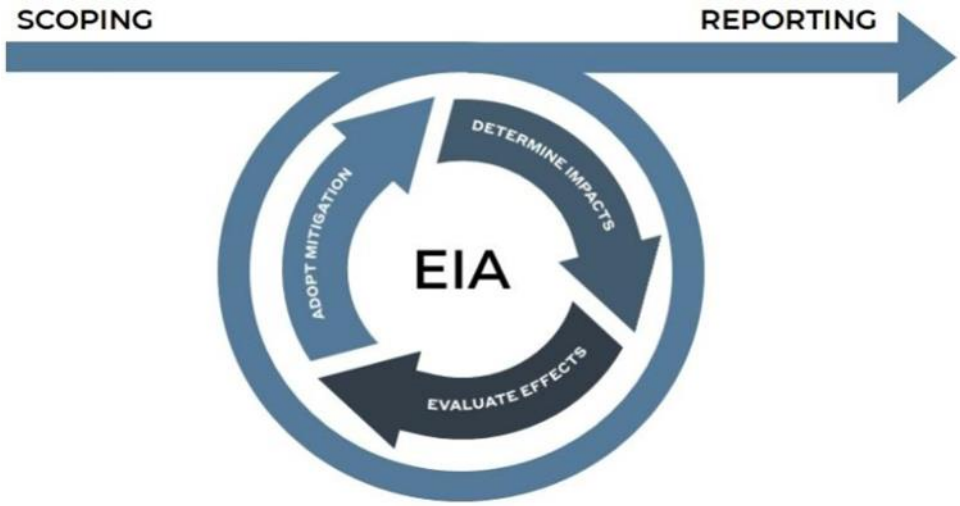
5.1.6 A focus on sustainability is fundamental to the development of the Project. This includes realising enhancements for local communities and the natural and built environment where possible, as well as avoiding, limiting and mitigating any negative effects. Where an enhancement represents a significant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

5.2 Embedding mitigation

5.2.1 The environmental assessment is and will continue to be instrumental in informing changes to the Project design through its feedback on aspects of the natural environment, of the communities affected by the proposals, of cultural and heritage assets, and of global sustainability issues, including climate change. The Project proposals will therefore accommodate various mitigation measures.

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

Figure 25 – Environmental Assessment Cycle.



5.2.3 This approach is one that is being followed on this Project: close working between the design team and environmental assessment specialists will secure modifications to the design that will limit potentially adverse effects and realise potential benefits. For example, the use of the tunnel beneath Chapel Hill will avoid or limit potential impacts on landscape, heritage and ecology; can provide other examples as they emerge.

5.2.4 Equally, some aspects of the design will be environment-led, with protecting the environment a fundamental aim of the design process.

5.2.5 The landscape strategy will be conceived as one that is a fully integrated part of the design. It will include mitigatory elements, such as screen planting, but more importantly will seek to make the Project's integration within the landscape a fundamental part of the overall design concept.

5.2.6 The draft Order limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

5.3 Construction and the code of construction practice

5.3.1 The construction strategy will rely extensively on the application of a CoCP. This will be a fundamental part of the Project proposals in that it will outline the measures needed during construction to avoid likely significant adverse effects on people and on natural and cultural assets. The environmental assessments for each topic will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and will utilise practices which have been tried and tested in large construction projects.

5.3.2 The measure set out in the draft CoCP submitted with the application will be used as the basis for more detailed measures that will be developed by the principal contractor. These measures will take account of the detailed designs, and to the specific approach to construction that they support, accommodating where necessary, local and specific sensitivities.

5.3.3 Appendix B sets out some indicative construction management methods that provide examples of the measures to be included in the CoCP.

5.4 Designing for a changing climate

5.4.1 Consideration of climate change will use climate projections to establish a future climate baseline. This will inform designs for structures, layouts and

operational scenarios that are resilient to future weather conditions. In this way, the designers can progress their work with a higher degree of confidence in their outputs remaining resilient and functional in a future with, for example, hotter drier summers and warmer wetter winters.

5.4.2 Specifically, the climate change assessment will inform design aspects of the Project including new stations, new railway lines, works to existing railway lines and works to road crossing, as well as wildlife-rich habitats to achieve BNG. The different Project elements will be grouped based on similar characteristics. As the design progresses, 'hotspots' will be identified where a particular Project element may be relatively more susceptible; for example due to age or condition, or due to siting in a flood plain where the hazard likelihood is deemed higher. The assets potentially affected by climate change are listed in 6.4 and its method statement.

5.4.3 The separate environmental topics will also use the information to confirm a future baseline so that they are able to assess impacts within that context. For example, water and flooding impacts taking account of heavier future rainfall, and ecology impacts against a background of prevailing trends in species abundance. Equally, mitigation proposals will need to be developed, where appropriate, to accommodate future climate conditions; for example drainage swale capacity or species choice for landscape mitigation.

5.4.4 Future climate parameters will be defined as the climate change resilience assessment progresses, as specific climate impacts are raised through the environmental and engineering teams, and are identified as impacts that need to be mitigated.

5.5 Monitoring arrangements

5.5.1 The EIA Regulations include a provision the consenting authority (for the Project this is the SoS) to consider whether it is appropriate to impose monitoring of the mitigation of likely significant effects. When considering whether to impose a monitoring measure, the SoS must consider whether to make provision for potential remedial action; take steps to ensure that the type of parameters to be monitored and the duration of the monitoring are proportionate to the nature, location and size of the proposed development; and consider whether any existing monitoring arrangements are more appropriate than imposing a monitoring measure specific to the consent.

5.5.2 Equally, the EIA Regulations state that the ES must, where appropriate, describe any proposed monitoring arrangements.

5.5.3 Monitoring of construction impacts, where required, will be secured through the CoCP, which will require the principal contractor to undertake all necessary monitoring as outlined for each environmental topic to comply with

the requirements of the CoCP, as well as any additional consent requirements. Monitoring will address the impact of construction works, and the effectiveness of mitigation measures.

5.5.4 The CoCP will also require the principal contractor, where necessary, to implement remedial measures to provide additional protection and to take other actions as may be necessary to enable compliance with relevant laws and policy.

5.5.5 Proposed environmental monitoring of the operational Project will focus on the efficacy of the permanent mitigation measures that are embedded within the design and the assumptions about its operation. Any proposed monitoring measures may be secured through DCO requirements or other suitable legal obligations.

6 Environmental assessment topics

6.1 Introduction

6.1.1 This chapter sets out a summary of each of the environmental assessment topics and whether it is proposed to be scoped in, partially scoped out or scoped out of the EIA. For each topic the summary covers:

- The sources of impacts;
- How the baseline will be established;
- The study area;
- Mitigation; and
- How effects will be evaluated.

6.1.2 A full method statement for each of the following aspects (which are presented below in alphabetical order) is available as appendix to this report for technical specialists who may require more detail on the assessment methodology. No method statement has been prepared for electro-magnetic interference or major accidents and disasters as these are detailed within this EIA Scoping Report.

6.2 Agriculture and soils

Introduction

6.2.1 The agriculture and soils assessment will consider the impacts of the Project on agricultural land (including the presence of best and most versatile (BMV) agricultural land), soil resources (agricultural soils and all other soils), and agricultural land holdings (land and associated infrastructure used for the purposes of agricultural production, including the commercial production of timber, if present).

6.2.2 The detailed proposed scope, sources, and method for the agriculture and soils assessment is provided separately in the *Agriculture and Soils Method Statement*.

6.2.3 The methods used to assess impacts on woodland and related to biodiversity, the historic environment and landscape and visual receptors are covered in their respective method statements.

Sources and types of impact

6.2.4 The potential sources of impact on agricultural land, soil resources and agricultural land holdings across the Project would include:

- Permanent work within the draft Order limits, including:

- Widening of existing railway corridor;
- New railway infrastructure (including stations) and associated substructures;
- Embankments, cuttings, viaducts, and tunnels;
- New highway diversions/links; and
- Environmental mitigation features.

- Temporary work within the draft Order limits, including:
  - Construction compounds;
  - Haul roads;
  - Borrow pits
  - Utility diversions; and
  - Temporary environmental mitigation.

6.2.5 Potential impacts include:

- Use of machinery causing soil compaction and deterioration, without proper consideration of sustainable soil handling practices to mitigate impacts;
- Interventions to earthworks and drainage leading to potential impacts on adjacent agricultural land;
- Activities leading to demolition of farm dwellings, buildings, and infrastructure; and
- Removal of agricultural land from holdings, fragmentation and severance.

6.2.6 The Project will require permanent and temporary acquisition of land. This will affect the nation's stock of agricultural land and could include areas of high-quality agricultural land, known as BMV land.

6.2.7 The Project will also result in permanent and temporary displacement of soils, although all soils will be sustainably re-used.

6.2.8 Changes in accessibility to and loss of agricultural land, property and infrastructure may affect the continued ability to farm or otherwise use the land to its full potential.

6.2.9 Permanent and temporary disruption to or loss of drainage, irrigation and water supplies. Such disruption or loss may affect land quality if permanent, and hence land use; or lead to short-term land use change.

Establishing the baseline

6.2.10 The agriculture and soils baseline will be compiled from a variety of sources such as Natural England's provisional ALC maps, post-1988 maps, peaty soils maps, environmental stewardship project agreements and ancient woodland maps. National soils data will be acquired from Cranfield University.

6.2.11 Agricultural land will be categorised according to the ALC framework, which classifies land into five grades based on local climatological data,

topography, flooding and soil properties. BMV land should be retained for agricultural use where possible, and development directed towards lower quality land (Grades 3b, 4 and 5).

6.2.12 National soil association mapping and LandIS data will be examined to obtain digitised information on soil properties such as texture, permeability, soil profile depth, resilience to damage during handling and presence of peat. The Natural England peaty soils map will be used to complement information from the National Soil Map.

6.2.13 Soil resource surveys will be undertaken on all soils potentially affected permanently and temporarily by the Project with the survey results reported in a soil resources report. This information will be used to establish the soils baseline. For soils on agricultural land, the ALC will also be determined and reported in the baseline.

6.2.14 Farm business interviews (FBI) will be conducted to inform the baseline providing information on the agricultural land holdings that could be affected by the Project.

Study area

6.2.15 The study area for soils and ALC is the land within the draft Order limits of temporary and permanent acquisition.

6.2.16 The study area for agricultural land holdings (land associated with arable cropping, livestock rearing, field-scale and glasshouse horticulture (of edible and non-edible crops), and commercial timber production) will incorporate all land managed by any holding that is affected by land acquisition within the draft Order limits of temporary and permanent acquisition.

6.2.17 The future baseline will have regard to land parcels where planning consent (or a planning allocation) has been granted that will have the effect of changing the use of agricultural land to built form. Where such development would take place within the construction lifetime of the Project, the effect of the Project on the agricultural resource will be disregarded, or downgraded.

Mitigation

6.2.18 The Project will be designed to reduce as much as possible the amount of land required, thereby reducing the extent of disturbance to agricultural land, soil resources and agricultural land holdings; for example through rationalising and careful location of balancing ponds, road realignments or landscape planting; local slackening of slopes to maintain agricultural use or steepened slopes to limit land use; and modifying access tracks to limit fragmentation and land severance.

6.2.19 A soils management plan (SMP) based on the Department for Environment, Food and Rural Affairs (Defra) Code of Practice for the Sustainable Use of Soils on Construction Sites[16] and on the Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings[17] will provide guidance for stripping, stockpiling, maintenance, reinstatement, and aftercare of soil resources. It will identify the volume of soils that will be displaced.

6.2.20 In addition, certain facilities can be included to help secure continued or improved agriculture, for example provision of agricultural tracks and gateways to gain access to fragmented/severed land; or provision of accommodation over- or underbridges to fragmented/severed land.

Evaluating effects

6.2.21 Effects on agricultural land and soils will be evaluated using guidance published by IEMA[18] and determined as a function of impact magnitude (for example the area of land, volume of soil or soil functions lost or improved) and receptor sensitivity (for example the ALC grade of the land or the sensitivity of the soil).

6.2.22 Effects on agricultural land holdings will be determined as a function of impact magnitude and receptor sensitivity. The terms used to define magnitude and sensitivity in relation to farm businesses stem from guidance published by HS2[19]. This is the most comprehensive method available and considered best practice.

6.2.23 Details of the criteria are provided in the *Agriculture and Soils Method Statement*.

Proposed scope

Table 9 – Proposed scope – Agriculture and soils.

Assessment item	Scoped in	Scoped out
Soil Resource Survey: Non-agricultural Land	All areas	
Soil Resource Survey: Agricultural Land (ALC survey)	All areas	
Agricultural land holdings	All areas	

[16] *Defra.* (2009) *Code of Practice for the Sustainable Use of Soils on Construction Sites*. Available at: https://assets.publishing.service.gov.uk/media/5b2264ff40f0b634cfb50650/pb13298-code-of-practice-090910.pdf (Accessed 13 May 2024).
[17] *Institute of Quarrying*. (2021) *Good Practice Guide for Handling Soils in Mineral Workings.* Available at: https://www.quarrying.org/soils-guidance. (Accessed 13 May 2024).
[18] *IEMA* (2022). *A New Perspective on Land and Soil in Environmental Impact Assessment*. IEMA: Lincoln.
[19] *High Speed 2* (2013). *London-West Midlands Environmental Statement Volume 5 Scope and Methodology Addendum CT-001-000/2.*

6.3 Air quality

Introduction

6.3.1 The assessment of air quality impacts from the Project will address how activities and proposals associated with the Project's construction and operation will affect air quality and potential consequences for human health and ecology. For each phase, the type and source of potential impacts will be identified, and in the context of assumed mitigation measures, the effects will be evaluated, highlighting those deemed to be likely and significant. Effects may be either positive or negative.

6.3.2 The assessment of effects will be made within the context of relevant air quality objectives and policy.

6.3.3 The detailed proposed scope, sources, and method for the air quality assessment is provided separately in the *Air Quality Method Statement*.

Sources and types of impact

6.3.4 Environmental Protection United Kingdom (EPUK), the Institute of Air Quality Management (IAQM), Defra and National Highways have produced a range of guidance, which will be followed in undertaking the air quality impact assessment. The pollutants considered include:

- Fugitive dust from construction with a potential to result in health, nuisance, loss of amenity and ecological effects;
- Nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) from road traffic and diesel freight trains, and sulphur dioxide (SO_2) from diesel freight trains, with potential impacts on human health; and
- Nitrogen deposition from NOx and ammonia (NH_3) from road traffic with potential impacts on ecology.

6.3.5 Air quality impacts during both Project construction and operation would result principally from road traffic, and specifically changes in traffic volumes and routes, where traffic flows may change on diverted or closed roads, or where new stations generate traffic (or closed stations lessen traffic), dust generation and exhaust emissions from diesel trains.

6.3.6 The following sources of air quality impacts will be considered:

- Exhaust emissions of NO_2, PM_{10}, $PM_{2.5}$ and NH_3 from road traffic during the operational phase from traffic generated, displaced or reduced from modal shift during the operational phase associated with new and existing stations, relocations or closure of stations, road closures, new roads or alteration in passengers using train services;
- Exhaust emissions of SO_2 and NO_2 from diesel freight trains using the Project (including idling) during the operational phase;

- Exhaust emissions of NO_2 from any proposed combustion sources (e.g. energy generating/ heating plant) during the operational phase;
- Construction activities with potential to generate dust;
- Exhaust emissions of NO_2, PM_{10}, $PM_{2.5}$ from construction plant (non-road mobile machinery; NRMM) during the construction phase; and
- Exhaust emissions of NO_2, PM_{10}, $PM_{2.5}$ and NH_3 from road traffic during the construction phase including heavy goods vehicles on the road network and along the trace of the route alignment, and from workers vehicles, as well as from rerouting of existing traffic.

6.3.7 Changes in road traffic flows due to new stations, relocations or closure of stations, road closures, new roads or alteration in passengers using train services has the potential to increase and decrease emissions to air.

Establishing the baseline

6.3.8 Strategically, areas of potentially poorer air quality will be identified through their designation by local authorities as air quality management areas (AQMAs).

6.3.9 Data on baseline air quality will be established through a combination of existing air quality data from LAs, Defra (national network monitoring sites and background mapping) and other sources such as the EA and Air Pollution Information System. A Project specific diffusion tube monitoring survey has been commissioned to gather data on current NO_2 concentrations to inform the baseline and modelling of road traffic emissions.

Study area

6.3.10 The study area for the construction dust assessment will be up to 250m from construction activities.

6.3.11 The study area for the assessment of construction and operational changes in road traffic will include human health receptors and ecologically designated sites within 200m of the affected road network (ARN). The ARN will be determined based on a combination of:

- The total annual average daily traffic (AADT) (all motorised vehicle types) flow changes by 1,000 or more; or
- The AADT flow of heavy-duty vehicles (including heavy goods vehicles, buses and coaches over 3.5 tonnes gross weight) changes by 200 or more; or
- A change in daily average speed of 10kph or more[20]; or
- Road alignment change of 5m or more.

[20] DMRB LA 105 applies a speed banding method to define study area and generate exhaust emissions based on levels of congestion. This approach is more suited to interventions made to the SRN where reductions in congestion is one of the primary objectives. On this basis, a daily average speed criteria have been adopted to screen roads for changes in speed.

6.3.12 During operation, where diesel freight trains will be in use, following criteria will apply to the study area:

- For stationary diesel freight trains there is relevant exposure within 15m and the locomotives are regularly (more than three times a day) stationary for periods of 15 minutes or more; or
- For moving diesel freight trains there is relevant exposure within 30m of the relevant railway tracks and background NO_2 concentrations are above 25µg/m^3.

Mitigation

6.3.13 Road traffic exhaust emissions are the principal concern both as temporary effects during construction and permanent effects during the operational phase of the Project. Embedded mitigation measures include facilities for active travel and public transport (e.g. electric vehicle and cycle parking, bus facilities and walking/cycling facilities) at new or upgraded stations.

6.3.14 During construction, potential temporary air quality impacts will be controlled using a range of mitigation measures which will be set out in the CoCP. The general approach for air quality is to design out or avoid emissions, and where this cannot be avoided, to reduce the emissions at source or locate the emission sources away from receptors. Additionally, the construction traffic management plan (CTMP) will detail the measures designed to minimise construction traffic related impacts. Strategic routing of construction traffic to avoid sensitive areas such as AQMAs will also be considered.

6.3.15 The Project proposes to establish an energy strategy that eliminates the use of combustion sources for meeting the heating and cooling requirements of facilities.

6.3.16 Based on the preference for discontinuous electric traction power, which will avoid emissions from diesel passenger trains, potential emissions from rolling stock will be greatly lessened.

Evaluating effects

6.3.17 Significance will be evaluated following the IAQM guidance for construction dust which follows a risk-based methodology used to select the appropriate level of mitigation measures and does not advocate defining the significance of pre-mitigation effects. A preliminary dust risk assessment will be undertaken prior to the ES to identify areas of low and medium dust risk that can be managed through general best practice mitigation measures. Areas assessed as high risk would be evaluated further within the ES to identify additional best practice mitigation measures required and any residual effects.

6.3.18 EPUK/IAQM guidance will be followed for other emissions affecting human receptors. Details of significance criteria are provided in the *Air Quality Method Statement*.

6.3.19 IAQM guidance will be followed for ecological receptors. Where the change in relevant predicted pollutant concentrations as a percentage of the relevant critical level or load is greater than 1% an ecologist will be consulted and the results and any significant effects will be reported in the biodiversity assessment or HRA.

Proposed scope

Table 10 – Proposed scope - Air Quality.

Assessment item	Scoped in	Scoped Out
Emissions to air from operational phase road traffic	All areas	
Emission to air from operational phase diesel trains	Freight (depending on initial screening)	Passenger services
Emission to air from any proposed combustion sources (e.g. energy generating/ heating plant) during the operational phase		All areas
Dust generation during construction	All areas	
Emissions to air from construction p**lant** and NRMM		All areas
Emission to air from construction phase road traffic both on the road network and the Project alignment	All areas	
Odours (construction and operation)		All areas

6.3.20 Emission to air from combustion sources is unlikely to have significant impacts on air quality. With the proposed energy strategy - referred to above under mitigation - emissions from combustion sources will be negligible. As such, emissions from combustion sources are considered out of scope and will not be assessed further.

6.3.21 IAQM guidance on the assessment of dust from demolition and construction notes that 'exhaust emissions from on-site plant (NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed'. Generally, construction plant emissions relative to the surrounding road traffic contributions will be negligible. However, given the scale of the construction works, where suitable information is available as design progresses, the location and number of site plant operating during

working hours will be reviewed with respect to baseline conditions and distance to nearby receptors. The qualitative review will be undertaken to support the scoping out assessment by confirming that significant effects are unlikely to occur based upon professional judgement.

6.3.22 Assessment of effects from odour have been scoped out, as no permanent sources of impact have been identified. Risks of temporary impact, though low, would be managed through application of the CoCP.

6.4 Communities and health

Introduction

6.4.1 Communities and Human Health have separate method statements appended, (*Communities Method Statement* and *Human Health Method Statement*) but are considered together here as they are closely related.

6.4.2 The assessment considers how the Project proposals will affect residential and community assets and networks, as well as the health of local populations. This includes loss of residential properties or land, as well as loss of or impacts on community facilities supporting health, education or amenity (including open spaces). It considers how settlements or closely associated settlements may be actually or perceptually separated by the railway. It also considers how other environmental impacts and effects (noise, visual, dust, traffic) might act in combination to the detriment of overall community amenity and quality of life. The assessment also considers how effects on determinants of health (such as air quality, noise, and access) could result in impacts on human health.

6.4.3 The assessment of community impacts will follow DfT's 2024 NNNPS. There is no definitive guidance on providing a community assessment; as such it will be based on accepted industry practice, a review of community assessments for other significant Projects and professional experience.

6.4.4 The related assessment of impacts on health will consider how the Project affects the health and wellbeing of local populations. Human health is influenced by a range of indirect and direct factors; some controllable such as lifestyle, and some uncontrollable such as genetics. In determining physical, mental and social wellbeing, factors known as "determinants of health" are considered which reflect the range of influences, from society and the environment, on an individual. Specific activities of the Project could change a determinant of health and potentially result in changes to health outcomes (an effect) in the population.

6.4.5 There is no UK legislation that specifies the detailed content required to assess human health or that sets standards or thresholds for assessing

significance. However, there is guidance from IEMA on this, for effective scoping[21] and determining significance[22]. This will be therefore evaluated based on accepted industry practice and a review of other health assessments for relevant projects.

6.4.6 The detailed proposed scope and method for the community and human health assessment is provided separately in the relevant method statement.

Sources and types of impact

6.4.7 Sources of impact will include a variety of physical impacts and activities resulting from the Project's construction and operation. Temporary community effects due to construction activity may last several months or even years. Longer term effects may originate at the construction phase but persist over several years and potentially permanently.

6.4.8 Sources of community impact will include:

- Land use or demolition of residential property or community facilities;
- Loss of open space and severance or diversion of PRoW;
- Separation (or perceived separation) of linked communities through introduction temporary or permanent infrastructure; and
- Combined impacts affecting the noise and visual environments, air quality, access, and traffic characteristics.

6.4.9 The assessment of health impacts will also rely on the findings of these other assessment workstreams, but will review these as determinants of health where they potentially result in changes to health outcomes (health effects) in a population, acting through 'health pathways' between the source and the receptor.

6.4.10 The environmental effects potentially resulting in changes to health outcomes include socio economic effects (such as changes in employment); transport impacts/effects (such as changes in vehicle movements, and road and path diversions); noise and vibration effects; air quality effects; visual impacts; and impacts on community facilities (including loss of residential properties, severance and loss of community facilities).

Establishing the baseline

6.4.11 The community and health baselines will be compiled from publicly available information on the area's population as provided by the Office for National

[21] *IEMA*. (2022). *Effective Scoping of Human Health in Environmental Impact Assessment*. (Online). Available at: https://s3.eu-west-2.amazonaws.com/iema.net/documents/IEMA-EIA-Guide-to-Effective-Scoping-of-Human-Health.pdf. (Accessed: 05 February 2024).

[22] *IEMA*. (2022). *Determining Significance For Human Health In Environmental Impact Assessment.* (Online). Available at: https://s3.eu-west-2.amazonaws.com/iema.net/documents/IEMA-EIA-Guide-to-Determining-Significance-for-Human-Health.pdf. (Accessed 05 February 2024).

Statistics (ONS), and information on residential property and community facilities identified through the AddressBase dataset.

6.4.12 Community surveys will primarily be focused on selected areas of public open space.

6.4.13 Existing health information will be taken from publicly available sources about the population, provided by the ONS and the Office for Health Improvement and Disparities.

Study area

6.4.14 Baseline data will be gathered within 500m of the Project draft Order limits for locations where the land use of receptors is likely to change. There may be some impacts identified beyond the 500m from the Project draft Order limits where access between communities and their facilities is affected. These will be identified on a case-by-case basis and the study area expanded as necessary as part of the evaluation of effects.

6.4.15 Using a single, geographically defined community (e.g. a settlement or specific population group) to cover a range of effects across different health metrics will give a proportionate approach to assessment.

Mitigation

6.4.16 The avoidance of impact on property and community facilities is a tenet of the design strategy. Any impairment of access to property and facilities, either temporary or permanent, will be mitigated where feasible by provision of an alternative either through diversion to another existing route or through re-provision by a new access route.

6.4.17 Otherwise, the general approach to mitigating community and health impacts will rely on the measures used to mitigate the other environmental effects that secondarily affect health.

Evaluating effects

6.4.18 The evaluation of community and health effects relies on consideration of the respective contributions of proximity of impact, the size of the affected community or number of people affected, the number of properties or facilities affected, the availability of alternatives, the duration of the impact and the ease with which it can be reversed or rectified.

6.4.19 The evaluation of health effects will consider various physical, mental and social characteristics of an affected population which influence how resilient the receptor population might be to changes to determinants of health that the Project proposals might bring about. These considerations include age, socio-economic status and/or pre-existing health conditions.

Proposed scope

6.4.20 Assessment items that are scoped in are those where there is the potential for significant effects to arise as a result of the construction or operation of the Project. However, where effects are unlikely, for example because the design has mitigated the potential effect or there is no source, pathway or receptor to the effect, or because it will be assessed elsewhere within the EIA, the aspects have been scoped out.

Table 11 – Proposed scope – Human Health and Communities.

Assessment item	Scoped in	Scoped out
Permanent land requirement (including demolition or change or use away from) residential property resulting in loss of the housing stock available to local communities (temporary during construction or permanent).	All areas	
Permanent land requirement (or change of use away from) community uses resulting in loss of community receptor or change in its ability to function (temporary during construction or permanent).	All areas	
Temporary land requirement affecting ancillary residential uses (e.g. gardens, garages, parking spaces) affecting fewer than five residential properties in a location.		All areas
Temporary loss or change in ability to function of community facilities during construction	All areas	
Disturbance (temporary and permanent) to residential and community receptors resulting from a combination of significant effects on air quality, noise and vibration and visual impacts, leading to potential effects on the amenity of the residential receptor, and specifically to sleep disturbance, annoyance and effects on health	All areas	
Exposure to air pollutants with potential for health risks including respiratory issues.	All areas	
Change in journeys and connectivity resulting from the new rail services as these affect access to health and community facilities	All areas	
Impacts (temporary and permanent) that affect access between residential property and / or community receptors including potential inhibition of day-to-day activities e.g. travelling to school, work, and healthcare facilities, with potential implications for social cohesion.	All areas	
Impacts (temporary and permanent) that potentially inhibit normal physical activity.	All areas	
Changes in demand for public services		All areas

Assessment item	Scoped in	Scoped out
Public services and infrastructure provision for construction workers and permanent workforce		All areas
Impacts on emergency services.		All areas
Accessibility as it relates to those with needs covered by the Equalities Act 2010		All areas (see EqIA)
Creation of future demand for housing / and employment sites (including over-site development)		All areas (see socio-economics)
Changes to existing utility infrastructure and provision of diverted / upgraded utility infrastructure.	All areas	
Safety and security		All areas
Permanent or temporary generation of employment and income where this affects the local community	All areas	

6.4.21 Where aspects are scoped in it is expected that different sections of the route are likely to experience different impacts, as the type of work required across the different sections varies.

6.4.22 The assessment will consider the permanent requirement for land from individual residential properties. The assessment will consider the temporary requirement for land affecting multiple properties at the same location. Where temporary requirement for land (garden, garage, outbuilding, parking space, driveway) affects fewer than five residential properties, this is unlikely to result in a significant effect at a community level and is therefore recommended to be outside of the scope of the EIA. It is understood that these are important issues for the individual owner or occupier and appropriate mitigation / compensation will be considered.

6.4.23 It is assumed that most additional jobs during construction and operational phases will be filled by people living within commuting distance of the Project. There is unlikely to be a significant increase in demand for accommodation and public services due to temporary workers or a permanent workforce. The construction and operation activities are not expected to result in an increase in demand for emergency services. The impact of the Project on journey times of vehicles is considered within the *Traffic and Transport Method Statement*. Therefore, it is recommended that these aspects are not assessed in the communities or health assessments.

6.4.24 The assessment of effects on communities considers the general population group plus any specific population groups that use affected community facilities (e.g. younger people using a school). The assessment does not consider the needs of all routes (footpaths, roads, cycleways,) between places, instead considering the physical adjustments made in order to

accommodate the Protected Characteristics Groups covered by the Equalities Act 2010. The effects of the Project on these groups are considered in the EqIA. The use of the term 'accessibility' in the community assessment refers to the physical needs of population groups such as those with disabilities.

6.4.25 The assessment considers effects on existing residential properties and those identified as 'committed development'. The assessment does not consider the Project's role in enabling or bringing forward future development of residential properties or community facilities.

6.4.26 The assessment of effects on amenity is triggered where residual significant effects are identified by two or more related topics. These related topics are air quality, noise and vibration, visual effects as well as traffic and transport (specifically an increase in heavy good vehicle (HGV) movements).

6.4.27 It is assumed that site security arrangements for the Project will be in line with the requirements set out the Construction (Design and Management) Regulations 2015 and appropriate levels of security (personnel / CCTV) will be provided. Furthermore, appropriate levels of security (personnel / CCTV) will be implemented during the operational phase. Therefore, there are unlikely to be significant effects in relation to crime and these will not be considered further.

6.5 Electro-magnetic interference

Introduction

6.5.1 The assessment will consider the likelihood of significant effects on third-party assets and the public in general to be affected by EMI and electromagnetic fields (EMF) respectively, as a result of the temporary construction activities and permanent features of the Project and its operation. Matters related to the exposure of passengers and staff to EMF will be addressed in the electromagnetic compatibility (EMC) Management Plan and EMC Strategy that will be developed as part of the Project design and are not considered under this assessment.

6.5.2 EMC is the ability of equipment and systems to operate satisfactorily in its electromagnetic environment, without introducing intolerable electromagnetic disturbances to other equipment and systems in that environment.

6.5.3 Non-mandatory EMF levels for the general public are defined in the European Council recommendation on the limitation of exposure of the

general public to EMF (0 Hz to 300 GHz) 1999/519/EC[23] which defines a reference level of 100μT at 50Hz, which is the same as the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines 1998[24].

6.5.4 Exposure of human beings (not passengers or staff) to EMF will be assessed and demonstrated that members of the (general) public are not subjected to levels above the advised limits, as a result of the implementation and operation of the Project.

Sources and types of impact

6.5.5 The primary source of EMF will be the traction power supplies generated at 25kV AC; the voltage and current generated in other railway used electrical supplies are not high enough to cause significant EMF outside of the railway boundary. The effects of EMF rapidly diminish with distance from the source, both horizontally and vertically.

6.5.6 Depending on the final electrification solution, it is assumed that electrified sections of the railway will be equipped with the following sources:

- 25kV OLE traction power system;
- ETCS Level 2 signalling system; and
- Telecoms systems for the radio-transmission of train control and signalling, as well as for emergency and public services.

6.5.7 EMF is produced wherever electricity is used. The electric field is produced by voltage and the magnetic field by current. The fields can result in:

- Interference to electric and electronic equipment, EMI, is the disturbance that affects an electrical system due to magnetic and electric fields, electromagnetic induction or electromagnetic radiation emitted from an external source; and
- Induced voltages in metallic infrastructure where there is parallel running for a significant distance e.g., the route running parallel and close to overhead electric power lines or metallic fences.

Study area

6.5.8 The study area will include up to 1km from the railway for radio telescopes, 50m for airports and military establishments,100m for universities, hospitals, highways, power cables and water and gas pipelines. Other receptors (such as radio masts and telecoms towers, dwellings, schools and commercial buildings) will be considered up to 50m.

[23] 1999/519/EC Council Recommendation on the limitation of exposure of the general public to electromagnetic fields (0Hz - 300GHz)
[24] ICNIRP GUIDELINES for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)

Baseline

6.5.9 The baseline assessment will identify commercial and residential receptors within 50m of the track.

6.5.10 The baseline will also include any existing National Grid 275kV (kilovolt) and 400kV overhead power lines that the Project runs under or adjacent to.

6.5.11 The *Traffic and Transport Method Statement* lists the network rail routes and motorways that the Project crosses or runs adjacent to.

Mitigation

6.5.12 Where the Project runs close to an existing Network Rail railway route, any effects of EMC, EMI or EMF will be mitigated by complying with the British Standards (BS) EN 50121 and BS EN 50122 suite of standards.

6.5.13 Induced voltages from the overhead traction power may affect metallic infrastructure that runs parallel to the Project. For this to have any significant effect, the infrastructure will have to run close to the railway and for a considerable distance, typically greater than 2km. Any effects will therefore be localised, but they can be mitigated by adopting design solutions that meet British and European standards and electrical engineering best practice.

6.5.14 Other effects, such as induced voltages, earthing and bonding issues associated with the interface with other railways, will be mitigated through design and construction in compliance with British, European Standards and best practice.

Proposed scope

Table 12 – Proposed scope – EMI.

Assessment item	Scoped in	Scoped Out
Electric and magnetic fields affecting electrical systems	Areas where the public can get closer than 5m to live overhead lines	All areas beyond 5m of the centre line except where the public can get closer than 5m to live overhead lines
Potential to cause harmful effects in the human body through EMF	See below	All areas beyond 5m of the centre line except where the public can get closer than 5m to live overhead lines
Creation of induced voltages in metallic infrastructure	See below	All other areas
Effects on wildlife		All Areas

All temporary effects during construction effects		All areas

6.5.15 Electric and magnetic fields beyond 5m of the centre line of the outermost track at 50Hz are well below the exposure limit values defined in the ICNIRP recommendations and therefore are not considered to impinge public health and amenity and won't be assessed further, except where:

- Bridges pass over/under the electrified railway or dwellings that might have been constructed over/under a tunnel or viaduct. In these situations, if public can get closer than 5m from live OLE, a specific EMF assessment, taking into account the conditions of the design and operation of the railway, will be carried out; and
- Third party energy conductors run parallel within a 10m boundary from the centre line of the outermost track or cross future station areas (typically HV cables). In these situations, a specific assessment will be carried out taking into account the combined effects of the Project railway infrastructure and the energy cables operation.

6.5.16 These receptors will be identified as the design progresses to clearly define the areas where EMF will be scoped in.

6.5.17 The limited number of published studies addressing the risk of EMF to wildlife shows little or no evidence of a significant environmental effect. From current information the exposure limits in the ICNIRP guidelines for protection of human health are also protective of wildlife and therefore effects on wildlife will be scoped out.

6.5.18 All construction activities will be confined to local areas. Mitigation will be controlled by the adherence to British and European standards, which will be mandatory for all installation contractors. It is therefore considered that there would not be significant effects associated with construction and so construction effects would be scoped out.

6.6 Land quality

Introduction

6.6.1 Land quality considers how the Project will affect land contamination and potentially result in its mobilisation adversely affecting people, built environment and environmental resources. Contamination refers to the presence of pre-existing contaminating substances in the subsurface (either in soils, as soil gas or in groundwater). The land quality assessment will also consider areas of geoconservation interest, specifically geological sites of rarity or importance that are designated at national or local level.

6.6.2 The assessment will use conceptual site models to determine potential contamination source-pathway-receptor routes through which potential impacts will be realised. These are listed below.

Table 13 – Potential pollutant linkages.

Possible Sources	Potential Pathways	Receptors
Historical landfills; Made ground associated with existing land use and railway infrastructure; Unrecorded landfills and animal burials; Contaminative land uses associated with pits, farmland and farming activities; Bourn Airfield and the former Lords Bridge Ammunition Depot; Light industrial and commercial works; and Former gas works.	Skin contact and ingestion by people; Inhalation of vapours and windblown contaminated dusts by people; Mobilisation of contaminants in shallow soils and groundwater into surface waters and aquifers; and Migration and build-up of ground gases in enclosed spaces.	Construction workers, maintenance workers, current and future railway users, adjacent land users, including allotments, farms, leisure activities, commercial land users and residents; Property including crops or livestock; and infrastructure; Secondary A and Secondary Undifferentiated superficial aquifers; Secondary A and Principal bedrock aquifers; Groundwater source protection zones (SPZs); Nine Wells chalk springs; GWDTEs; Surface watercourses including main rivers; and Ecologically sensitive areas, e.g., local nature reserves.

6.6.3 Mitigation measures will be implemented in accordance with land contamination risk management (LCRM) guidance[25] prior to construction to ensure that any contamination risks to human health, property, surface water and groundwater are mitigated. The measures described within the *Land Quality Method Statement* and outlined here will be sufficient to ensure that significant effects for land contamination are unlikely to occur.

6.6.4 This section sets out the assessment that will be required to identify potential land contamination and other land quality impacts, although it is proposed to scope out coverage of contamination in the ES given the measures that

[25] *Environment Agency* (2023) *Land contamination risk management, Environment Agency*. Available at: Land contamination risk management (LCRM) - GOV.UK (www.gov.uk). (Accessed 14 May 2024).

would be used to manage risk in accordance with the government's LCRM guidance (see mitigation below).

Sources and types of impact

6.6.5 Sources of potential impact are associated with the following activities where these disturb and potentially liberate contaminated ground or groundwater, introducing new receptors to existing contaminations, or creating a pollutant linkage. This includes:

- Excavation of cuttings for new railway line;
- Dewatering of deep excavations such as cuttings or tunnels;
- Construction of foundations for structures including deep foundations such as retaining walls or piles;
- Construction of temporary construction compounds;
- Introduction of stations and enclosed occupied spaces which introduce potential receptors to volatile contamination or ground gases;
- Reuse of material – made / artificial ground and natural soils across the Project; and
- Effects relating to impacts from train operations, maintenance or stabling.

6.6.6 Sources of impact on areas of geoconservation interest relate to activities resulting in full or partial loss, or where the setting of or access to these assets is impaired by the Project.

Establishing the baseline

6.6.7 The baseline for Land Quality will be initially established through a desktop analysis of documentary records including:

- British Geological Survey (BGS) of England and Wales 1:50,000 geological map series;
- Natural England Multi-Agency Geographic Information for the Countryside and data on designated geological sites;
- EA's Catchment Data Explorer;
- Joint Nature Conversation Committee data for basic site information on Geological Conservation Review, Bedfordshire and Cambridgeshire local geological sites (LGS);
- LA Part 2A contaminated land designations; and
- EA and LA information searches and consultation data on waste management sites, industrial sites, potentially contaminative land uses and potentially infilled land.

6.6.8 Environmental site walkovers across the accessible parts of the study area will be undertaken, including visual, non-intrusive inspections within and surrounding the Project draft Order limits.

6.6.9 In addition to the above a review of existing information will be undertaken and desk studies in areas not yet covered will be completed. The desk

studies will include a review of previous information and conceptual site models to assess whether there are unacceptable risks to sensitive receptors (human health, controlled waters and geological sites).

Study area

6.6.10 The following study areas will be considered for land quality:

- 250m from the Project draft Order limits for potential land contamination sources (e.g. landfills), which is established industry practice augmented by professional judgement;
- 250m from the Project draft Order limits for designated geological sites;
- 250m from the Project draft Order limits for surface water receptors; and
- 1km from the Project draft Order limits for groundwater, GWDTEs, and groundwater SPZs.

Mitigation

6.6.11 Mitigation measures will be implemented in accordance with LCRM guidance in advance of construction to ensure that any contamination risks to human health, property, surface water and groundwater are mitigated.

6.6.12 Further mitigation through the use of the CoCP and accompanying documents will reduce impacts during construction works.

6.6.13 Excavated soils would be managed in accordance with the definition of waste code of practice (DoWCoP) which will determine the appropriate re-use or disposal routes for soils produced during the excavation works phase of the proposed development. This is documented by one or more materials management plans (MMPs). The MMPs will consider naturally occurring background contaminants to ensure that uncontaminated natural soils from particular domain are not used in areas with a lesser background contaminant levels.

6.6.14 The Project will include traction power substations and auto-transformer stations. Fuel and oil storage tanks, auto-transformer stations, feeder stations and substations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk will be included in the installed design. The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage can be manged by robust maintenance and operating procedures, is expected to be very small and is unlikely to result in significant contamination. Spillage or leakage would be cleaned up in accordance with operational procedures.

6.6.15 The following mitigation measures will be undertaken prior to construction of the proposed development to ensure that any contamination risks, including

those to human health, property, surface water and groundwater are mitigated in accordance with LCRM guidance.

- Where not already completed, further preliminary risk assessments (desk studies) would be undertaken for the Project to provide an initial conceptualisation of sources, pathways and receptors which would be used to inform the scope of ground investigations;
- A written Project of investigation would be produced for the targeted geo-environmental site investigation; a Phase 1 ground investigation is currently underway;
- The site investigation would include contamination testing of soils, groundwater and surface water to seek to confirm the ground conditions, groundwater regime and any surface water groundwater interaction;
- Where necessary ground gas or vapour monitoring would be completed;
- Findings of the investigations would be reported in generic or detailed quantitative risk assessment in line with LCRM guidance and other relevant standards and guidance e.g., BS10175, CIRIA C665, CIRIA C552, BS8576 and EA groundwater protection guidance;
- If contamination is identified a remediation options appraisal in line with LCRM and Sustainable Remediation Forum (SURF-UK) is usually undertaken as part of the pre-construction works to identify and evaluate the option or options that would be most appropriate;
- Should contamination be identified by the ground investigation and subsequent risk assessments that poses an unacceptable risk, a remediation strategy would be produced, and remediation undertaken to mitigate the risk;
- Contamination remediation methodologies for soil and groundwater will be chosen and will generally be expected to follow the hierarchy given below:
    - Monitored natural attenuation of groundwater;
    - On-site treatment of soils or groundwater and subsequent reuse of soils on site;
    - Nearby off-site treatment of soils and re-importation to site and reuse (e.g., use of a hub and cluster approach or a soil treatment centre);
    - Off-site soils treatment (possibly at a treatment hub or cluster) and reuse on other projects; and
    - Off-site disposal of soils or groundwater (with or without treatment).

6.6.16 A procedure would be put in place for dealing with unexpected contamination that may also impact on surface water quality, groundwater quality and adjacent land users or property.

Evaluating effects

6.6.17 In practice, all potential impacts from contamination that could result in significant environmental effects must be mitigated in accordance with LCRM guidance to avoid regulatory breach and the measures described within the

Land Quality Method Statement and outlined here will be sufficient to ensure that significant effects are unlikely to occur.

6.6.18 Levels of risk will reflect the potential magnitude of impact, which will be determined on the basis of a nine-point scale, based on widely used land contamination risk assessment guidance, R&D66, as well as the Design Manual for Roads and Bridges (DMRB) standard for geology and soils.

6.6.19 It is therefore only potential geodiversity effects, and then only in Route Section 7, that may need to be evaluated, taking account of sites' rarity and scale of importance and the extent of loss or damage.

Proposed scope

6.6.20 Based on the station operations and infrastructure design, the likelihood of significant contamination from the operation of stations or other infrastructure is not considered to be significant therefore, in line with other rail DCO projects, effects resulting from the operation of the Project will be scoped out of the assessment.

6.6.21 The mitigation measures described above are standard requirements in any development and the level of detail and work required will be commensurate with the complexity of the Project and the nature of the contamination identified. In each case the end point is the same, i.e., that no unacceptable risk should remain at the completion of the Project. Therefore, significant permanent effects from the Project in respect of the land contamination element of the land quality aspect are not anticipated.

6.6.22 It is common for land contamination to be scoped in for projects on a precautionary basis, however, significant effects are commonly not identified when these measures are incorporated into the Project. Therefore, EWR Co considers it is a proportionate approach to scope out land contamination within the ES. However, it is emphasised that considerable work related to land contamination, as outlined, will be undertaken through the normal consenting channels, taking into account regulatory consultation and agreements. This work will be made available to provide examiners and consultees with the usual avenue for comment through the examination process and input into the DCO requirement.

6.6.23 Although management of contamination risks will remain central to the evolving Project development, it is proposed that land contamination is scoped out as an ES issue. The end point of the mitigation is that no unacceptable risk should remain at the completion of the Project. Therefore, likely significant permanent effects from the Project in respect of the land contamination element of the land quality topic are not anticipated.

Table 14 – Proposed scope - Land Quality.

Assessment item	Scoped in	Scoped out
Geodiversity – temporary construction effects		All Areas
Geodiversity – permanent and operational effects	Comberton to Shelford	All areas except Comberton to Shelford
Land contamination – temporary construction effects		All areas
Land contamination - permanent and operational effects		All Areas

6.6.24 Due to the presence of Barrington Quarry SSSI and nine wells LGS site in the Comberton to Shelford area, geodiversity (designated areas of particular geological interest) remains within the scope of the EIA.

6.7 Socio-economics

Introduction

6.7.1 The socio-economic topic considers three main areas: businesses, employment and the economy. Businesses relate to local businesses that could be impacted by the Project; employment relates to employment opportunities generated from the Project; economy relates to the impacts of the Project to relevant regional economies. A key driver of the Project is to support economic growth by improving east-west connectivity and opening up new areas for businesses to grow.

6.7.2 The detailed proposed scope, sources, and method for the socio economics assessment is provided separately in the *Socio-economics Method Statement*.

Sources and types of impact

6.7.3 Sources of impact will include a variety of impacts and activities resulting from the Project's construction and operation. Temporary socio-economic effects due to construction activity may last several months or even years. Longer term effects may persist over several years and potentially permanently.

6.7.4 The following aspects of the Project would be a source of impact for socio-economic receptors:

- Demolition of commercial premises and/or assets;
- Temporary land use required to facilitate the construction of the Project;
- Permanent land use required as part of the Project;

- Construction activities and construction traffic;
- Implementation of traffic management systems, including vehicular, footway and cycleway diversions;
- Temporary job generation as a result of the construction of the Project; and
- Improved east-west transport link resulting from the operation of the Project.

6.7.5 The following sensitive receptors will be considered for the socio-economics assessment:

- Businesses which are a privately owned or operated organisation or enterprise that is engaged in commercial, industrial or professional activities. For the purpose of the socio-economic assessment, businesses consist of commercial premises and assets, as well as land used for or associated with business operations; and
- Local economies and employment, including working age individuals within the study areas.

6.7.6 Land allocated in local plans as well as committed developments due to be constructed at the same time or after the Project are considered as part of the cumulative assessment.

6.7.7 The impacts on the viability of agricultural businesses will be assessed separately, as described in the *Agricultural & Soils Method Statement*. This sets out the approach to the assessment of the viability of agricultural businesses. However, agricultural land holdings and farms will be considered to be a socio-economic receptor if they provide a commercial function, for example, host commercial events.

Establishing the baseline

6.7.8 The two main documents of relevance to socio-economics are the Social Baseline and Business Case. The Social Baseline includes baseline information relevant to socio-economics, communities, human health and equalities. This Social Baseline will be further developed to inform the preparation of PEI and the ES at relevant stages of the Project

6.7.9 The elements of the Social Baseline that are of relevance to socio-economics are businesses as well as economy and employment. For the business element of the Social Baseline, business names and types within the vicinity of the Project will be identified via AddressBase data. Ordnance Survey maps, Google maps as well as business specific websites will also be reviewed to understand business operations and land / access required for these operations. If deemed necessary to support the PEI or ES, a survey will be undertaken to verify directly affected businesses and further understand their business operations.

6.7.10 For the economy and employment section of the Social Baseline, available demographic information has been reviewed in the relevant geographical areas of effect. Demographic information includes, for example, the working age population, employees by industry sector and economically active population.

6.7.11 The Business Case for the Project will set out the economic benefits of the Project including, for example, how the Project will support economic growth.

Study area

6.7.12 For businesses, the study area has been identified as 500m from the draft Order limits. In addition, some temporary and permanent components of the Project may result in changes in accessibility. This may result in impacts that occur beyond 500m from the proposed route / area of intervention. These instances will be identified separately (informed by baseline analysis, stakeholder engagement and professional judgement where relevant) and the Study Area will be expanded in these specific areas to assess impact.

6.7.13 The economic impact of the Project is considered relative to the South East and East of England regions, as they represent the principal labour market catchment areas. The regional labour markets incorporate populations that may reasonably be expected to travel to and benefit from the Project.

Mitigation

6.7.14 The avoidance of adverse impact on businesses is a tenet of the design strategy. Loss of commercial premises / assets and land used for business operations will be reprovisioned where possible and appropriate.

6.7.15 Engagement with affected businesses will be a key element of the mitigation strategy.

6.7.16 Signage to advertise that businesses are open and operating as normal will be put in place during the construction period. In addition, businesses will be given advanced notice of construction works and diversions to access or PRoW. All PRoW diversion routes will be developed in agreement with relevant LA.

6.7.17 Recruitment will be from the local communities, wherever practicable, and the Project will enable access to training and career development. The processes used to recruit and manage staff to work at the Project would be demonstrably fair and offer equal opportunities to all.

6.7.18 Mitigation measures set out in the method statements for *Air Quality*; *Sound, Noise and Vibration*; *Landscape and Visual*; and *Traffic and Transport* are also relevant to socio-economics. For example, the *Landscape and Visual*

Method Statement sets out the requirement for new vegetation screening and landscaping.

6.7.19 Although crime and safety has been scoped out of the EIA, mitigation measures such as appropriate site security arrangements will be in place during construction and operation.

Evaluating effects

6.7.20 The socio-economic assessment will identify the potential impacts and effects of the Project on businesses, employment and economy and assess these against the baseline conditions, in order to determine whether the socio-economic effects of the Project are significant or not. Significant effects are effects that can be considered or are material in the decision-making process.

6.7.21 For businesses, the significance of effects will be determined by consideration of the resource value or sensitivity and the magnitude of the impact with the proposed mitigation in place. The Project could impact on businesses as a result of changes to:

- Land use: due to a loss of commercial premises and assets as well as land used for or associated with business operations;
- Accessibility; which covers changes in accessibility to commercial premises and assets as well as land used for or associated with business operations; and
- Amenity: which covers the loss of business viability due to changes to the amenity on an area used for business operations.

6.7.22 For economy and employment, significance will be evaluated by consideration of the sensitivity of the resource to change, the magnitude of the impact and the scope for adjustment or mitigation. The assessment will consider employment generation during construction of the Project and the benefits of the Project to the economy.

6.7.23 Effects will be evaluated by combining sensitivity of the resource or receptor with the magnitude of the impact as described above and assessed as minor, moderate or major. Significant effects will be those considered to be moderate or major beneficial or adverse.

Proposed scope

6.7.24 Assessment items that are scoped in are those where there is the potential for significant effects to arise as a result of the construction or operation of the Project. However, where effects are unlikely, for example because the design has mitigated the potential effect or there is no source, pathway or receptor to the effect, the aspects have been scoped out.

Table 15 – Proposed scope – Socio-economics.

Assessment item	Scoped in	Scoped out
Loss of commercial premises and/or assets	All areas	
Temporary loss of land used for business operations	All areas	
Permanent loss of land used for business operations	All areas	
Temporary changes to vehicular and pedestrian access to commercial premises/assets and land used for business operations	All areas	
Permanent changes to vehicular and pedestrian access to commercial premises/assets and land used for business operations	All areas	
Temporary changes to amenity on area that could affect business operations	All areas	
Permanent changes to amenity on area that could affect business operations	All areas	
Temporary employment generation	All areas	
Permanent changes to the economy	All areas	
Operational employment Generation		All areas
Tourism		All areas
Increased Demand for Accommodation and Community Facilities due to an Influx of Workers		All areas
Crime and Safety		All areas

6.7.25 It has been assumed that operational and maintenance duties for the Project, would be undertaken by a company (such as Network Rail) with an extant maintenance team with responsibilities for the upkeep and condition of railway infrastructure. Therefore, employment generation would likely be limited in the context of the regional labour market. It is anticipated that operational employment generation would not be significant and, therefore, this has been proposed to be scoped out of the EIA.

6.7.26 During operation, the improved connectivity afforded by the Project has the potential to benefit tourism, although this is not considered to be significant in the overall context of the tourism industries in the area. Overall, it is anticipated the Project would not significantly impact on tourism and, therefore, this has been proposed to be scoped out of the EIA.

6.7.27 Given the urban location of elements of the Project, good transport linkages and workforce to be utilised, it is anticipated that there would not be a significant increase in demand for accommodation and social infrastructure

from construction workers relocating. Therefore, increased demand for accommodation and community facilities due to an influx of workers has been proposed to be scoped out of the EIA.

6.7.28 It is assumed that site security arrangements for the Project will be in line with the requirements set out the Construction (Design and Management) Regulations 2015, where appropriate levels of security (staff/CCTV) will be appointed, and fencing will be in place during the construction phase. With these measures in place, there is unlikely to be a significant effect in relation to crime and safety during construction and this has been scoped out of the EIA.

6.7.29 It is anticipated that appropriate levels of security (staff/CCTV) will be implemented during the operational phase of the Project. These include, for example, controlled entry automated gate car park access barrier, lighting, and fencing and repairment. Therefore, there is unlikely to be a significant effect in relation to crime and safety during operation and this has been proposed to be scoped out of the EIA.

6.8 Sound, noise and vibration

Introduction

6.8.1 The assessment of impacts from sound, noise and vibration will consider the potential for noise and vibration generated by various activities associated with the operation and construction of the Project to affect sensitive receptors. There are many types of effects due to noise and vibration (for example annoyance and sleep disturbance) which require different methods of assessment. Community, health, biodiversity, historic environment and socio-economic effects arising from impacts identified for sound, noise and vibration will be considered and reported in the relevant sections of the ES.

6.8.2 The detailed proposed scope and method for the sound, noise and vibration assessment is provided separately in the *Sound, Noise and Vibration Method Statement*.

Sources and types of sound, noise and vibration

6.8.3 During operation, impacts may include direct impacts generated by the Project trains and infrastructure, and from maintenance activities and equipment. Airborne railway noise will include rolling noise (trains travelling on the line), wheel squeal occurring on curved sections of track; and stationary noise (trains idling on passing loops or at stations). Other operational impacts may include noise from fixed plant at depots and substations and station public address and voice alarm (PAVA) systems, and from maintenance activities.

6.8.4 During construction, impacts may include direct impacts generated by construction plant, activities and from construction rail traffic.

6.8.5 For both construction and operation, the assessment will consider indirect impacts where the operational Project or construction activities may result in changes in other sound, noise and vibration sources, principally road traffic.

6.8.6 The main potential permanent types of impact and their sources will be:

- Airborne noise and ground-borne noise and vibration from rail traffic;
- Airborne noise and ground-borne vibration from operational maintenance activities;
- Airborne noise from road traffic on new or altered links, or changes on existing links as a result of the Project;
- Airborne noise from fixed plant at depots and substations; and
- Airborne noise from station PAVA overspill.

6.8.7 The main potential temporary impacts will be from:

- Airborne noise and ground-borne vibration due to construction activities and the movement of mobile plant; and
- Airborne noise from road traffic on temporary diversion routes or road realignments, or changes on existing links as a result of the Project.

6.8.8 For both construction and operational phases, the resulting effects that may arise comprise:

- Annoyance of people in outdoor amenity areas or within buildings used for residential, educational, places of worship, childcare facilities, offices, commercial or community facilities; and
- Disturbance of people sleeping in buildings: residential, hospitals, hotels, camp sites, residential moorings.

Establishing the baseline

6.8.9 Baseline sound, noise and vibration will be described using the results of surveys of background sound levels, ambient sound levels and vibration undertaken at key locations. These will mostly use measurements from long-term, unattended monitors, or where these are not possible, from short-term, attended monitoring.

6.8.10 Baseline surveys will be supplemented with additional data where available, including Defra strategic noise maps for road and rail; appropriate measurements undertaken by or on behalf of third parties, such as private developers, LAs, National Highways and Network Rail.

6.8.11 A future baseline (in terms of future receptors and sources) will be determined taking account respectively of committed developments and modelled changes to the long-term road traffic.

Study area

6.8.12 The study areas for sound, noise and vibration as set out below will be developed as part pf the assessment:

- Operational airborne rail noise: 300m from the Project railway;
- Operational groundborne rail noise: 125m from the Project railway;
- Operational and construction airborne road noise: 600m from new roads; for existing roads 50m where road traffic noise is expected to change (increase or decrease) by 1 dB or more;
- Operational and construction vibration: 125m from the trains/closest construction activity;
- Noise from fixed plant (construction and operation) up to 1km; and
- Construction noise: 300m from the closest construction activity.

6.8.13 The assessment will be based on the comparison of predicted impacts with criteria for noise and vibration and may need to consider impacts outside these buffers where noise modelling suggests a need for this. These will be reviewed as part of the assessment.

Mitigation

6.8.14 The general approach to mitigating sound, noise and vibration impacts follows a hierarchy that seeks respectively to:

- Modify the design alignment and position of noise sources to avoid adverse effects;
- Control noise or vibration at source;
- Minimise noise or vibration propagation; and
- Mitigate at receptor.

6.8.15 Specific measures to mitigate permanent impact rail and train noise and vibration impacts might include the following:

- Noise bunds and barriers;
- Management of friction at the wheel/rail interface;
- Resilient track forms, rail fixings, rail dampers; and
- Restrictions on services in terms of numbers and speeds.

6.8.16 This list is not exhaustive. Other forms of mitigation may be employed, depending on what is most appropriate to the circumstances.

6.8.17 The proposed measures to mitigate construction noise impacts will be set out within the CoCP.

Evaluating effects

6.8.18 The evaluation of sound, noise and vibration effects relies on comparing the predicted level of impact with appropriate threshold values for the type of receptor accounting for factors such as the duration of the impact, frequency of occurrence, time of day and resulting change relative to baseline.

6.8.19 The sensitivity of a receptor to a given type of noise or vibration impact, under given conditions (e.g. daytime or night-time), is accounted for by applying specific threshold values.

6.8.20 The assessment will follow the policy and guidance set out in the Noise Policy Statement for England 2010. This involves the identification of the no observed effect level, lowest observed adverse effect level, the significant observed adverse effect level and the unacceptable adverse effect level. The equivalent approach will also be taken for vibration. The specific criteria used in the evaluation of effects, and the ways that significant effects are defined, are set out in the *Sound, Noise and Vibration Method Statement*.

Proposed scope

Table 16 – Proposed scope – Sound, Noise and Vibration.

Assessment item	Scoped in	Scoped out
Baseline noise survey	All areas	
Baseline vibration survey	All areas	
Temporary airborne noise and ground-borne vibration from construction activities	All areas	
Temporary airborne noise from construction road traffic	All areas	
Temporary ground-borne vibration from construction road traffic		All areas
Temporary airborne noise and ground-borne vibration from construction rail traffic	All areas	
Permanent airborne noise and ground-borne vibration from operational rail traffic	All areas	
Permanent airborne noise and from operational maintenance activities	All areas	
Permanent airborne noise from operational road traffic	All areas	
Permanent ground-borne vibration from		All areas

Assessment item	Scoped in	Scoped out
operational road traffic		
Permanent airborne noise from operational fixed plant at depots and substations	All areas where there are depots and substations	
Permanent airborne noise from operational fixed plant associated with station PAVA	All areas where there are stations	
Temporary and permanent airborne noise due to horn/audible warning devices		All areas

6.8.21 The impact from operational vibration caused by vehicles using a road is recommended to be scoped out within DMRB LA 111.

6.8.22 Noise from train horns sounded at whistle boards used at footpath crossings, or to give warnings to personnel working at the track side, are required for safety reasons. Consequently, these noise impacts are unavoidable but are short in duration and will generally result in a minor contribution to the daytime and night-time L_{Aeq} noise levels. Furthermore, train drivers are instructed not to use horns at whistle boards during the Network Rail Night Time Quiet Period between midnight and 06:00, except in emergencies. Therefore, train horn noise is not expected to result in significant environmental effects. The elimination of track crossings and the sensitive siting of whistle boards will be undertaken where feasible and in compliance with relevant safety requirements.

6.8.23 The assessment of impacts will consider potential noise and vibration arising from service patterns and interventions made within the Project area only. The assessment of impacts due to the movement of trains beyond the Project area is excluded and considered to be part of the growth allowed for within the capacity of the existing wider network.

6.9 Traffic and transport (journeys and access)

Introduction

6.9.1 The assessment of effects on journeys and access due to traffic and transport impacts will consider how the Project could affect the amenity and ability of people in making journeys and getting to their destinations. It considers changes in journey times and journey length for users of roads, footpaths and PRoW. This includes motorised users such as drivers and passengers of vehicles including cars, HGVs, and buses; and non-motorised users (NMU) such as walkers, cyclists and horse riders. Impacts on rail

passengers and rail freight, severance of communities, perceptions of safety (fear and intimidation) and pleasantness of journeys are also assessed.

6.9.2 Impacts will occur on routes used by construction traffic (and particularly HGVs) and on routes where traffic flows and volumes change as a result of the Project's construction and operation. Impacts will also occur where closures or restrictions affect people's ability or convenience in making journeys or gaining access.

6.9.3 The detailed proposed scope and method for the Traffic and Transport assessment is provided separately in the *Traffic and Transport Method*.

Sources and types of impact

6.9.4 The Project includes works to existing stations, new stations, new railway, works to existing railway, and works to road crossings. The elements of the Project most relevant to journeys and access during construction would be the location of construction sites, construction traffic routes and freight train paths required (for any movement of construction materials), and any temporary or permanent closures, restrictions, and diversions of roads and PRoW due to the interaction of these elements with road, rail and NMU networks. All these features will be temporary in nature.

6.9.5 During construction, changes to road traffic close to construction sites and the routes used for construction traffic may give rise to impacts, especially if they are close to residential areas. With respect to freight rail traffic, freight train paths for construction materials may affect other services.

6.9.6 It may be necessary to temporarily or permanently close, restrict access to or divert roads and PRoW, which would increase journey length or journey time.

6.9.7 Consideration will also be given to changes in road traffic that might result in fear or intimidation for people due to increases traffic volume particularly from HGVs during construction.

6.9.8 Impacts could also arise where new roads or rail infrastructure, or traffic increases cause severance by preventing or affecting ease of access. This will be reported under Community effects.

6.9.9 Closed or new/relocated stations will cause changes (good and bad) to people wishing to access rail services. Traffic accessing the stations and associated changes in traffic patterns will also be assessed.

6.9.10 The operational rail service will bring numerous benefits in terms of new or improved journeys.

Establishing the baseline

6.9.11 The baseline for the traffic and transport assessment will be established through reference to existing maps and topographical information, traffic count surveys, user surveys and questionnaires, timetables, level crossing surveys, rail station surveys, and traffic modelling.

6.9.12 The future baseline will be determined taking account respectively of committed developments and changes to the long-term road and rail travel patterns as confirmed with the relevant planning, highway and transport authorities (including national agencies such as National Highways).

Study area

6.9.13 The study area for traffic and transport is that within which significant effects will potentially occur. It is not set at a specific distance but having regard to IEMA guidance will be determined by those highway links where traffic flows (or HGV flows) would increase by 30% or more, or any other link or location where the assessment team determine that environmental or population sensitivities may warrant it, and where existing routes are closed or diverted.

6.9.14 For temporary construction impacts, considerations affecting the study area will also include:

- Designated HGV and abnormal indivisible load routes between construction sites and SRN junctions (regardless of change in flows);
- Roads subject to closure, restricted access or restricted speed;
- Roads used as diversion routes; and
- PRoW that are closed or diverted temporarily.

6.9.15 The construction study area will also assume the wider rail network to include impacts on passenger services as a result of construction, when services may be modified or suspended to allow for works on the railway, as well as operation, when new East West Rail services will affect journey time improvements for people and freight.

Mitigation

6.9.16 Embedded mitigation during construction will aim to reduce impacts of construction traffic on residential streets, minimise construction vehicles during peak times, and encourage active travel. Generic measures will be set out within the CoCP. In due course specific measures, agreed with the LA would be set out in a CTMP that will be developed by the principal contractor. Examples of such mitigation include:

- Specifying construction routes to contain construction traffic on more appropriate routes as much as possible, to reduce impacts upon residential streets;

- Reduce as much as possible construction vehicle movements during peak times on the highway network;
- Providing attractive and ample parking for cyclists at stations to encourage active travel to stations; and
- Providing attractive walking routes into stations to encourage active travel to stations.

6.9.17 Within the design, mitigation for operational impacts will be embedded through factors such as:

- New/replaced crossings for PRoW and roads;
- New/additional station facilities;
- Upgrades to/provision of station access facilities (for example vehicle/cycle parking, bus facilities, walking/cycling facilities);
- Upgrades to the highway network; and
- Upgrades to the highway network on access routes to stations.

Evaluating effects

6.9.18 Determining whether an impact would result in likely significant effects will be derived through a combination of the sensitivity of a receptor and the magnitude of the impact, with criteria for

- Journey length;
- Journey time;
- Severance;
- NMU journey amenity (pleasantness);
- Fear and intimidation on and by road users; and
- Station access routes and facilities.

6.9.19 The specific criteria to be used in the evaluation of effects, and the ways that significant effects are defined, are set out in the *Traffic and Transport Method Statement*.

Proposed scope

Table 17– Proposed Scope - Traffic and Transport.

Assessment item	Scoped in	Scoped out
Permanent effects from operation		
Railway users – change in journey time	All Areas	
Railway users - Change in provision of rail services (for passengers)	All Areas	
Vehicle occupants - Change in travel movements to existing stations due to improved rail service and any changes in journey time	All Areas	
Vehicle occupants - Change in travel movements to new stations and any changes in journey time for existing network users (network delay)	All Areas	

Assessment item	Scoped in	Scoped out
Vehicle occupants - Re-distribution of trips, and use of alternative routes by road	All Areas	
NMUs - Re-distribution of trips, and use of alternative routes by NMUs affecting journey time	All Areas	
NMUs - Severance effects on routes used by NMUs	All Areas	
NMU journey amenity	All Areas	
NMU fear and intimidation	All Areas	
Road safety		All Areas
Vehicle occupants - Increase in maintenance vehicle movements on highway		All Areas
Railway users - Change in provision of rail services (for passengers) due to closure for maintenance		All Areas
Temporary construction effects		
Railway users - Change in provision of rail services (for passengers)	All Areas	
Vehicle occupants - Change in travel movements to existing stations due to improved service	All Areas	
NMUs - Re-distribution of trips, and use of alternative routes by NMUs affecting journey time	All Areas	
NMUs - Severance effects on routes used by NMUs	All Areas	
NMU journey amenity	All Areas	
NMU fear and intimidation	All Areas	
Road safety		All Areas

6.9.20 Within the EIA, increase in maintenance vehicle movements on highway and changes in provision of rail services for passengers due to closures for maintenance have been scoped out of the assessment as significant effects are not considered to be likely.

6.9.21 A separate TA will be completed to assess aspects which are outside the scope of EIA, to include road safety.

6.10 Biodiversity

Introduction

6.10.1 The assessment will consider impacts on the study area's habitats and wildlife, focusing on designated sites and protected species, as well as priority habitats (so called habitats of principal importance, HPI). There is a host of UK regulations related to nature and ecology, and these are centred on these protected assets. In addition, this Project could fall under mandatory

BNG requirements. Requirements for BNG are described in more detail in 7.2.

6.10.2 A number of pieces of legislation and guidance apply to the assessment of ecology and biodiversity, but in preparing the assessment, the 2018 guidelines from the Chartered Institute of Ecology and Environmental Management (CIEEM[26]), the Habitat Regulations Assessment Advice note 10 as well as BS42020:2013 will be used, supported by DMRB guidance, where appropriate.

6.10.3 The occurrence of sites that were formerly part of the European Natura 2000 network (and now referred to here as Habitats Sites) will also necessitate a HRA for the Project. This will inform the EIA but will address only those Habitats Sites and the species fundamental to their designation. HRA is described in more detail in 7.3.

6.10.4 The assessment will consider how the temporary and permanent impacts of the Project will affect protected and notable ecological features directly as well as in the context of wider populations or habitat occurrence. As with other topic assessments, the EIA ecologists are working as part of the design team to ensure that impacts are avoided where possible, or to devise way of minimising, or as a last resort compensating for impacts. Effects will be evaluated assuming that mitigation or compensation is in place.

6.10.5 The BNG assessment, though not directly part of the EIA, will inform both the avoidance of impacts and the enhancement and creation of wildlife-rich habitats in ways that are resilient to climate change.

6.10.6 The detailed proposed scope and method for the biodiversity assessment is provided separately in the *Biodiversity Method Statement*.

6.10.7 BNG is discussed in 7.2 and in *An Approach to Biodiversity Net Gain*. Habitat Regulations Assessment is discussed in 7.3 the *Biodiversity Method Statement*.

Sources and types of impact

6.10.8 The majority of potential impacts will result either from land use or Project operation. Although many of these impacts will occur during construction, they may have long term or permanent effects. These comprise of:

- Loss or severance of habitats (e.g., wetlands, water features, hedgerows, woodlands, and other terrestrial habitats, particularly those qualifying as HPIs) either to new Project infrastructure or as a result of construction works, affecting habitats directly or resulting in loss of habitat connectivity.

[26] *IEEM* (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester*.

- Impaired movement of wildlife between habitats resulting from the new railway or roads;
- Disturbance and changes in behaviour due to noise and vibration impacts from trains and other operations;
- Changes in activity due to lighting from new stations, depots and sidings;
- Collision with moving trains;
- Pollutant deposition from road traffic; and
- Provision of habitats within the wider landscape.

6.10.9 During construction sources of temporary impact on ecology and biodiversity will include:

- Disturbance from other environmental impacts from construction (vibration, dust, noise, light spillage, pollution risk); and
- Temporary activities or land use affecting protected or notable species (including bats, breeding birds, otter, aquatic fauna, water vole, badger and terrestrial invertebrates).

Establishing the baseline

6.10.10 A description of the ecology potentially affected by the Project will draw on a mix of desk studies and survey findings from earlier studies for the Project, as well as from an ongoing survey programme. Third party survey information from other local development proposals will also be used (for example, the Cambourne to Cambridge project and the A421 dual carriageway). Surveys will comprise:

- UKHab surveys;
- National Vegetation Classification and Ancient Woodland Indicator surveys;
- Hedgerow surveys;
- Aquatic surveys (ponds and aquatic invertebrates);
- River Habitat and Macrophyte surveys;
- Ditch Vegetation surveys; and
- A range of species surveys for badgers, bats, fish, reptiles, otter, water vole, terrestrial invertebrates and white-clawed crayfish.

Study area

6.10.11 Baseline data will be gathered, as appropriate, for the length of the Project alignment between Oxford and Cambridge. The study areas will differ depending on the habitat, sites or species in question and taking account also of the potential impacts of the Project proposals in those areas. Details of the study areas are provided in the *Biodiversity Method Statement*.

Mitigation

6.10.12 The general approach to ecological mitigation is in line with the mitigation hierarchy in seeking, in decreasing order of priority, to avoid, minimise, rectify and compensate for adverse effects. For example:

- Avoidance (or minimisation) of important biodiversity features through the design-development process wherever possible;
- Rectify: development of an appropriate ecological design (in conjunction with wider landscaping, BNG and drainage measures); and
- Compensate: habitat recreation to offset for habitats lost elsewhere.

6.10.13 In addition, several potential biodiversity enhancement measures are being developed which will form part of the design. Land within the boundary would include areas identified to deliver protection and compensation, as well as enhancement measures.

6.10.14 Mitigation measures will be devised iteratively with the evolving design and embedded where practicable at successive stages. In this way the final ecological assessment (as with other topics) will address a mitigated Project concept and design.

6.10.15 The CoCP will be fundamental to dictating the site practice and measures necessary to avoid or limit ecological impact during the construction period. These will cover issues such as timing of works to avoid bird breeding periods, protection of ecological resources on or near to sites, and various measures to ensure aquatic resources are protected from pollution. The CoCP will detail various pre-construction surveys that may need to be undertaken to validate and, where necessary, update the baseline survey findings throughout the construction phase.

6.10.16 A register of environmental actions and commitments will be developed alongside the ES and CoCP.

6.10.17 The Project is also committed to the achievement of 10% BNG. While this is an objective out with the requirements of the EIA (and the mitigation of likely significant effects), it is part of a wider strategy that conceives the Project as green infrastructure.

Evaluating effects

6.10.18 The evaluation of biodiversity effects will follow Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2018) produced by the CIEEM. Both temporary construction effects and permanent and operational effects will be assessed in the same way, as follows:

- Determine the importance of ecological features affected, through desk study and/or field survey;
- Identify impacts potentially affecting important ecological features;
- Characterise the impacts by describing their extent, magnitude, duration, reversibility, timing, and frequency;
- Identify significant effects of impacts;
- Incorporate measures to avoid and reduce (mitigate) these impacts;
- Evaluate the severity (and significance) of any residual effects after mitigation;
- Identify cumulative impacts;
- Identify appropriate compensation measures to off-set significant residual effects (if any); and
- Identify opportunities for ecological enhancement.

6.10.19 In addition, the ecological assessment will contribute to the wider assessment of cumulative impacts.

6.10.20 A ‘significant effect’ is an effect that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ or for biodiversity in general.

Proposed scope

Table 18 – Proposed scope – Biodiversity.

Assessment item	Scoped in	Scoped out
Habitat of Principal Importance	All areas	
Ancient Woodland	• Oxford to Bletchley • Clapham to Colesden • Croxton to Toft	• Fenny Stratford to Kempston • Roxton to east of St Neots • Bedford • Comberton to Shelford • Cambridge
Hedgerow	All areas	
Bats	All areas	
Badger	All areas	
Riparian Mammals	All areas	
Kingfisher	All areas	
Barn Owl	All areas	
Hazel Dormouse	• Oxford to Bletchley • Fenny Stratford to Kempston	All other areas except
Terrestrial Invertebrates	All areas	

6.10.21 Some particular species/habitats have been scoped out for particular sections of the route due to absence. This may be revisited and revised should new information on these species/habitats warrant adding to the assessment.

6.11 Water resources

Introduction

6.11.1 Assessment of impacts on water resources will consider the potential effects as a result of the Project. It will be based on the principles and methodology outlined within LA 113 – Road drainage and the water environment (National Highways, 2020), as well as other relevant guidance as listed in the *Water Resources Method Statement.* The assessment of impacts on water resources will draw also on information from the FRA, which is a separate study that will inform aspects of the design and other environmental topics. This is described in 7.6.

6.11.2 Water resources considers surface water quantity, quality, and flow; hydromorphology; and groundwater quantity, quality, and flow. Surface water bodies include natural (rivers, streams, lakes) and artificial (canals, land drains) water bodies. Groundwater includes all water below the ground surface within the saturated and unsaturated zone.

6.11.3 The assessment will consider impacts to watercourses, canals, reservoirs, lakes, ponds and GWDTEs (where work will be aligned with the ecological assessment workstreams). The assessment will also consider impacts to licensed and private groundwater and surface water abstractions, groundwater/surface water interactions (springs and sinks), and licensed discharges to groundwater or surface water.

6.11.4 The detailed proposed scope and method for the water resources assessment is provided separately in the *Water Resources Method Statement* and its technical appendix. Sources and types of impact

6.11.5 The principal sources of permanent impacts to surface water and groundwater receptors will include:

- New infrastructure that could cause change in flow regime and geodynamics of surface water receptors;
- Crossings or diversions of watercourses, resulting in changes in channel cross-section, bed slope, sediment transport and flow dynamics, or that may require requiring replacement of natural bed and banks;
- Permanent below ground structures (e.g. impermeable barriers that extend below the groundwater table) that may alter groundwater flow and baseflow to surface water receptors;
- Creation of voids (e.g. excavation below ground level) and/or changes in permeability (e.g. to the type of fill used) that may alter groundwater flows or creation of new contamination pathways.
- Drainage and runoff from rail, roads and stations that may contain elevated concentration of pollutants and pose contamination risk to surface water and groundwater receptors; and
- Changes in traffic flow where this could result in increased contamination risk to surface water and groundwater receptors from road runoff.

Establishing the baseline

6.11.6 The baseline data used to inform the assessment (including the FRA and related WFD Assessment) will be sourced from a range of sources including the EA, the BGS Geology of Britain, as well as others listed in the Method Statements. This will be supplemented by various survey information, including:

- Groundwater level data from any Project-specific ground investigation;
- Groundwater level data from the EA located within the study area;

- Surface water quality sampling from watercourses likely to be impacted by drainage or run-off from the Project;
- National Vegetation Classification surveys of GWDTEs;
- Targeted water feature surveys and hydromorphological surveys of water features within hydraulic connectivity of the Project; and
- Topographic, channel and structural survey data to support fluvial flood risk hydraulic modelling.

6.11.7 Engagement with various organisations will also be informative, including the EA, internal drainage boards, water companies, the Canal & River Trust, Natural England; and LAs.

6.11.8 In some cases quantitative assessment (including modelling) of impacts to surface water and groundwater receptors may be required using a tiered approach with increasing levels of detail/complexity added incrementally where uncertainty requires more detailed understanding.

6.11.9 Hydraulic modelling will be undertaken to establish the baseline fluvial flood risk in locations where construction of new track and supporting infrastructure is expected to cross significant watercourses that have an associated fluvial floodplain or that may pose flood risk to identified receptors.

6.11.10 It is not proposed to model watercourses that are crossed by the Project along sections of existing track unless the nature of the works dictates a need, such as through encroachment on the floodplain.

Study area

6.11.11 The assessment will use a general study area of 1km from the centreline of the proposed or existing railway for consideration of all groundwater, surface water, hydromorphological and flood risk effects. Where necessary, the study area will be extended or reduced where hydraulic connectivity suggests another distance is appropriate (for example, over a chalk aquifer), where particularly sensitive receptors require a more assiduous approach, or where major groundworks or large-scale dewatering demands warrant wider coverage.

Mitigation

6.11.12 The assessment of impacts on the water environment will take account of the various mitigation measures that can be implemented to minimise risk of impact, all of which would be discussed and agreed in advance with the EA. Embedded mitigation might include bridge design revisions to avoid or minimise in channel works and floodplain encroachment; maintaining significant overland flow paths that cross the alignment of the Project; omission or minimisation of ground intrusive works where near sensitive groundwater receptors; and use of sustainable drainage solutions. Where

dewatering abstractions are required, these will be discharged either to ground or to nearby water bodies downstream of works to maintain normal flows and levels.

6.11.13 Measures at watercourse crossings will be developed to ensure scour and bank protection, and, where necessary, excavations 'in the dry' with watercourses diverted or over-pumped to minimise erosion or scour and minimise the release of excessive suspended solids.

6.11.14 The proposals will seek to avoid or protect potable abstractions as far as reasonably practicable, including interactions with SPZs and Principal Aquifers.

6.11.15 The measures set out in the CoCP will be fundamental to ensure that pollution and other potential impacts are avoided during construction. These will address, amongst other things, pollution prevention measures, site drainage and watercourse and groundwater protection, protection and reinstatement of land and soils, and ground investigation and remediation. A register of environmental actions and commitments will be developed alongside the ES and CoCP.

6.11.16 The development of mitigation will take other environmental aspects into account, including but not limited to the design and mitigation requirements relating to ecology, biodiversity, BNG, landscape, soils, agriculture and land quality.

Evaluating effects

6.11.17 DMRB LA 113 will provide the general approach to determining whether an impact will result in a likely significant effect, adapted as necessary to the requirements of a rail project over a road project. For example, in relation to the criteria for determining magnitude of surface water impacts where the requirements of the Project depart from the Highways England Water Risk Assessment Tool and therefore require additional qualitative means based on previous experience of linear infrastructure projects. Equally, the DMRB does not outline a specific methodology for the evaluation of hydromorphological effects. However, the DMRB guidance on the method of assessment and mitigation for hydromorphology can be applied.

6.11.18 A standalone Water Environment Regulations (WER) assessment will be undertaken. The WER assessment will inform the assessment of effects relating to water quality and quantity and hydromorphology and assessment of these aspects during the EIA process will be undertaken collaboratively with the WFD assessment. More information on the WFD assessment is provided in section 7.7.

6.11.19 The detailed evaluation criteria are set out within the *Water Resources Method Statement* as these pertain respectively to sensitivity and magnitude.

Proposed scope

Table 19 – Proposed Scope- Flood Risk and Water Resources.

Assessment item	Scoped in	Scoped out
Groundwater receptors – Permanent changes in groundwater quantity and quality arising from new infrastructure	All areas	
Groundwater receptors – Permanent disruption of GWDTEs arising changes in groundwater quantity or quality	All areas	
Ground water receptors – Temporary change in groundwater quantity and quality arising from construction activities	All areas	
Surface water receptors - Change to (or loss of) hydro-morphological features and processes arising from new assets	All areas	
Surface water receptors – Changes to baseflow to water courses	All areas	
Surface water receptors – Changes in water quality arising from discharges from the Project	All areas	
Surface water receptors – Increase in fine sediment (arising from construction activities) causing loss of hydro-morphological features and reduction in water quality	All areas	
Surface water receptors – Changes to hydro-morphological features and processes arising from construction assets and discharges	All areas	
Surface water receptors – Changes to water quality arising from discharge of construction water and surface runoff	All areas	
Groundwater and surface water receptors - Effects from changes in service pattern, changes in train speeds, station closures		All areas for all aspects of the water environment
Groundwater and surface water receptors - Changes in water quality due to changes in traffic movements arising from alterations to the roads network (e.g. Highways level crossing closures)	All areas for surface water (excluding hydro-morphology)	All areas for groundwater and hydro-morphology

Assessment item	Scoped in	Scoped out
Groundwater and surface water receptors - Changes in surface water and groundwater quality and groundwater quantity from highway underpasses during operation	All areas for groundwater and surface water (excluding hydro-morphology)	All areas for hydro-morphology
Groundwater receptors - Unproductive aquifers		All areas for all aspects of the water environment
Surface water receptors not hydraulically connected to Project		All areas for all aspects of the water environment
Groundwater receptors not hydraulically connected to Project		All areas for all aspects of the water environment
Groundwater and surface water receptors - Maintenance activities		All areas for all aspects of the water environment

6.11.20 Where there are no proposed works to existing infrastructure (i.e. track, stations and highways) it will be assumed there are no potential impacts and therefore these sections will be scoped out of future assessment.

6.11.21 Many of the impacts scoped in for the assessment would take place during construction and potentially result in temporary effects. Longer term effects on hydromorphology, as part of the operational scheme, would be expected to have been accommodated in the design, and are therefore scoped out.

6.11.22 Following the source-pathway-receptor model, where there is no hydraulic connection between source of impact and potential groundwater receptors, impacts are scoped out. Moreover, where unproductive strata are identified, with only limited quantities of water held, any impact on them would be negligible in scale.

6.11.23 Maintenance activities are unlikely to have any measurable impact on the water environment, especially where best practice is followed.

6.12 Historic environment

Introduction

6.12.1 The assessment of impacts from the Project will consider how the Project will change and protect the historic environment, and specifically, heritage assets. Heritage assets are important buildings, places, spaces and remains which contribute to an understanding of our pre-history and history. They include ones which have been formally identified through national designation, local designation and historic environment record (HER). They also include ones which have not been formally identified but still hold a level of importance.

6.12.2 Designated heritage assets include scheduled monuments, listed buildings, conservation areas, and registered parks and gardens. Non-designated heritage assets include archaeological sites and remains, buildings, structures and historic landscapes which are an important part of local history.

6.12.3 Through an understanding of the impacts on heritage assets, the assessment will consider how the Project will affect the ability to understand the importance of these heritage assets, including their historic relationships with each other and the wider landscape and how to mitigate these impacts. It will also consider the archaeological potential and character of the route to understand likely impacts on archaeological remains that are not currently recorded and how these impacts can be managed and mitigated.

6.12.4 The detailed proposed scope and method for the historic environment assessment is provided separately in the *Historic Environment Method Statement*.

Sources and types of impact

6.12.5 The types and sources of permanent and temporary impacts on the historic environment that could occur are listed below:

- Visual and noise intrusion during construction impacting the setting of heritage assets and the historic landscape character;
- In rural contexts and where there are open views construction activity has the potential to alter the setting of heritage assets and historic landscape character. These may affect the tranquillity, darkness at night and other aspects of a rural setting of assets;
- Permanent impacts arising from demolition of locally important buildings and structures, vibration damage or accidental damage;
- Disturbance or removal of archaeological remains;
- Changes to hydrology impacting on historic water bodies, for example moated sites;

- Changes to visual and historic relationships between heritage assets and the historic landscape and to the setting of designated and non-designated heritage assets;
- Visual and audible changes in the setting of heritage assets or within the historic landscape from movement of trains, additional vehicular and pedestrian traffic; and
- Additional light within the setting of heritage assets where this is introduced as fixed lighting part of stations and platforms and from train movements at night.

Establishing the baseline

6.12.6 A baseline for the historic environment will be compiled from a variety of information sources, such as the National Heritage List for England, and the HER for Milton Keynes, Bedfordshire, Bedford and Cambridgeshire and adjoining authorities where appropriate. Other sources of data will include satellite imagery, geological survey data, historic mapping and photographs and other relevant local planning applications and online local heritage lists and information. Heritage information derived from other development projects in the vicinity of the Project will also be used, including data from previous archaeological investigations: geophysical surveys, trial trench evaluations, excavations and rescue excavations, watching briefs, and borehole surveys.

6.12.7 The assessment will also draw on the non-intrusive surveys that are being undertaken at the time of writing and future intrusive archaeological investigation between Bletchley and Cambridge.

6.12.8 Identified assets will be assigned a ‘heritage value’ instead of ‘significance’ to avoid confusion with the EIA’s use of the term ‘significant effects’.

Study area

6.12.9 A pragmatic approach will be used to define a proportionate study area for the EIA, in consultation with stakeholders. Data will be gathered for assets within a buffer informed by the Zone of Theoretical Visibility. At this stage baseline data has been gathered within 1km of the draft Order limits for designated assets and within 500m for non-designated assets. This is considered sufficient to provide a baseline to inform scoping and to provide an understanding of the heritage assets with the potential to be affected by the Project.

6.12.10 While this boundary provides an indicative understanding of the likely significant effects for the purposes of scoping, any other assets outside these areas that is highlighted by stakeholders may also be included. A high-level review of heritage assets found during the baseline gathering will be carried

out to group and highlight areas of focus or screen out heritage assets which will evidently not be impacted.

Mitigation

6.12.11 The general approach to mitigating heritage impacts will be to seek to adapt the design and land requirements to avoid or reduce impacts on heritage assets or their setting. The heritage team will also work alongside other environmental specialists, for example, supporting and informing landscape design and ecological mitigation proposals to ensure that they accommodate and enhance historic landscape character. Where practicable measures will be sought that adapt the design to better reveal the heritage value of an asset or group, and where possible, to reinstate historic landscapes or landscape features.

6.12.12 Most direct impacts will occur during the construction period. General good practice measures to mitigate potential heritage effects will be set out within the CoCP.

6.12.13 Ways to offset potential permanent impacts on heritage assets are likely to include recording a heritage asset's value to gain understanding and a record for future research. This will not mitigate the significance of the effect on the asset being lost or altered but will increase knowledge and understanding of the heritage asset and how it contributes to the history of the area.

6.12.14 Non-intrusive and intrusive survey work to inform the ES baseline is ongoing. Requirements for recording of assets as per the NNNPS requirements will be determined during production of the ES.

Evaluating effects

6.12.15 The evaluation of effects on the historic environment relies on a robust baseline of all known heritage assets, and an understanding of potential for unknown buried archaeology being found due to works related to the Project. It also relies on understanding the inter-relationships with historic environment and other topics, such as landscape, noise, vibration and ecology, and the likely effects these will have on the area's heritage value.

6.12.16 The assessment will be based on the criteria for assessment as set out in the DMRB. It is acknowledged that whilst the standard matrix is a useful tool for reporting significant effects, it does not directly allow for a qualitative assessment of the level of harm caused to the historic environment and individual heritage assets (which is a policy test under the NNNPS). As such specific criteria developed using Historic England guidance to establish significance (heritage value) and levels of harm (impact) will be used to allow a qualitative assessment to be incorporated.

Proposed scope

Table 20 – Proposed scope for Historic Environment.

Assessment item	Scoped in	Scoped Out
Scheduled monuments	All Areas	
Listed Buildings	All Areas	
Conservation Areas	All Areas	
Registered Parks and Gardens	All areas except those scoped out	Roxton to east of St Neots Comberton to Shelford
Historic Landscape	All areas	
Locally important buildings and structures	All Areas	
Known archaeological remains	All Areas	
Unknown archaeological remains	All Areas	

6.12.17 With reference to PINS Advice Note 7, where an assessment item is scoped out this is because that heritage asset type is not present within the study area.

6.13 Landscape and visual

Introduction

6.13.1 The landscape and visual assessment will consider how the Project will alter the landscape and townscape character of the study area of the Project. Separately it also considers how views and the amenity people derive from them will be affected.

6.13.2 The landscape assessment will consider how the Project will change the character of the landscape and whether these changes will be beneficial or adverse. The landscape assessment will assess the effects of the Project on the landscape of the study area where the route passes through the countryside, and the townscape of the study area where it passes through urban areas such as Oxford, Bicester, Bletchley, Bedford and Cambridge.

6.13.3 The visual assessment will consider how the Project will affect people's views and specific viewpoints will be used to represent these impacts. The viewpoints may represent groups of people (such as people living in the same street) if the change to their view is likely to be similar. Impacts will be evaluated by considering how the view will change and the number of people whose views will be affected.

6.13.4 The assessment will follow the guidance set out in the Guidelines for Landscape and Visual Impact Assessment, Third Edition[27].

6.13.5 The detailed proposed scope and method for the landscape and visual assessment is provided separately in the *Landscape and Visual Method Statement*.

Sources and types of impact

6.13.6 The sources of temporary impacts during construction will include:

- Construction activity and vehicle movements;
- Construction compounds, fencing, hoardings, access roads, site offices, temporary structures and machinery;
- Soil stripping, temporary soil stockpiles or other earthworks;
- Construction lighting; and
- Temporary changes in access including road or path diversions.

6.13.7 The sources of permanent impacts will include:

- Removal of or changes to landscape features such as woodland, trees, hedgerows, built structures or topographic features;
- Changes in land use affecting, for example, farmland;
- Introduction of new structures including stations, depots, permanent way (tracks/sidings), overhead line equipment, traction power equipment, bridges/viaducts, embankments/ cuttings, roads, fencing and balancing ponds;
- Introduction of landscape planting and earthworks;
- Changes to existing infrastructure such as enlarged or redesigned stations, new permanent way within the widened the rail corridor, bridge widening, road realignment and level crossing closures;
- Lighting associated with new or modified facilities; and
- Train movement through the landscape, as well as changes in road traffic characteristics.

6.13.8 Potential impacts and effects include:

- Changes to rural landscape and townscape character and changes to views due to the presence of construction activity, machinery, construction compounds and large-scale earthworks in the rural landscape or urban area. Reduction in tranquillity resulting from activity and noise generated during construction. Reduction of PRoW connectivity due to temporary PRoW diversions or closures;
- Changes to rural landscape character and changes to rural views due to loss of vegetation and the introduction of a new railway line and associated embankments, viaducts, bridges, underpasses, cuttings, stations, sidings and rail depots into the countryside;

[27] *Guidelines for Landscape and Visual impact Assessment (3rd edition)* (2013). *Landscape Institute and Institute of Environmental Management and Assessment.*

- Changes to townscape character and changes to urban views due to loss of vegetation, the introduction of new stations, widening of tracks and changes to the road network including road realignment, bridge widening and the replacement of level crossings with overbridges;
- Reduction in tranquillity due to the activity and noise generated by road traffic and trains in operation; and
- Introduction of or changes to lighting on stations, roads, depots, and sidings reducing the darkness of night skies and the landscape in rural areas and increasing light levels in night-time views in rural and urban areas.

6.13.9 Between Oxford and Bedford, the permanent effects of the Project will affect discrete locations where, for example, there will be a new station or road bridge, or a level crossing will be closed. Overhead electrification where it is introduced will increase the prominence of the new infrastructure. Were it required along existing lines, lineside vegetation will need to be removed, potentially opening up views of the existing line which is currently well integrated into the landscape.

6.13.10 Between Bedford and Cambridge, where a completely new railway line will be constructed, permanent effects will be more widespread, with the introduction of large-scale infrastructure including embankments, viaducts, bridges, cuttings, stations at Tempsford and Cambourne, roads and passing trains into a predominantly rural environment. Passing trains will reduce the tranquillity of the landscape. Landscape and visual effects will be experienced throughout the study area.

Establishing the baseline

6.13.11 The baseline landscape, townscape and visual assessment information will be derived from a variety of information sources, such as Natural England's NCA profiles (four for the Project), published local landscape and townscape character assessments (where available), field survey and consultation with local planning authorities and stakeholders. This will establish the existing landscape, townscape and visual conditions against which the changes resulting from the Project will be described and evaluated in the landscape and visual impact assessment (LVIA).

6.13.12 The landscape baseline will be evaluated based on the constituent elements, features and other factors that contribute to existing landscape character within the study area including:

- The physical influences on the landscape - including topography, geology, soils, microclimate, water bodies, and water courses;
- The influence of human activity - including land use, open space, transport routes, PRoW, land management, the character of settlement and

buildings, the night-time environment, and the pattern and type of fields and enclosure;
- Local distinctiveness and identity;
- The aesthetic and perceptual aspects of the landscape - including scale, complexity, openness, tranquillity, and wildness; and
- Habitats and historic environment features - including nature reserves, sites of special scientific interest, conservation areas, listed buildings, registered parks and gardens and other elements contributing to historic landscape character.

6.13.13 For the baseline assessment, local landscape character areas (unique, discrete geographical areas of a particular landscape type) within the study area, will be identified. These will be based on Natural England's NCA profiles and published local landscape character assessments and refined through desk study and site survey.

6.13.14 The visual baseline study will identify visual receptors and important, designated, or protected views potentially affected by the Project. Viewpoints will also be selected to represent specific views valued for their scenic quality, heritage importance or cultural associations or to demonstrate a specific issue. The selection of viewpoints will be based on the findings of the site survey, a review of planning policy documents and discussion with local planning authorities and other stakeholders.

Study area

6.13.15 Where the Project passes through the rural landscape, the LVIA will assess the likely landscape and visual impacts and effects within 2km of the draft Order limits. It is considered that at distances beyond 2km, if visible, the Project would be a minor component in views. However, the study area will be extended if required where changes to highways or utilities take place more than 2km from the draft Order limits.

6.13.16 In predominantly urban areas, the LVIA will assess the likely impacts of the Project on townscape and views within 750m of the draft Order limits. The urban study area will be less extensive than the rural study area because of the screening effect of buildings, which typically limit longer views.

6.13.17 More distant views in both situations will also be considered from areas of higher ground or more open areas of the landscape or townscape, and in response to the feedback from consultation and engagement with stakeholders.

6.13.18 Surveys will take place in summer and winter to understand the likely visibility of the Project and confirm the selection of viewpoints, as well as to identify specific landscape features and understand the local landscape character.

6.13.19 The baseline arboriculture information will be recorded through a survey in accordance with *BS5837:2012 2012 Trees in relation to design, demolition and construction – recommendations* and will be used to produce an Arboricultural Impact Assessment to determine the arboricultural impact of the Project and identify any tree removals required to facilitate construction. This will support the landscape and visual assessment, as well as ecology and climate change assessments.

6.13.20 The landscape and visual effects of the Project will be evaluated during winter during the construction phase to capture the effects when construction will be most visible. They will be evaluated during winter and summer in year 1 of operation and during summer in year 15 of operation. The mitigating effects of maturing mitigation planting, implemented as part of the Project, will be considered in the evaluation of effects in summer year 15 to demonstrate the maximum effectiveness of the planting.

Mitigation

6.13.21 Landscape considerations in the Project design will adopt a wider approach than simply mitigating adverse effects. While mitigation will be used to resolve potentially likely significant effects, an integrated approach to landscape design within a wider landscape strategy will be adopted to help secure an effective landscape response to the Project proposals. This will be developed drawing on advice from the landscape team, as well as other

environmental specialists from arboricultural, ecology and historic environment disciplines.

6.13.22 As part of this, the mitigation of potentially adverse effects will remain key. Over and above the measures inherent in the mitigation hierarchy that focus on avoiding or reducing impacts, aspects of landscape mitigation will include:

- Woodland, tree and hedgerow planting for screening and landscape integration;
- Landscape earthworks for screening and landscape integration;
- Meadows and grassland in rural and urban areas for landscape integration;
- Design of high-quality public realm around stations and in urban areas; and
- Careful location and design of fencing and noise barriers for the Project in operation; and
- Use of measures to control the temporary landscape and visual impacts from construction which will be set out within the CoCP.

6.13.23 A register of environmental actions and commitments will also be developed alongside the ES and the CoCP.

Evaluating effects

6.13.24 The levels of significance of effect will be evaluated by combining the sensitivity of the landscape/townscape/visual sensitivity receptor with the magnitude of effect that has been determined in the assessment. Major and moderate effects will be considered significant (effects which should be considered by the decision makers in granting development consent).

6.13.25 Visual effects will be evaluated based on changes in the view arising temporarily from the construction activities, and on permanent structures and the operation of the Project. The significance of effects will depend on the value of the view and how sensitive the visual receptor is to a change in the view (either temporary or permanent).

6.13.26 Night-time landscape and visual effects will be considered qualitatively.

Proposed scope

Table 21 – Proposed Scope - Landscape and Visual.

Assessment item	Scoped in	Scoped out
Landscape and townscape character	All areas	
Visual amenity	All areas	

6.14 Carbon (greenhouse gas) emissions

Introduction

6.14.1 The assessment will address the Project's impact on climate change through the changes it causes in emissions of greenhouse gases, measured in carbon dioxide equivalent (CO_2e). The emissions measured include embodied carbon from the raw material supply and transport, and manufacturing of materials and items within the Project, construction activities (transport of materials, construction waste plant and equipment operation), and from operation and maintenance, as well as from changes in land use. It also considers the emissions associated with modal shift from rail and road users due to behaviour changes caused by the Project.

6.14.2 The assessment will be undertaken in accordance with relevant guidance documents including PAS 2080:2023 Carbon Management in Infrastructure; Royal Institute of Chartered Surveyors whole life carbon assessment for the built environment (2023); Transport Analysis Guidance: Unit A3 Environmental Impact Appraisal; and IEMA (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition.

Sources and types of impact

6.14.3 The Project will result in GHG emissions during construction as well as changes to emissions during operation.

6.14.4 The sources of potential GHG emissions during construction include:

- Embodied GHG emissions from the construction materials used, including raw material supply, transport and manufacture;
- GHG emissions associated with construction processes, including transport of materials, workers and machinery to/from the works site and construction/installation processes;
- GHG emissions associated with the transport of waste from the site and the treatment of waste; and
- GHG emissions associated with land use change, for example those mobilised from vegetation or soil loss during construction.

6.14.5 The sources of potential GHG emissions during operation include:

- GHG emissions from the use of fuel and/or electricity to operate the trains, and any ancillary infrastructure including lighting, signalling and the energy required to operate stations;
- GHG emissions from changes in traffic flow (road users);
- Replacement and maintenance activities including emissions from embodied carbon (i.e., materials), construction plant, transport of materials, and the treatment/disposal of waste;
- GHG emissions associated with ongoing land use change/sequestration.

6.14.6 These are considered to be permanent effects as although the period of emissions impacts may occur during the construction stage, the effect on the climate of the GHG released is permanent.

Establishing the baseline

6.14.7 The scope of the baseline will include existing operational emissions including user emissions, road user emissions, maintenance emissions for existing infrastructure and emissions from land use change and sequestration. The GHG assessment will consider how the Project will result in additional or reduced emissions in comparison to the baseline scenario. It is assumed that there is not currently any construction activity at the site of Connection Stage 2 and Connection Stage 3, hence construction impacts will not be considered in the baseline. The construction of Connection Stage 1 will have been completed so the operation of Connection Stage 1 is considered committed baseline.

6.14.8 The future baseline will describe a 'business-as-usual' scenario wherein GHG emissions continue to occur as a result of human and natural activity.

Mitigation

6.14.9 A carbon management plan (CMP) will be developed for the Project, aligned to the PAS 2080 requirements, as well as those of the NNNPS, which will outline the approach to carbon management, include targets for carbon reduction, outline the carbon baseline assessment and the methodology for carbon assessments and include monitoring and reporting requirements. This will be secured by the DCO.

6.14.10 The approach to carbon reduction in the CMP will be aligned to the carbon reduction hierarchy (as defined within PAS 2080 (2023)[28]), with a particular focus on the carbon hotspots identified through the baseline carbon assessment. The key considerations in the carbon reduction hierarchy are as follows:

- Avoid: evaluate the basic need for an asset and/or programme of works and explore alternative approaches to achieve outcomes;
- Switch: evaluate the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required and consider the use of low carbon solutions (including technologies materials and products) to minimise resource consumption during the construction, operation and user's use stages;
- Improve: use techniques (e.g., construction, operational) that reduce resource consumption during the construction and operation phases of an asset or programme of work; and

[28] British Standards Institution (2023) *PAS 2080 – Carbon Management in Infrastructure.* Available at: Revised PAS 2080:2023 | BSI (bsigroup.com) (Accessed October 2023).

- A key activity to reduce emissions is through the option selection process, where the potential carbon emissions of different options will be considered, and carbon will be included as a key criterion during decision-making. Whole life carbon assessments will be undertaken periodically throughout design and construction, to assess the progress of targets against the baseline.

Evaluating and reporting effects

6.14.11 The significance of GHG emissions will be assessed based on guidance from IEMA's Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance. The guidance sets out five distinct levels of significance based on the GHG emissions relative contribution towards achieving a science-based 1.5ºC aligned transition towards net zero by 2050. As such, significance of GHG emissions will be put into context through comparison with the respective UK carbon budgets.

Proposed scope

Table 22 – Proposed scope – Carbon.

Assessment item	Scoped in	Scoped out
Embodied GHG emissions from the construction materials used, including raw material supply, transport, and manufacture	All areas are scoped in for these issues except for Oxford to Bletchley	Oxford to Bletchley, based on relatively minor nature of proposed works
Transportation of materials from the manufacturer to the site of the Project		
GHG emissions associated with construction and installation processes, including transport of waste from the site and waste treatment.		
GHG emissions associated with land use change, for example those mobilised from vegetation or soil loss during construction.		
GHG emissions from the use of fuel and/or electricity to operate the trains, and any ancillary infrastructure including lighting, signalling.	All areas	
GHG emissions from changes in traffic flow (road users).	All areas	
Replacement and maintenance activities including emissions from embodied carbon (i.e., materials), construction plant, transport of materials, and the treatment/disposal of waste	All areas	
GHG emissions associated with ongoing land use change/sequestration.	All areas	
End of life decommissioning for items that require replacement during the assessment period	All areas	

6.14.12 End of life decommissioning for the Project is proposed to be scoped out as the Project will not be decommissioned within the assessment period.

6.15 Major accidents and disasters

Introduction

6.15.1 A major accident is an incident (e.g., a train derailment) that threatens immediate or delayed severe impacts on the environment and human health and would usually be beyond the resources of the operator (or contractor) to manage such an incident alone, requiring emergency services and/or specialist contractors to manage (IEMA 2020). A disaster is a man-made hazard (e.g., act of terrorism) or a natural hazard (e.g., flood event) with the potential to cause a major accident (IEMA 2020).

6.15.2 The 2024 NNNPS notes in section 3 that 'the UK's railways are amongst the safest in the world and that safety performance continues to improve… It is the Government's policy, supported by legislation, to ensure that the risks of passenger and workforce accidents are reduced so far as reasonably practicable. Rail schemes should take account of this and seek to further improve safety where the opportunity exists and where there is value for money in doing so'. It also refers to security considerations, stating in section 4.75 that 'where possible, proportionate protective security measures are designed into new infrastructure projects at an early stage in the project development'.

Sources and types of impact

6.15.3 Main risks associated with railways and their construction and operation potentially include:

- Higher speed trains leading to potentially more severe accidents;
- More railway over which major accidents and disasters may occur;
- Construction risks; and
- New risks from non-project related natural and manmade events along new sections of line.

Establishing the baseline

6.15.4 The baseline for major accidents and disasters will consider:

- Nearby sites with the potential to cause major accidents – sites would include control of major accident hazards (COMAH) sites and other major infrastructure; and
- Nearby locations or natural occurrences with potential to cause disasters – this would include land formations, localised weather patterns e.g., known strong wind events or fog hollows, and areas with susceptibility to flooding.

6.15.5 These will be considered in the context of environmental receptors identified by other assessment topics.

Study area

6.15.6 The study area for major accidents and disasters is proposed to cover:

- Within 5km of the draft Order limits for COMAH sites, or within 1km for other sites with potential to cause major accidents; and
- The draft Order limits for all other locations and receptors

6.15.7 Table 23 shows the known sites with potential to cause major accidents within 5km of the Project for COMAH sites, or within or near to 1km for other sites.

Table 23 – Known Sites with Potential to Cause Major Accidents for the Project.

MA&D site/feature categories	Description	Approx distance to Project
COMAH site – Lower Tier	Veolia (UK) Ltd, Green Lane, Stewartby, Bedford MK43 9LY. Waste storage, treatment and disposal. Hazard classification: Flammable liquids and gases; and Toxic. Principle dangerous characteristics: Fire/explosion; and Toxic when eaten, inhaled, touched.	0.4km
COMAH site – Lower Tier	Henkel UK Operations Limited, 5 Cromwell Road, St Neots PE19 1QL. Chemicals manufacture/production and/or disposal – general. Hazard classification: hazardous to the aquatic environment Principle dangerous characteristics: flammable, toxic to aquatic life.	1.0km
COMAH site – Lower Tier	2M Manufacturing Limited, Tego House (HQ), Chippenham Drive, Kingston, Milton Keynes MK10 0AF. Chemicals manufacture/production and/or disposal – general Hazard: hazardous to the aquatic environment; and Toxic Principle dangerous characteristics: Causes skin burns and eye damage; Toxic if swallowed and contact with skin; and Toxic to aquatic life.	2.1km
COMAH site – Lower Tier	Frontier Agriculture Limited, Georgetown Road	4.3km

MA&D site/feature categories	Description	Approx distance to Project
	A1 Trunk Road, Sandy, Bedfordshire, SG19 2UB. Hazard: Flammable liquids and gases; Hazardous to the aquatic environment; Petroleum products and alternative fuels; and Toxic Principle dangerous characteristics: Flammable - gas, aerosol, liquid. May cause an allergic skin reaction May cause respiratory irritation, Toxic if inhaled, if swallowed, and in contact with skin, and Toxic to aquatic life.	
Intersecting infrastructure (highways)	Highways. Multiple highways crossing Project including M40, A5, M1, A428, A6, A1 and M11	Crossing Project. Running in parallel.
Intersecting infrastructure (utilities)	Buried services including major accident hazard (MAH) pipelines. Overhead power lines.	Crossing Project. Running in parallel.
Railway infrastructure	Cuttings and embankments (due to slippage potential).	Associated with the existing railway.

Mitigation

Permanent and operational

6.15.8 The requirements of the NNNPS with respect to safety standards in the rail industry have already been outlined. Safety standards ("so far as is reasonably practicable") are applied through the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended)[29] which are enforced by the Office of Rail and Road. The rail industry is also required by legislation to comply with applicable Common Safety Methods. This includes the Common Safety Method for Risk Evaluation and Assessment[30], which applies whenever any significant technical, operational or organisational change is proposed to the railway system.

6.15.9 Risks during operation will be managed through the Construction Design and Management Regulations 2015 processes for the Project and mitigated through the design, or will be managed by the operator under their

[29] *Office of Rail and Road.* (2024) *ROGS.* Available at: ROGS | Office of Rail and Road (orr.gov.uk). (Accessed 14 May 2024).
[30] *Office of Rail and Road.* (2018) *Common Safety Method for Risk Evaluation and Assessment.* Available at: Common Safety Method for Risk Evaluation and Assessment - Guidance on the application of Commission Regulation (EU) 402/2013 - September 2018. (Accessed 14 May 2024).

operational safety management plans with emergency procedures and incident plans established in accordance with industry best practice. This includes considerations such as:

- Easements of infrastructure;
- Rail safety procedures to avoid collision/derailment;
- Fire safety, including measures to protect the environment from chemicals used in firefighting;
- Loss of electrical power or technology incidents including cyber-attacks; and
- Resilience to extreme weather including wind, flood and extreme temperatures (including ice, snow and heat waves).

Temporary (construction) phase

6.15.10 Risks of major accidents or disasters during construction will be managed through the Construction Design and Management Regulations 2015 processes for the Project. Specific risks will be identified and the measures to be implemented will be agreed with the relevant external stakeholders through ongoing consultation and will be detailed in the CoCP. Emergency procedures will be established in accordance with industry best practice.

6.15.11 The following construction phase risks will be considered through construction design and management and mitigated through the design process where possible, and via the CoCP:

- Risks from works close to oil or gas pipelines, high voltage electrical cables or diversions of utilities;
- Construction plant collisions and other risks during works close to, or during relocation of, overhead lines;
- Train derailment or incidents or other risks associated with the interface between construction and existing rail assets and working close to live rails;
- Major road traffic accidents, including construction traffic movements and road safety measures;
- Ground contamination and landfill gas, serious pollution incidents such as large scale spills;
- Major accident or explosion at COMAH facility; and
- Extreme weather such as wind, flood and extreme temperatures (including ice, snow and heat waves).

Proposed scope

6.15.12 All the measures described will be covered under the requirements of the existing legislation and therefore significant effects are not likely to occur as compliance will be secured through an alternative regulatory process.

6.15.13 Major accidents and disasters are therefore proposed to be scoped out of the EIA. Matters related to operational safety will be addressed during the DCO

application and through stakeholder consultation in line with legislation and industry best practice.

6.16 Material resources and waste

Introduction

6.16.1 The material resources and waste assessment will look at two aspects. Firstly, the potential impacts from the use of material resources such as steel, aggregates and minerals, concrete, wood, plastic, and manufactured construction products. Secondly the assessment will look potential impacts and management of waste generation from the Project. For both matters, potential impacts will be considered for the construction and operation of the Project.

6.16.2 The detailed proposed scope and method for the material resources and waste assessment is provided separately in the *Material Resources and Waste Method Statement* and technical appendix.

Sources and types of impact

Material resources

6.16.3 The construction phase considers site preparation, demolition and construction of the Project. Construction will require large quantities of both primary raw materials and manufactured construction products. Raw materials include aggregates and minerals from primary, secondary and recycled sources.

6.16.4 The potential impacts and effects from the use of material resources include:

- Requirement for materials to be imported to the site, as it is assumed that the Project is unlikely to recover/reuse all the site-won materials. This will affect the availability of material resources and the demand for materials due to the consumption of raw resources;
- Use of primary materials as the Project is unlikely to be able to source all requirement materials from recycled/secondary materials. The effect will be depletion of non-renewable resources; and
- Potential sterilisation of mineral safeguarding area (MSA) and/or peat resources.

6.16.5 The Project will require certain materials for ongoing operation and maintenance.

Waste

6.16.6 For the construction phase, waste is likely to be generated mainly from site preparation works, including green waste from vegetation clearance, inert waste from demolition and site preparation, surplus excavated materials

(including contaminated soils or soils which need to be treated before they can be reused), non-hazardous materials such as timber, tarmac, signage etc.

6.16.7 During operation, waste will be generated from general maintenance works as well as municipal solid wastes, or similar type wastes, from operation of the railway.

6.16.8 Landfills and other waste management infrastructure will need to have sufficient capacity to accommodate waste from the Project. The potential impacts from the generation and management of waste on these receptors, without mitigation measures, are likely to effect:

- Temporary occupation of waste management infrastructure capacity (from treatment of waste);
- Temporary occupation of land for the storage of waste awaiting transfer off-site; and
- Permanent reduction in landfill capacity (from disposal of waste).

Baseline

6.16.9 The assumed availability of material resources and waste management facilities is considered on a route-wide basis. The approach set out in DMRB Volume 11, Section 3, Part 13 LA110 'Sustainability and Environment Appraisal - Material Assets and Waste has been followed to establish the baseline condition for resources and waste.

6.16.10 As the Project is within two regions, separate baselines have been developed for the east of England and south-east of England and that the Project will be assessed against both baselines separately.

6.16.11 For material resources, documentary records from a range of sources including LAs, the BGS, Works Steel Association, Mineral Product Association and aggregates working parties have been reviewed.

6.16.12 Information on the current waste arisings, and the waste management infrastructure have been determined through a desk-top study, using a number of readily available resources, in particular data from the EA on landfill sites, remaining landfill capacity, and permitted waste sites.

6.16.13 The baseline conditions for the use of material resources identifies:

- Regional and/or national availability of the main materials required for the construction of the Project, including for the site preparation and construction;
- MSA, peat resources, allocated minerals sites and area of search for minerals within or adjacent to the Project; and
- Future baseline information for use of material resources up to 2035, the assumed first full year of operation of the Project.

6.16.14 The baseline conditions for waste identify the following:

- The availability and capacity of regional and (where appropriate) national landfill facilities. Landfill void data has been collated for both inert and non-inert (non-hazardous and hazardous) landfill types, where available;
- Historical and future trends in waste processing, recovery and/or landfill void capacity (especially where increases can be forecast or otherwise ascertained) to provide a useful insight as to the capability of these facilities; and
- Future baseline information for waste generation up to 2035 (the first full year of operation) and regional waste infrastructure capacity that will be required.

Study area

6.16.15 In accordance DMRB LA110 guidance for materials assets and waste, and informed by professional judgement, this assessment uses two geographically different study areas to examine the material resources use and generation and management of waste for construction and operational phase.

6.16.16 The first study area is the area within which key construction materials will be consumed (used/deployed), and waste will be generated (including temporary compounds and storage areas).

6.16.17 The first study area for materials and generation of waste is within the draft Order limits and all temporary compounds and storage areas. A study area of 500m from the Project draft Order limits is used to identify potential impacts to MSA, peat resources and potential land contamination (and sources of contaminated waste).

6.16.18 The Project is within two regions, East of England and South-east of England. The second study areas have been considered for materials, and separately for management of waste.

6.16.19 Feasible sources and availability of primary key construction materials required to construct the main elements of the Project. For the purpose of the assessment, the second study area is the east of England and south-east of England regions for materials sourced locally and UK for materials sourced nationally (e.g., steel, concrete and cement).

6.16.20 Suitable recovery and waste management infrastructure that could accept arisings and/or waste generated by the Project. For the purpose of the assessment, the second study area is the east of England and south-east of England regions. Suitable waste infrastructure including landfills, has been identified within close proximity to the Project to promote the proximity principle and reduce transport distances. An initial search area of 10km from the Project draft Order limits has been assessed to support the proximity

principle by highlighting appropriate waste management and disposal sites within a reasonable proximity to the of the Project.

Mitigation

6.16.21 For the assessment of impacts on resources and waste, embedded mitigation might include:

- Reuse of suitable site-won excavated and demolition materials to achieve a balanced cut and fill across the project where technically feasible and economically viable;
- Implementation of circular economy principles to design out waste, to reduce the generation of waste and reduce the material demand of the detailed design;
- Use of secondary and/or recycled materials where these are locally available and suitable for use;
- Local and responsible sourcing of materials;
- Take back schemes, procurement of waste efficient materials or technology and the use of minimal packaging; and
- A sustainable procurement plan.

6.16.22 Mitigation during construction will be via the CoCP, including site waste management plans. This is likely to include:

- Selection and management of materials;
- Demolition;
- Protection of land and soil;
- Monitoring requirements;
- Minerals and contamination
- Protection of environment;
- Management of hazardous waste; and
- Duty of care.

Evaluating effects

6.16.23 The assessment will follow the approach set out in the DMRB Volume 11 LA 110, Section 3, Part 13 Sustainability and Environment Appraisal - Material Assets and Waste, August 2019. Details are provided in the *Material Resources and Waste Method Statement* and will be a route-wide assessment.

6.16.24 Effects will either be categorised as significant (at least a moderate effect) or not significant (a slight or neutral effect).

6.16.25 Significant environmental effects are more likely to arise from those materials which:

- Are associated with the largest quantities;
- Are primary or virgin materials; and
- Have hazardous properties.

6.16.26 Significant environmental effects are more likely to arise from wastes which:

- Are associated with the largest quantities; and
- Have hazardous properties.

Proposed scope

Table 24 – Proposed Scope – Material Resources and Waste.

	Scoped in	Scoped Out
Material resources use:		
Construction	All areas	
Sterilisation of MSA and/or peat resources	All areas	
Operation (maintenance works only)		All areas
Generation of waste:		
Construction	All areas	
Operation	All areas	

6.16.27 Currently all aspects of this topic are scoped in although it is anticipated that sterilisation of peat resources can be scoped out at a later date (pending receipt of further documentary sources).

6.16.28 Materials required and waste generated from commercial activities associated with the operation of the railway such as rolling stock is not considered part of the scope of the DCO application and has been scoped out.

7 Other assessments

7.1.1 There are aspects of the Project that, while outside the scope of EIA, are related to and supportive of wider environmental assessment and many of the EIA workstreams. These comprise assessments:

- For BNG;
- Under the Habitats Regulations';
- Of climate resilience;
- Under the Equality Act;
- Of flood risk;
- Under the Water Framework Directive; and
- For arboriculture.

7.2 Biodiversity Net Gain

7.2.1 BNG is a way of creating and improving biodiversity by requiring development to have a positive impact ("net gain") on biodiversity[31]. In May 2023, EWR Co committed to "delivering 10% BNG across the whole EWR project", as stated in the route update report[32]. EWR Co also set an intention to align with the BS 8683: a process to design and implement BNG. The BS8683 provides a step-by-step process for the design and implementation of BNG throughout a project lifecycle, based on the Good Practice Principles for BNG (2016)[33].

7.2.2 The approach to BNG has been developed with consideration to the mandatory BNG requirement for most developments seeking planning permission[34], and with regard to the BNG requirements outlined in the NNNPS[35]. This approach to BNG closely aligns with other environmental aspects, particularly biodiversity, landscape, historic environment, and climate resilience.

7.2.3 The baseline for BNG will be a static baseline established for the EIA of the Project. The baseline will comprise all land within the draft Order limits. If off-site provision of BNG is required (i.e., habitat creation and enhancement to achieve BNG that is outside of draft Order limits), the off-site baseline will be assessed in order to calculate the net change in habitat units from off-site habitat creation or enhancement only.

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[31] *Defra*. (2024) *Biodiversity net gain, GOV.UK*. Available at: https://www.gov.uk/government/collections/biodiversity-net-gain.
[32] *East West Rail* (2023) *Route Update Report.* Available at: Route-update-report.pdf (eastwestrail-production.s3.eu-west-2.amazonaws.com) (Accessed 27 October 2023).
[33] *Biodiversity net gain: Good practice principles for development.* (2020a) *CIEEM*. Available at: https://cieem.net/resource/biodiversity-net-gain-good-practice-principles-for-development/.
[34] Land Use Policy Team. (2023) *The Biodiversity Net Gain Statutory Instruments - explained*, *Environment*. Available at: https://defraenvironment.blog.gov.uk/2023/11/29/the-biodiversity-net-gain-statutory-instruments-explained/.
[35] *Department for Transport* (2024) *National Networks – National Policy Statement*. Available at: National Networks - National Policy Statement (publishing.service.gov.uk).

7.2.4 Habitat types, areas, and condition will be identified from survey methodologies described in the *Biodiversity Method Statement*. Baseline information from other environmental aspects including arboriculture, historic environment, landscape, water resources, geomorphology, carbon, communities and the built environment (such as utilities and structures) will be incorporated into a qualitative BNG baseline assessment that will accompany the Biodiversity Metric baseline calculation. This information will be used to identify limitations to, and opportunities for, achieving BNG from other environmental aspects, so these are recorded as considerations for the BNG design.

7.2.5 Applying the Mitigation Hierarchy is fundamental to achieving BNG, especially the first steps of avoiding and reducing negative impacts on biodiversity. Only after all possible steps have been taken to avoid and reduce negative impacts, will further mitigation be considered. For the assessment of impacts on biodiversity, examples of embedded mitigation are described in the *Biodiversity Method Statement*. Mitigation will count towards BNG where it meets the requirements of Defra's current guidance on "*What you can count towards a development's BNG*"[36] but this approach will be adapted if necessary to comply with statutory requirements on BNG for NSIPs.

7.2.6 The design of BNG for the Project will be undertaken as a collaborative design approach, especially with engineering and earth works, biodiversity, landscape, historic environment and climate resilience (please refer to the relevant sections in these method statements).

7.2.7 Key aspects for designing BNG include:

- Adhering to the UK's Good Practice Principles for BNG, especially to apply the Mitigation Hierarchy throughout the design, construction and operation stages of the Project;
- Designing habitat retention, creation and enhancement based on sound ecological principles including consideration of soil types, the size of habitat parcels to maintain ecological functionality and suitable environmental conditions;
- Creating and enhancing habitats in ways that contribute towards local nature conservation objectives;
- Creating and enhancing habitats in ways that are resilient to climate change and, where possible, increase carbon sequestration of habitats;
- Through habitat retention, creation and enhancement, generating a minimum 10% increase in habitat units (separately for area units, hedgerow units and watercourse units);

[36] *What you can count towards a developments biodiversity net gain* (2024) *GOVUK*. Available at: https://www.gov.uk/guidance/what-you-can-count-towards-a-developments-biodiversity-net-gain-bng (Accessed 18th October 2023).

- Reduce, as much as possible, time-lags between habitat clearance for construction and the start of habitat creation and enhancement for BNG and, where possible, commencing BNG activities before habitat clearance; and
- Accommodating maintenance and management activities, for example access and storage areas.

7.2.8 The design of habitat retention, creation and enhancement for BNG will be integrated in the landscape design outputs including landscape drawings and planting schedules.

7.2.9 Change in carbon sequestration rates of habitats from baseline to post-development will be assessed with the aim for BNG to be designed to also achieve carbon neutrality as a minimum, and to increase carbon sequestration where possible. Carbon sequestration is defined as the capture of carbon by habitats that would otherwise be emitted to, or remain in, the atmosphere.

7.2.10 Post-development Biodiversity Metric calculations will be undertaken as part of an iterative process. These calculations include risk multipliers already set within the Biodiversity Metric, for example time to target condition and difficulty risk. BNG will be predicted when the Biodiversity Metric post development calculation (as based on the Project's BNG design) demonstrates a minimum 10% increase in each type of unit.

7.2.11 Further details are provided in the *Approach to achieving BNG document*.

7.3 Habitats Regulations Assessment

7.3.1 The Project will be subject to an HRA. An HRA refers to the several distinct stages of assessment which must be undertaken, in this case by the SoS for Transport, in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations').

7.3.2 The HRA will determine whether the Project may affect the interest features and objectives of protected nature conservation sites at a European and International level (referred to as Habitats Sites). This sits alongside the EIA but is separate to it.

7.3.3 The assessment focuses on the likely significant effects of the Project on the nature conservation interests of Habitats Sites in and around specified zones of influence along the Project route. The HRA seeks to establish whether or not there will be any adverse effects on the ecological integrity of these Habitats Sites as a result of the proposals either alone or in-combination with other plans and projects. The HRA is required before deciding whether to undertake, permit or authorise the proposed Project.

7.3.4 The broad likely significant effects that will be considered are:

- Habitat loss (degradation of habitat during the construction phase through e.g., release of pollutants / deposition of dust);
- Habitat fragmentation (disturbance to qualifying features resulting from habitat fragmentation arising from loss or degradation);
- Disturbance (noise, vibration and lighting from construction activities or the operational Project);
- Hydrological changes (changes to surface water levels and flows e.g., changes to surface drainage, or soil compaction leading to reduced infiltration and flooding in construction and operation of the Project, or changes to groundwater levels and flows, any dewatering required for excavations or inadequate soil restoration. Also possible in the operational phase with new impermeable features below ground impeding flow);
- Change in water quality (e.g., pollution of surface and groundwater including changes in water chemistry, nutrient changes and turbidity, for example from run-off from stripped areas and construction of bridge/viaduct abutments next to watercourses.); and
- Change in air quality (e.g., air emissions associated with vehicular traffic and plant during construction and change in passenger car journeys to stations during operation and from new and increased operational rail rolling stock, release of dust during construction).

7.3.5 The HRA is an iterative, three-staged process. The three stages are described below in turn.

7.3.6 Stage 1 - Screening sets out which Habitats Sites may experience likely significant effect(s) and identifies which potential effects can be screened out. The Habitats Sites identified at the screening stage as potentially experiencing LSE will be taken forward to Stage 2 (Appropriate Assessment). Mitigation cannot be taken into account at the Stage 1 screening stage.

7.3.7 If Stage 1 identifies likely significant effect(s), it is necessary to assess whether the Project will adversely affect the integrity of the Habitats Site in view of its conservation objectives under a Stage 2 - Appropriate Assessment.

7.3.8 Stage 3 – Derogation comprises consideration of alternatives and imperative reasons of overriding public interest (IROPI). Regarding alternatives; if an effect on integrity cannot be ruled out on the basis of objective information, even after mitigation, then it is necessary to confirm if there are no feasible alternative solutions, which could deliver the objectives of the proposal, that would be less damaging or avoid damage to the Habitats Site in question. If there are no alternatives, considering whether there are nevertheless IROPI which justify authorising the proposal notwithstanding the identified significant effect on the integrity of the European sites.

7.3.9 A number of Habitats Sites relevant to this HRA have been identified in accordance with the Study Area criteria noted in the *Biodiversity Method Statement*. These will be considered systematically through the relevant stages of HRA. It is anticipated that a small number of Habitats Sites could progress to Stage 2 Appropriate Assessment.

7.4 Climate resilience

7.4.1 The UK's climate is changing. 2022 was the warmest year in the UK since records began in 1884, 0.9°C above the 1991–2020 average[37]. It was the first year to record a UK annual mean temperature above 10°C. All the top-10 warmest years for the UK in the series from 1884 have occurred in this century. In 2022 40°C was recorded in the UK for the first time during a heatwave which exceeded previous records by a large margin. The following year, 2023, was the second warmest on record in the UK. The UK's record warm years of 2022 and 2023, and unprecedented July 2022 heatwave, were both made more likely by climate change[38].

7.4.2 In general, climate change in the UK is driving the following trends:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice, however snow and ice events and extreme cold snaps remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds and storms both in summer and winter.

7.4.3 Understanding how the impacts of future climate could affect the operation and maintenance of the Project needs to be considered within the Project's design (see Section 5.4). Equally, the ES needs to describe how climate change could affect the outcomes of environmental impacts; for example by changing baseline environmental conditions and characteristics, or by exacerbating (or ameliorating) impacts due to the Project.

7.4.4 The assessment of physical impacts of climate change on the Project asset is referred to as the climate change risk assessment (CCRA). In addition, the ES will include under relevant environmental topic headings an assessment of the impacts to environmental receptors including the impacts of future climate change. The baseline climate information contained in the *Climate Resilience Method Statement* is used across both the CCRA and the EIA.

7.4.5 The methodology for conducting the CCRA is set out in the *Climate Resilience Method Statement*. It will be based upon BS EN International

[37] Subsequent to the publication of the 2022 report, 2023 was recorded as the second warmest year on record in the UK.
[38] *Met Office*. (2022). *State of the UK Climate.* Available online at State of the UK Climate - Met Office (Accessed: October 2023).

Organization for Standardization (ISO) 14091:202139, the UK implementation of EN ISO 14091:2021. It uses the definition of climate risk as provided by the IPCC AR6[40]. This is summarised as 'the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on asset(s). The methodology is also compatible with the Network Rail Adaptation Reporting Power 3rd report (ARP3)[41].

7.4.6 The projections used in the assessment will cover two emissions scenarios, as defined by different representative concentration pathways (RCP). RCP 6.0 and RCP 8.5 will both be used to provide a spread of plausible climate change projections, representing medium and high emissions scenarios respectively. These are aligned with Network Rail's approach to considering climate change and adaptation. The latest State of the UK Climate Report[42] provided by the Met Office will be used to draw UK-wide context to how climate change may affect the UK.

7.4.7 The current baseline describes an overview of the climate conditions for the study area using climate variable data from the weather stations representative of the Project route, such as temperature, precipitation and wind. This is provided by the Met Office and gives understanding of how recent climate trends have impacted the study area. Weather station data has been collected from Cambridge National Institute of Agricultural Botany (Cambridgeshire[43], Bedford[44] and Oxford[45]).

7.4.8 The United Kingdom climate projections (UKCP18)[46] have been used to infer future changes in a range of climate variables. The climate risk indicators (CRI)[47], developed as part of the UK Climate Resilience Programme has been used to inform this assessment. The CRI utilises the UKCP18 projections and provides data for a range of climate related indicators. The CRI data for three geographical areas representing the study area has been used, referred to 'Local Resilience Forum' areas.

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[39] *International Organization for Standard.* (2021). *Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment Edition 1.* Available at: ISO 14091:2021 - Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment.
[40] *IPCC* (2023) *Sixth Assessment Report.* Available at: Sixth Assessment Report — IPCC.
[41] *Network Rail* (2021) *Third Adaption Report*. Available at: https://www.networkrail.co.uk/wp-content/uploads/2022/01/Network-Rail-Third-Adaptation-Report-December-2021.pdf (Accessed: October 2023).
[42] *Met Office.* (2022). *State of the UK Climate.* Available online at: https://www.metoffice.gov.uk/research/climate/maps-and-data/about/state-of-climate. (Accessed: October 2023).
[43] *Met Office* (2023) *UK Climate Averages: Cambridge, National Institute of Agricultural Botany*. Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u1214qgj0. (Accessed: October 2023).
[44] *Met Office* (2023) UK Climate Averages: Bedford. Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcr9j7q0s (Accessed: October 2023).
[45] *Met Office* (2023) UK Climate Averages: Oxford (Online). Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcpn7mp10 (Accessed: October 2023).
[46] UKCP18 Climate Projections. Available from: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index
[47] Climate Risk Indicators (2022). Available from: https://uk-cri.org/

7.4.9 The summary of projections for the area affected by the Project is explained further in the *Climate Resilience Method Statement*.

7.4.10 The Project includes works to existing stations, new stations, new railway, works to existing railway and works to road crossings. All assets of the Project would be relevant to the CCRA as each asset would have a level of sensitivity and adaptive capacity when exposed to a change in a particular climate hazard. However, to ensure a proportionate approach, these assets have been categorised into asset groups as outlined in his section. The assets have been grouped based on similar characteristics. As the design progresses, 'hotspots' will be identified where a particular asset may be more sensitive than other assets within that asset group for example due to age or condition, or due to siting in a flood plain where the hazard likelihood is deemed higher. By identifying these specific assets, they will then be assessed separately to the rest of that asset group.

7.4.11 Asset groups are defined as follows:

- Drainage and flood conveyance infrastructure;
- Utilities (high voltage and low voltage energy, pipelines and telecommunications);
- Highways and access;
- Geotechnical – cuttings, embankments and false cuttings;
- Ancillary civils (Boundary protection, lighting, signage);
- Bridges, viaducts, tunnels and other structures;
- Rolling stock – passenger and non-passenger;
- Track;
- Stations and buildings; and
- Staff and passengers.

7.4.12 These asset groups may be subject to minor changes through the course of the assessment. In particular, the assessment of the utilities asset group may be broken down further, as required, due to the variety of sub-assets present within this group. This will ensure the assessment is made to the appropriate level of detail.

7.4.13 Some of the climate hazards that are considered to have the potential to impact assets of the Project are set out the *Climate Resilience Method Statement*. This is not an exhaustive list of potential hazards, impacts and consequence, which will be presented in the CCRA. Other Project risks include those due to vulnerabilities within third parties, upon which the Project is dependent. These interdependency risks include loss of utility services such as water and power to the Project, disruption of supply lines, lack of staff access via public road networks due to extreme weather events.

7.4.14 The design will support the adoption of measures that avoid, reduce or otherwise mitigate climate risks to the Project. The Project proposals will

therefore have embedded within them various resilience measures; and the risks to the Project will be assessed on the basis that this resilience is an integral part of the Project.

7.4.15 Impacts of climate change on the temporary construction compounds and works are considered unlikely due to the near-term nature of the construction phase. As such, climate and extreme weather risks to construction compounds and works may be impacted by present-day climate conditions rather than future conditions. Present-day climate conditions may include a range of different weather impacts due to extreme weather events (e.g., heatwaves, cold snaps, heavy rainfall and flooding, high winds). These impacts will be identified in the CoCP which will include measures intended to provide resilience against such weather events. Therefore they will not be detailed within the CCRA which focuses on future impacts due to changes in climate.

7.4.16 Based on the current level of design and environmental information, the CCRA will focus on the impacts of climate change due to the following climate hazards for the operational phase of the Project, for all three Local Resilience Forum areas:

- Temperature increase (including increased frequency of extreme heat days and heatwaves);
- Increase in precipitation (mean winter rainfall and frequency of heavy rainfall events);
- Increased dry spells and decrease in mean summer rainfall;
- Increase in frequency of wind storm events; and
- Increase in frequency of lightning events.

7.4.17 These parameters may be expanded upon as the climate change resilience assessment progresses, as specific climate impacts are raised through the environmental and engineering teams and are identified as impacts that need to be mitigated.

7.4.18 The CCRA will also consider the various impacts to operations due to vulnerabilities in third-party assets or services (e.g., utilities, highways) that the Project is dependent on or interfaces with. These impacts are referred to as interdependencies.

7.4.19 Climate change is not anticipated to have much impact on average windspeed, fog events, low temperatures or relative humidity. As such these climate hazards are proposed to be excluded from the assessment. Further justification for this, with regard to PINS Advice Note 7 is provided in the *Climate Resilience Method Statement*.

7.5 Equality impact assessment

7.5.1 An EqIA is a predictive assessment tool which supports compliance with equality legislation for public bodies set out within the Public Sector Equality Duty (PSED) set out in section 149 of the Equality Act 2010 ('the Equality Act').

7.5.2 The Equality Act requires that disadvantages experienced by people due to their protected characteristics are considered, reduced as much as possible, and that steps are taken to meet the different needs of sensitive social groups which share protected characteristics (referred to hereafter as 'equality groups'). It also requires that participation from these groups is actively encouraged, especially when their involvement is disproportionately low.

7.5.3 EqIA is a common means of understanding the potential effects of a proposed development or project on equality groups through:

- Providing a written record of the equality considerations which have been taken into account;
- Ensuring that decision-making includes a consideration of the actions that would help to avoid or mitigate any negative effects on particular equality groups; and
- Supporting evidence-based and transparent decision-making.

7.5.4 The Project is likely to result in both positive and negative effects on the people living in the communities around the railway, as well as on future passengers and staff. Due to the diversity of local communities, some of those people may experience those effects in a way that is different to those experienced by the population at large. It is therefore important for the success of the Project to understand what those effects may be, who may experience them, and the measures that can be put in place to maximise positive outcomes and minimise negative outcomes.

7.5.5 The EqIA Report will sit alongside the ES as part of the DCO application and will draw on relevant chapters of the ES to identify impacts and equality effects. The EqIA will seek to assess whether significant effects identified in the relevant ES assessments - Communities; Human Health; Socio-economics; Sound, Noise and Vibration; Air Quality; Landscape and Visual; and Traffic and Transport – would have disproportionate or differential impacts on equality groups.

Protected characteristics

7.5.6 The Equality Act provides a single legislative framework to effectively tackle disadvantage and discrimination toward people with protected

characteristics. The protected characteristics that will be used in the EqIA are:

- Age;
- Disability;
- Gender reassignment;
- Marriage and civil partnership;
- Pregnancy and maternity;
- Race;
- Religion and belief;
- Sex; and
- Sexual orientation.

Equality groups

7.5.7 'Equality groups' have been identified within certain protected characteristics, based on the desk-based evidence review to improve the assessment. They include:

- Within 'age', all ages and age ranges are considered, but specific equality groups include children (aged under 16 years), younger people (aged 16-24 years), and older people (aged 65 and over);
- Within 'pregnancy and maternity', pregnant women are reported as an equality group where an effect only relates to pregnancy;
- Within 'race', all races and ethnicities are considered, but people from ethnic minority communities or backgrounds are identified as referring to non-White British communities;
- Within 'religion and belief', all religious, faith and belief groups are considered, but the term 'minority faith groups' is used to refer to religious groups who are not Christian (including Buddhist, Hindu, Jewish, Muslim, Sikh, and 'other'). People who profess no religion or belief are considered, but are not included within 'minority faith groups';
- Within 'sexual orientation' and 'gender reassignment', all sexual orientations and gender statuses are considered, but the 'Lesbian, Gay, Bisexual, Transgender, Queer (or questioning) +' (LGBTQ+) community is considered as an equality group; and
- Within 'sex', the equality groups of men and women are used.

7.5.8 Additional equality groups have been identified for inclusion in the EqIA, which are not covered by the protected characteristics set out in the Equality Act. They include:

- People living in deprived neighbourhoods – defined as people living within the most deprived Local Planning Authorities, using national Indices of Deprivation;
- People living in low-income households – defined as people who live on less than 60% of the average (median) net disposable equivalised UK household income;

- Carers – defined as anyone, including children and adults, who looks after a family member, partner or friend who needs help because of their illness, frailty, disability, a mental health problem or an addiction and cannot cope without their support. The care they give is unpaid[4];
- People living in households without access to a car;
- Ex-offenders – defined as persons who have criminal convictions;
- Homeless people – defined as people living on the street or staying temporarily with friends/family, in hostels or B&Bs;
- Veterans – defined as former armed forces personnel;
- Intersex people – defined as individuals born with any of several sex characteristics including chromosome patterns, gonads or genitals that do not fit typical binary notions of male or female bodies. This equality group is not protected under equality legislation, but is considered within the EqIA where relevant; and
- Non-binary people – people who feel their gender identity cannot be defined within the margins of gender binary – identifying as either a man or woman. This equality group falls outside of the definitions applied to 'gender reassignment' and 'sex' but is considered within the EqIA where relevant.

7.5.9 Intersectionality recognises the interconnected nature of social characteristics, such as race, gender and other identity markers and acknowledges that individuals may experience overlapping forms of discrimination or privilege based on the intersections of these characteristics. The EqIA will consider the intersectionality to identify and address the challenges faced by individuals with multiple protected characteristics identities.

Study area

7.5.10 A study area of 500m from the draft Order limits of proposed works will be used to consider equality impacts. In addition, some temporary and permanent components of the Project may result in changes in accessibility between community receptors. This may result in impacts that occur beyond 500m from the proposed route / area of intervention. These instances will be considered separately (informed by baseline analysis, stakeholder engagement and professional judgement).

Potential effects on equality groups

7.5.11 Where the Project's activities are identified as likely to result in impacts on sensitive receptors or resources, specific geographic areas, or sections of the population, equality effects may be identified:

- **Differential effects** (where protected characteristic groups are likely to be affected in a different way when compared to the general population);
- **Disproportionate effects** (where there is likely to be a comparatively greater effect on equality groups than on other members of the general

population. Disproportionate effects may occur if the affected community comprises of a higher than average proportion of people with a particular protected characteristic, or because people from a particular equality group are the primary users of an affected resource); and
- **Combined effects** (where a specific area is expected to experience effects on numerous equality groups or where an equality group would experience multiple effects irrespective of geography). Once potential effects have been identified, they will be characterised and assessed.

Assessing effects

7.5.12 The following information for each effect will be gathered:
- Whether the effect is positive, negative, or neutral;
- Whether the effect is a direct relationship (for example, land requirement) or an indirect relationship (for example, access to services) affecting lives of equality groups;
- The duration, frequency and permanence of the effect;
- The severity of the effect and the amount of change relative to the baseline;
- Any existing regulatory standards already in place to manage the effect;
- The size of the population experiencing the effect or the extent of usage of a particular facility or service;
- Local equality priorities, supported by evidence and the views of professional stakeholders;
- The capacity of the affected population to absorb the effects (their resilience), including access to alternatives; and
- Views of local people, captured through consultation and engagement with community stakeholders.

7.5.13 The assessment will be reported for each equality group within the scope of the EqIA to identify potential positive and negative effects, reaching a conclusion on whether any disadvantage is expected and whether any disadvantage is ‘because of’ a protected characteristic.

7.5.14 Measures will be applied to minimise any negative effects, maximise any positive effects and identify the need for monitoring.

7.6 Flood risk assessment

7.6.1 The proposed Project will be subject to an FRA as part of the DCO application. This will sit alongside the ES but is separate to it. Consideration of flood risk to the Project and elsewhere as a result of the Project will take account of flooding from fluvial (main rivers and ordinary watercourses), surface water, groundwater, sewers, reservoirs and other artificial sources.

Fluvial Flood Risk

7.6.2 For the construction of new track and supporting infrastructure, it is proposed to undertake hydraulic modelling of significant watercourses crossed by the Project that have an associated fluvial floodplain or that may pose flood risk to identified receptors. The following decision tree will be used to determine the proposed modelling methodology to assess flood risk impacts:

- Group 1: these sites correspond to crossings where there is known fluvial flooding (Flood Zone 2) and the Project has potential to increase associated flood levels. Hydraulic modelling is proposed even if there are no receptors currently at risk, as the hydraulic model can inform the decision to replace a viaduct with a bridge or culvert for cost saving purposes;
- Group 2: these sites correspond to crossings where the capacity of the minimum structure size is inadequate to convey the peak 1% annual probability flow, including an allowance for climate change, where there are receptors with potential to be affected;
- Group 3: these sites are where the proposed hydraulic infrastructure is more complex (e.g., inverted siphons) and checks may be required to assess whether the design flows can be conveyed through the Project without causing flooding problems; and
- Group 4: these sites correspond to straightforward crossings, with no existing flood risk issues, where only hand calculations are required.

7.6.3 The scope of the hydraulic modelling will be to assess potential impacts to the Project, as well as potential impacts to people, property, and infrastructure elsewhere as a result of the Project as well as opportunities for wider benefits. The assessment will consider the present day scenario and future flood risk over the lifetime of the Project that takes the potential impacts of climate change into account.

Surface water flood risk

7.6.4 The assessment of surface water flood risk will comprise a qualitative assessment informed by review of the EA's Risk of Flooding from Surface Water maps. The need for subsequent quantitative analysis will be identified during the course of the FRA.

7.6.5 The FRA will be informed by the proposed drainage strategy for the Project. This will summarise how surface water runoff will be managed to mitigate flood risk to the Project and elsewhere as well as risk to the quality of the water environment. The impacts of climate change associated with the Project generated surface water runoff and the Project drainage network will be embedded within the design of the proposed drainage system, with core design principles reported within the ES and supporting FRA. Predicted

increases in peak rainfall intensity will be applied for each management catchment crossed by the route.

7.6.6 The impacts of the drainage strategy on existing catchment hydrology will be assessed in the FRA.

Groundwater flood risk

7.6.7 The assessment of groundwater flood risk will also comprise a qualitative assessment informed by available data. Subsequent qualitative analysis will depend on the magnitude of risks identified and where it is not possible to rule out significant effects both to the Project or to groundwater flood risk elsewhere.

Sewer flood risk

7.6.8 Sewer flood risk is likely to be at its greatest in Bedford and Cambridge. Whilst the risk of sewer flooding to the Project is deemed low, a more detailed assessment of the SFRAs, and engagement with the sewer undertakers will be undertaken with a review of all key sewer mains crossings along the route of the Project.

7.6.9 The scope of the FRA is discussed in the *Flood Risk Method Statement*.

7.7 Water Framework Directive

7.7.1 A standalone WER assessment will be undertaken. It will be the subject of a separate screening and scoping exercise and is not covered in this Scoping report.

7.7.2 Reference will be made to the designation of WFD water bodies and the magnitude of impacts based on the water body scale. The WER assessment will inform the assessment of effects relating to water quality and quantity, and hydromorphology and assessment of these aspects during the EIA process will be undertaken collaboratively with the WFD assessment.

7.8 Arboriculture

7.8.1 An assessment of the trees within the draft Order limits will be undertaken with a focus on risks from the Project to trees considered notable[48] due to their size or age, or where ecological, landscape or heritage value had been identified by complementary disciplines. Planning constraints associated with tree preservation orders (TPO) and conservation areas will be outlined.

[48] Woodland Trust – “Notable trees are usually mature trees which may stand out in the local environment because they are large in comparison with other trees around them”

7.8.2 With respect to considering veteran trees, the National Planning Policy Framework (NPPF (updated July 2024)) sets out government policy on considerations relevant to the granting of planning permission and the circumstances where planning permission should be refused. The definition in the NPPF is the most appropriate definition to be used when deciding whether to grant planning permission. This states that a veteran tree is one *"….which, because of its age, size and condition, is of exceptional biodiversity, cultural or heritage value. All ancient trees are veteran trees. Not all veteran trees are old enough to be ancient but are old relative to other trees of the same species. Very few trees of any species reach the ancient life-stage."*

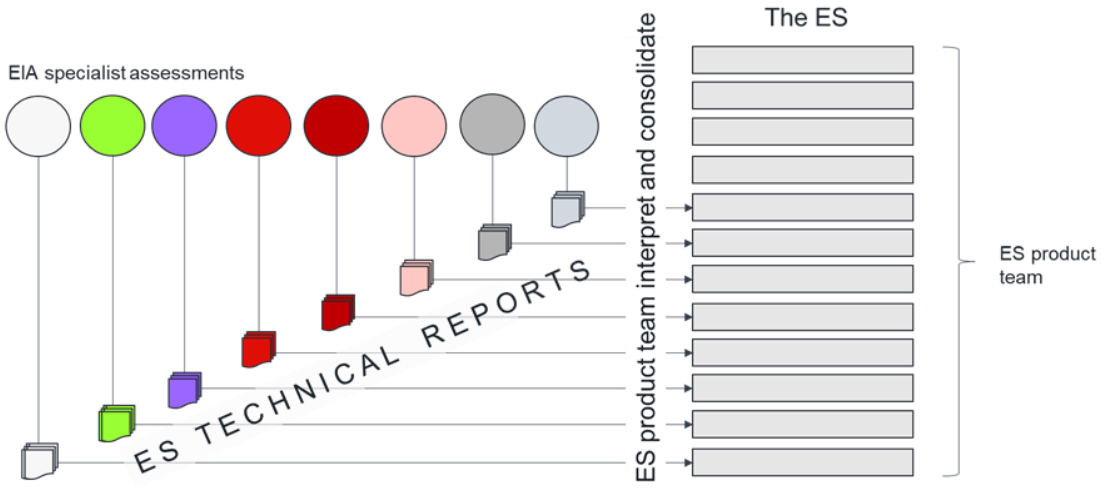
8 The environmental statement

8.1 Reporting approach

8.1.1 The approach to environmental reporting for the Project's EIA will prioritise the creation of outputs that are proportionate and succinct: that provide the necessary information in a form that is easy to read and understand. This reflects an emphasis on presenting information that is understandable and more accessible and accords with emerging priorities from government[49]. It will adopt a model where the main documents (principally the PEIR and ES) are prepared by a designated product team who will draw on the assessment team findings and use them as the material that informs the main reports. In this way the PEIR and ES will be focused, with a clearer narrative, and with strong reliance on graphics.

8.1.2 The assessment teams will prepare technical reports rather than ES chapters; these will form annexes to the main ES. In this way, the main information that accords directly with the requirements of EIA Regulations, and in particular Schedule 4[50] , will be in the ES, with the more detailed topic-information available in specific technical reports.

Figure 26 – Model for the developing the environmental statement.

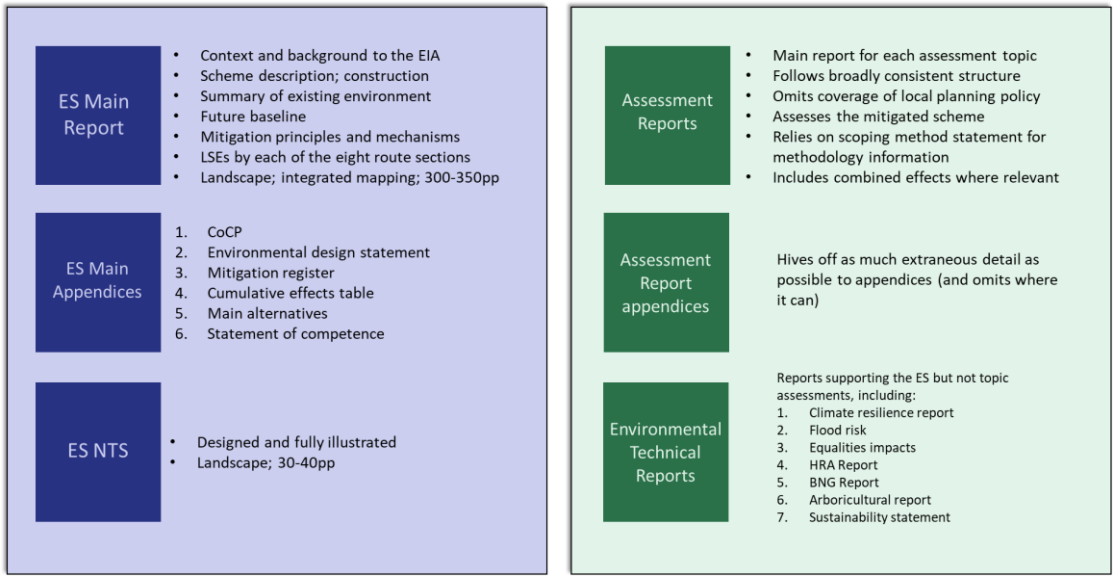


8.1.3 Assessment reports will be prepared to represent each of the topics addressed listed in Chapter 6. The ES will include a small number of

[49] Department for Levelling Up, Housing and Communities (March 2023) Environmental Outcomes Reports: a new approach to environmental assessment.
[50] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Schedule 4. information for inclusion in environmental statements

appendices; these are likely to include the CoCP, the mitigation register, a statement of competence and the detailed cumulative assessment.

Figure 27 – Documents supporting the EIA.



8.2 ES structure and digital reporting

8.2.1 The format and structure of the ES (as well as the PEI that precedes it) will use the route sections as the basis for the geographical separation of information.

8.2.2 There is also an ambition for the ES (and the PEI) to be prepared as digital products, either supporting conventional reports or as the singular digital ES. These will present information that is easy to access and navigate and more engaging for its audience through provision of interactive functionality. This could include:

- Mobile and desktop-friendly page template designs and menu systems;
- GIS and interactive mapping options including story maps, time sliders and dashboards;
- Embedded media content including animations, videos and fly-throughs; and
- Commenting and feedback options stored within a GDPR-compliant database.

8.2.3 EWR Co is interested to receive feedback from the statutory consultees on general support and detailed requirements for adopting this approach.

Table 25 – Proposed Structure of the Preliminary Environmental Information Report (and Environmental Statement).

Proposed PEI	
1	East West Rail and the environment
1.1	Purpose of the PEIR
1.2	The East West Rail proposals
1.3	Environmental context
1.4	Route sections
1.5	The EIA and the PEI
2	The EIA process
2.1	The DCO and legal requirements
2.2	Assessment techniques
2.3	Scoping the assessment
2.4	Consultation and engagement
2.5	Assessment concepts
2.6	Environmental issues
2.7	Spatial context
2.8	Temporal context
2.9	Potential impacts
2.10	Impact interaction
3	Mitigation and environmental design
3.1	Mitigation strategy and concepts
3.2	Integrating mitigation in design
3.3	Securing mitigation and the mitigation register
3.4	Monitoring arrangements
4	Overview of the EWR Scheme
4.1	The route
4.2	General design elements
4.3	Environmental design
4.4	The EWR service
4.5	Stations
4.6	Providing power for the trains
4.7	Managing the trains
4.8	Drainage
4.9	Road crossings
4.10	Crossing footpaths and bridleways
4.11	Security and safety
4.12	Major acccidents and disasters
5	Overview of construction
5.1	Construction programme
5.2	Construction logistics and worksites
5.3	Road crossing construction techniques
5.4	Tunnel construction techniques
5.5	New stations and station upgrades
5.6	Embankments and cuttings
5.7	Mitigating construction impacts - the code of construction practice
5.8	Materials and waste
5.9	Sustainable design and construction
6	Oxford to Bletchley: the scheme and its effects
6.1	Scheme requirements
6.2	EWR proposals
6.3	Construction approach
6.4	Environment along the route
6.5	Summary of impacts and effects
6.6	Noise and vibration
6.7	Journeys and access
6.8	Air quality
6.9	Views of the scheme
6.10	Community, health and wellbeing
6.11	Agriculture and farming
6.12	The landscape
6.13	The historic environment
6.14	Ecology and wildlife
6.15	The water environment
6.16	Cumulative effects
7	Fenny Stratford to Kempston: the scheme and its effects
	Same structure as above
8	Bedford: the scheme and its effects
	Same structure as above
9	Clapham Green to Colesden: the scheme and its effects
	Same structure as above
10	Roxton to east of St Neots: the scheme and its effects
	Same structure as above
11	Croxton to Toft: the scheme and its effects
	Same structure as above
12	Comberton to Shelford: the scheme and its effects
	Same structure as above
13	Cambridge: the scheme and its effects
	Same structure as above
14	Scheme wide and global effects
14.1	Housing and the economy
14.2	The transport network
14.3	The land resource
14.4	Nature and biodiversity
14.5	Water supply
14.6	Historical and cultural change
14.7	Climate change
14.8	Materials assets
15	Cumulative effects
15.1	Introduction
15.2	Types of cumulative impacts and effects
15.3	Assessment method
15.4	Predicted cumulative significant effects
16	Going forwards
16.1	Progressing the scheme
16.2	The DCO process
16.3	Giving feedback
16.4	Examination
16.5	Decision making

8.3 Preliminary environmental information

8.3.1 In advance of the ES (which will be available with the DCO application), preliminary environmental information will be made available in support of statutory consultation.

8.3.2 The PEI will reflect the information that has been collected at the time the statutory consultation. It will include conclusions about some of the predicted likely significant effects, as well as providing details on proposed mitigation solutions.

8.3.3 Both documents will be prepared in accordance with the philosophy of proportionate reporting. We will also explore the potential to provide the information in the form of an online product.

APPENDIX A

A.1 Consideration of alternatives

A.1.1 Coverage of alternatives in this Scoping Report takes a historic perspective of East West Rail as it has been conceived and refined over the course of almost 30 years. It summarises the decisions that have been made and the rationale behind them. During this time, different routes and alignments have been considered, as well as options for stations and other infrastructure. The decision on how East West Rail services would be powered has also been the subject of discussion and review.

A.1.2 At the route update announcement in May 2023 (Route Update) a preferred route alignment between Bedford and Cambridge was identified. This, together with associated work between Oxford and Bedford, forms the basis of the current project. Since the route update announcement East West Railway Company (EWR Co) has continued to develop the proposals, with further options considered at 20 or so locations. The process used to sift and distinguish preferences from these specific project options has used an Assessment Factors process, which is described in Chapter 4 of the Technical Report.

A.1.3 There remain a few locations where options remain, including proposals for: the crossing of the River Great Ouse south of St Neots and the location of the new Tempsford station; proposals for new rail crossing solutions in Harston; and several remaining options for station closure and level crossing closures on the Marston Vale Line.

A.1.4 This chapter describes the consideration of alternatives up to the route update announcement. The alternatives are presented below as a chronological evolution. Information on the assessment factors process and its recommendations can be found in the Technical Report.

A.2 1995-2016

A.2.1 A group of local authorities and businesses called the East West Rail Consortium started to develop proposals for a direct rail link between Bedford and Cambridge. The Consortium was established by Ipswich Borough Council who provided the chairman until 2005 when the role was taken on by Buckinghamshire County Council. The Consortium included local councils, Network Rail, port authorities and the now defunct regional government bodies.

A.2.2 In 2006, the Office of Deputy Prime Minister supported the principle of reopening the link between Oxford and Bedford.

A.2.3 In 2007, the Consortium commissioned a study confirming the clear business case for a service between Oxford and Milton Keynes, as well as an Aylesbury spur.

A.2.4 In the 2011 Autumn Statement, the Chancellor confirmed that the western section of the proposed East West Rail route (between Oxford and Bedford) would go ahead if the Consortium could demonstrate a strong business case that was accepted as robust by Department for Transport (DfT) and Network Rail.

A.2.5 In 2013, Network Rail announced the western section (Oxford to Bedford) as part of its five-year business plan. The Oxford to Bicester segment was opened to Chiltern Railway services in 2015. A Transport and Works Act order (TWAO) was granted for the Bicester to Bletchley segment in 2018; at the time writing this is under construction.

A.2.6 The improved infrastructure on the western section of East West Rail would, however, need to be upgraded further to meet East West Rail's four trains per hour service, such as lengthening platforms and providing turnbacks. Proposals for this, along with the completion of the link through Bedford and onwards to Cambridge, initiated in 2016 and further developed with the setting up of the EWR Co in 2018.

A.3 2016-2017

A.3.1 Network Rail and Chiltern Railways considered several route corridor alternatives, building on the government's plan to promote an Oxford to Cambridge growth corridor, known as the Ox-Cam Arc. By providing better transport links across this area, improved commuting would help unlock new housing and nurture significant contributions to GDP, particularly in innovative and research-based industries in the biomedical and hi-tech sectors.

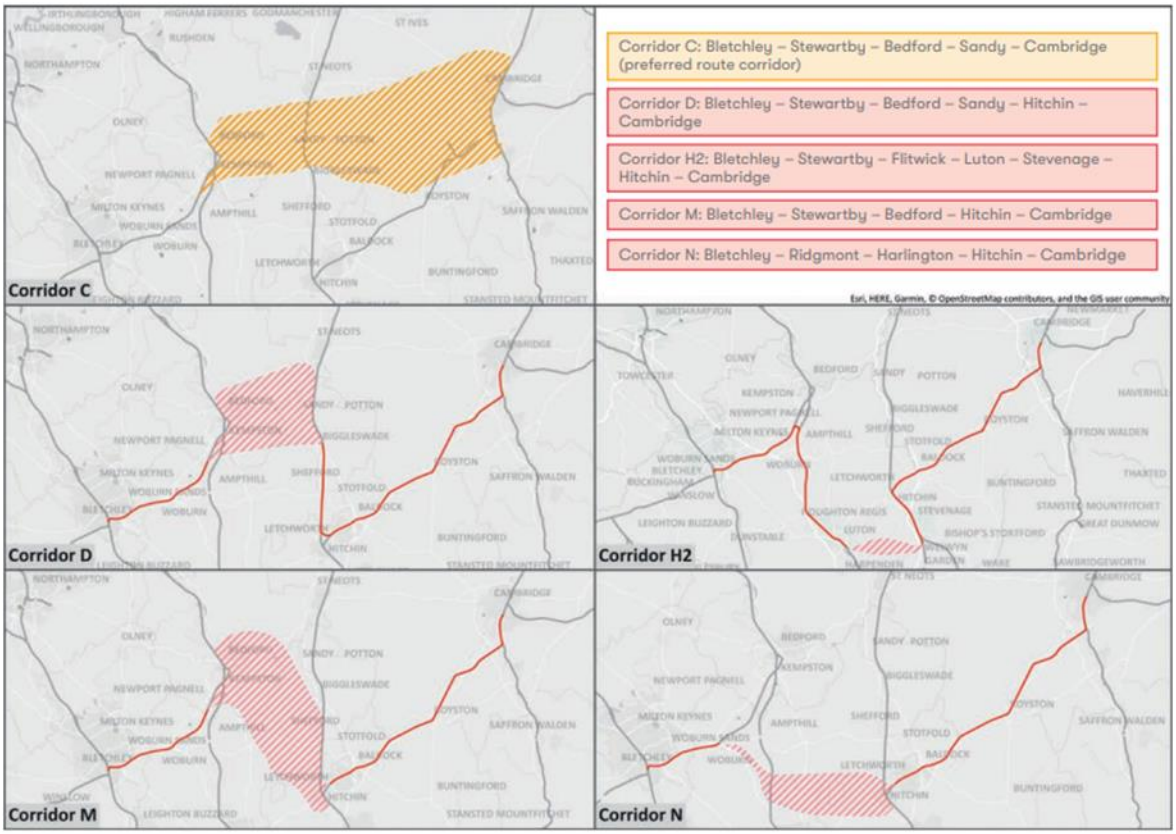
A.3.2 The work up to this point established that the route between Oxford and Bedford would follow the existing railway corridor, with no obvious benefit of using other route corridors, which would have entailed great expense and disruption. On the existing line between Oxford and Bedford, the railway would need upgrades and changes to support East West Rail services.

A.3.3 Several route corridor options were developed between Bedford and Cambridge where there is no existing railway track, due to the majority of the old Varsity Line having closed in 1968. These corridors were proposed as options between Bletchley and Cambridge, spanning the broad area between St Albans and Harlow and northwards to Peterborough.

A.3.4 Network Rail initially identified twenty potential broad route corridors between Bletchley and Cambridge. These were appraised against the initial strategic objectives relating to improving rail links, increasing economic growth and employment, improving journey times, enhancing capacity for freight and contributing to tackling climate change. These strategic objectives focussed on unlocking economic and housing growth and better short-distance rail journeys between towns and cities. As a result, five corridors were taken forward for further work based on engineering modelling:

- Corridor C: Bletchley – Stewartby – Bedford – Sandy – Cambridge.
- Corridor D: Bletchley – Stewartby – Bedford – Sandy – Hitchin – Cambridge.
- Corridor H2: Bletchley – Stewartby – Flitwick – Luton – Stevenage – Hitchin – Cambridge.
- Corridor M: Bletchley – Stewartby – Bedford – Hitchin – Cambridge.
- Corridor N: Bletchley – Ridgmont – Harlington – Hitchin – Cambridge.

Figure 28 – Route Corridor Options



A.3.5 A quantitative assessment of the potential costs and benefits of these five corridors, and informed by engineering studies, was undertaken, which retained Corridors C and M as preferred.

A.3.6 Further analysis of corridors C and M considered infrastructure requirements, construction cost, demand for travel, geography and environmental impacts (including designated ecological sites, and issues such as flood risk, heritage considerations, landfill and recreation areas and paths). This analysis indicated that Corridor C would generate greater benefits than Corridor M, while incurring similar capital costs and lower operating costs. Journey times were estimated to be between 75 and 82 minutes for Corridor C and between 85 and 106 minutes for Corridor M. On this basis, Corridor C was selected as the preferred corridor in 2016, driven largely by economic opportunities and engineering feasibility. This was

effectively the first major decision point in getting to a preferred corridor, within which more detailed design refinement could then occur.

A.4 2018-2019

A.4.1 EWR Co was established in early 2018, taking over the development of the railway link between Oxford and Cambridge from Network Rail. Its remit was to drive the delivery of the western section between Oxford and Bedford and separately the section between Bedford and Cambridge.

A.4.2 During this period an application for a TWAO for works between Bicester and Bletchley was submitted. This was approved in 2020 (EWR Bicester to Bedford TWAO).

A.4.3 The long history of this project, as well as the support from decision-making powers for elements of the overall length from Oxford to East Anglia, has meant that works to the western section between Bicester and Bedford have already begun and services on this section will add to those already in operation between Oxford and Bicester. To accommodate the overall objective of a full service, upgrades would be needed between Oxford and Bedford, and new railway track would be needed between Bedford and Cambridge. The following sections discuss the route corridor and alignment decisions between Bedford and Cambridge in more detail.

A.4.4 Route options within Corridor C were developed as general areas that could accommodate the tracks, stations and associated elements needed between Bletchley and Cambridge. Eleven potential route options were identified based on East West Rail's strategic objectives (EWR Bedford to Cambridge Route Option Consultation Technical Report) as previously developed by the East West Rail Consortium and agreed with DfT. Having agreed the 15 Assessment Factors (as described earlier) with the DfT, these were used to assess and sift down the 11 longlist route options within Corridor C to a shortlist. The Assessment Factors (listed in A.4.6) consider benefits to the transport user, contribution to wider housing and economic growth, costs, onward travel connections, future demand aspirations, and environmental and social sensitivities.

A.4.5 Both northern and southern approaches into Cambridge, as well as a tunnelled approach, were considered at this stage in the development of proposals (EWR Bedford to Cambridge Route Option Consultation Technical Report). The northern approach was discounted at this stage due to the additional route length required which meant journey time penalties and the need to reverse in Cambridge in order for trains to continue towards Ipswich/Norwich. Additionally, an approach from the north would not provide direct east-west connectivity to the proposed new Cambridge South station, a key tenet of unlocking the growth and housing opportunities from the bio-medical employment there.

A.4.6 The Assessment Factor used at this stage in development of the proposals addressed:

- Transport user benefits.
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land.
- Capital and operating costs an overall affordability.
- Environmental impacts and opportunities.
- Short distance connectivity to support commuting travel into key employment hubs (current and future).
- Rail passenger connectivity to existing mainline.
- Long distance passenger services.
- Satisfying existing and future freight demand (as anticipated by the freight industry) where affordable.
- Railway performance and alignment with wider railway strategy and infrastructure.
- Safety risk (construction and operation).
- Consistency with proposals for the location of settlements.

A.4.7 EWR Co focused on the potential for route options to support growth and new homes, alongside the indicative cost estimates, benefits for transport users and environmental impacts. The overall affordability, including the potential to capture some of the increase in land values resulting from the railway and opportunities for private financing, was also an important consideration.

A.4.8 Six of the 11 route options were not taken further based on their overall inferior performance against the Assessment Factors. They offered no significant additional economic or journey benefit to the shortlisted options and largely covered the same alignments as those shortlisted.

A.4.9 The five shortlisted route corridor options were named Routes A to E (EWR Bedford to Cambridge Route Option Consultation Technical Report). These were consulted on in a non-statutory consultation between January and March 2019, wherein a commitment was made to consider the views of a variety of stakeholders alongside the considerations of the Assessment Factors. Consultation feedback was itself categorised on the following basis:

- Supporting economic growth.
- Supporting delivery of new homes.
- Costs and overall affordability.
- Benefits for transport users.
- Environmental impacts and opportunities.

A.4.10 Environmental considerations at this stage focused on distance to and potential impacts on/from various statutory ecological and heritage designations, landfill sites, flood risk and recreational spaces. The potential impacts of the five shortlisted options identified at this stage would be addressed over subsequent project refinements.

A.5 2020-2021

A.5.1 Based on the 2019 non-statutory consultation feedback as well as the Assessment Factors, the DfT selected Route E in 2020 as the preferred route option in the Preferred Route Update Announcement Report (EWR Bedford to Cambridge Preferred Route Option Report). The key reasons for selecting Route E as the preferred route were as follows:

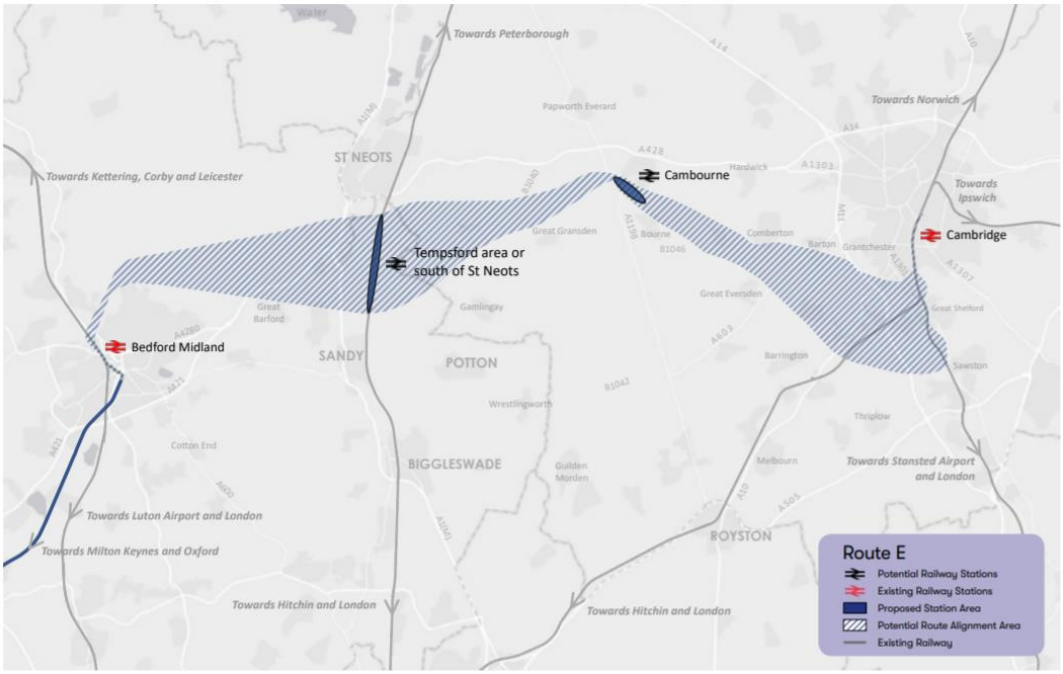
- Best performing option on four out of five key criteria: benefits for transport users, environmental considerations, supporting economic growth and supporting new homes.
- Offered the greatest opportunity to avoid the most environmentally challenging areas and potential direct impacts on irreplaceable or sensitive environmental features.
- Included new links to Thameslink and the Midland Main Line at Bedford, the East Coast Main Line in the vicinity of Sandy/St Neots and the West Anglia Main Line in Cambridge, and so was considered to provide additional inter-regional connectivity.
- Provided easy connectivity into Bedford town centre from Bedford Station and also provided an opportunity for other bodies such as Bedford Borough Council to bring forward regeneration proposals in this area of Bedford.
- Connected the growing population of Cambourne with sustainable transport and could integrate with proposed improvements to the local transport network in south Cambridgeshire. This could include the Cambourne to Cambridge busway (soon to be the subject of a TWAO application) or the (since abandoned) Cambridgeshire Autonomous Metro.
- Could support much needed development of more affordable housing in areas such as Bedford, Sandy/St Neots and Cambourne.
- Was supported by most local authorities in the Bedford to Cambridge area.

A.5.2 The 2020 *Preferred Route Option* Announcement also reconfirmed EWR Co's preference for approaching Cambridge from the south rather than north. Key issues associated with the northern approach included in that report were that the northern approach:

- Impacted the local transport connectivity were East West Rail to use the guided busway route.
- Required additional tracks for the West Anglia Main Line.
- Involved a longer route length than the southern approach.
- Was less able to support the planned biomedical campus and wider economic growth opportunities around Cambridge South than the southern approach.

A.5.3 Further detail, including a review of the alternative route proposed by CamBedRailRoad, is contained within the *Route Update Announcement Report.*

Figure 29 – Route E indicative alignment



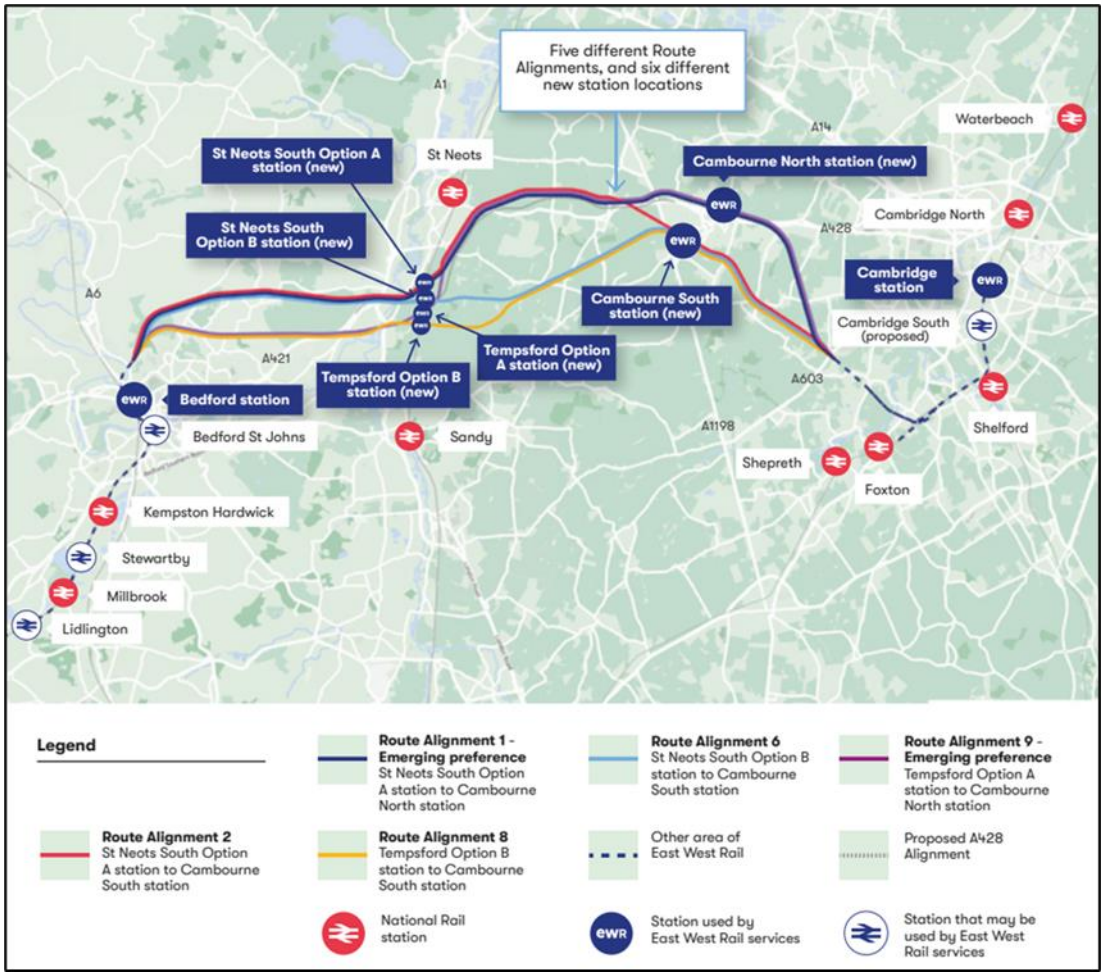
A.5.4 Further design work in 2020 culminated in a second non-statutory consultation in 2021 addressing the whole route between Oxford to Cambridge. As far as Bedford this included:

- **Oxford to Bicester** – Improvements to existing railway and stations, considering improving capacity at Oxford station.
- **Bletchley and the Marston Vale Line** – Improving existing infrastructure, stations and level crossings.
- **Bedford** – A redeveloped Bedford station and relocated Bedford St Johns station, improving existing railway and introduction of new tracks.

A.5.5 Between Bedford and Cambridge, the preferred corridor Route E was refined and developed into distinct route alignments. An initial design proposal provided a reference 'Route Option E Indicative Alignment' informed by desktop data, including key environmental features. Variations of this alignment were generated to test operational performance (such as station locations to best serve communities) and to address certain areas of critical engineering need (such as passing loops and depots), engineering challenges or environmental sensitivities.

A.5.6 Nine route alignment options (1 to 9) emerged from this design phase with different benefits, such as links with other transport infrastructure, support for potential new homes and communities, and overall value for money.

Figure 30 – Route alignments and station location options



A.5.7 The 15 Assessment Factors were used again to assess the nine alignments and produce a shortlist of five alignment options, with Route Alignment 8 chosen as the Reference Alignment, given its similarity to the Route Option E indicative alignment.

A.5.8 Findings of further Assessment Factor comparison of the five options were reviewed by a multidisciplinary project team including expert assessors and subject matter leads alongside EWR Co core team members. This identified two emerging preferences:

- **Alignment 1** – St Neots South Option B to Cambourne North (via the new A421 dual carriageway corridor). This option includes Cambourne North which was identified as the emerging preferred Cambourne option.
- **Alignment 9** – Tempsford to Cambourne North (via the new A421 dual carriageway corridor). This option also includes Cambourne North as the emerging preferred Cambourne option.

A.5.9 EWR Co's preference for these two was presented in the 2021 public consultation. Locations for new stations at Cambourne and Tempsford were presented at this time. The southern approach to Cambridge was confirmed as the most suitable in

order to unlock employment opportunities in the south and for a connection with West Anglia Main Line.

A.5.10 A full explanation of the process is provided within the *Consultation Technical Report* for the 2021 non-statutory consultation (Consultation Technical Report).

A.6 2022-2023

A.6.1 Consultation responses in 2021 raised issues about the strategic case, estimated costs/affordability and previous optioneering decisions, as well as concerns about a route that entered Cambridge from the south.

A.6.2 EWR Co agreed with DfT to set up an Affordable Connections project (ACP) in late 2021 to try and drive lower costs and ensure local leadership buy-in to East West Rail. The ACP considered alternative transport solutions to those previously developed, including a reassessment of transport mode, service level options and route alignments based on an understanding of demand requirements and affordability (EWR Economic and Technical Report). The ACP therefore considered whether there were solutions which could deliver most of the benefits of East West Rail at a lower capital cost. This exercise also sought to address concerns raised during the 2021 consultation.

A.6.3 The Route Update Report (Route Update Report) provided an updated rationale and more detail for these decisions, particularly for the London Road level crossing in Bicester, a review of the 31 level crossings on the Marston Vale Line, and how to best serve Bedford with East West Rail.

A.6.4 The 2023 route update announcement also discussed the onward connection between Bedford and Cambridge, concluding that Alignment 1 provided the best option for the majority of East West Rail's length, serving a new station at Cambourne North and unlocking economic benefits for the town whilst mitigating for potential environmental effects.

A.6.5 For Tempsford, the best location for a new station is shown as part of Alignment 9 compared to a station at St Neots South. A station at Tempsford was considered to enable greater growth opportunities, opportunities to improve biodiversity and increase people's access to green space. A new station here would be part of a wider transformation of accessible active travel routes for the area, including for cycling and mobility aids as well as walking. This emerging preferred route was referred to as Alignment 1 (Tempsford variant).

A.6.6 The route update announcement also confirmed that the southern approach into Cambridge remained EWR Co's preference. The southern approach into Cambridge would provide direct access to Cambridge South and the biomedical facilities on the Addenbrooke's hospital campus, with onward connection to Cambridge station.

APPENDIX B

B.1 Indicative construction management methods

B.1.1 As set out in Chapter 2 of this Scoping Report, a draft CoCP will be developed and submitted as part of the application for the Development Consent Order (DCO). This will support the responsible delivery of the new railway, manage expectations, and set a consistent approach to avoiding or minimising construction impacts. The draft CoCP will continue to be developed, in consultation with local authorities and relevant stakeholders, and further information will be presented at statutory consultation. At this stage, the typical elements and measures likely to be included in the draft CoCP are set out in Table 26.

Table 26 – Typical elements and measures likely to be included in the draft CoCP

Category	Topic	Examples of mitigation
General requirements	General measures	*Contractors will be required to manage their works to comply with relevant regulations and industry best practice, including the following general matters:* • Surveys to record conditions before works start to inform reinstatement requirements. • Measures to avoid spills of chemicals or fuel and procedures to deal with any incidents. • Plans to avoid impacts arising from extreme weather events. • Community helpline for residents to obtain information and report issues. • Community engagement to advise locals of upcoming works and potential disruption. • Provide suitable lighting/general nuisance avoidance measures. Demonstrate best practice through adoption of Considerate Constructors Scheme or equivalent.
Effects on people	Sound, noise and vibration	*Contractors will be required to control and limit noise and vibration during the construction works as far as reasonably practicable and in accordance with best practicable means (BPM) as defined under Section 72 of the Control of Pollution Act 1974. This will include a range of measures, such as:*

Category	Topic	Examples of mitigation
		• Controls on working hours, although some works (such as those requiring possessions of the railway) may need to occur during the evenings or overnight. • Acoustic enclosures and screening. • Seeking Section 61 consents under the Control of Pollution Act 1974, if necessary. This is an agreement between the local authority and the contractor to agree, for example, noise levels and hours of work. • Selection of plant and construction methods wherever possible to minimise noise emissions. • Designing site layouts to minimise potential disturbance, such as siting plant or haul roads away from areas where they could cause disturbance. Noise and vibration monitoring at key locations to ensure potential impacts are kept to reasonable levels.
Effects on people	Air quality	*Contractors will be required to control and limit dust, air pollution, odour and exhaust emission during the construction works as far as reasonably practicable and in accordance with best practicable means (BPM). This will include a range of measures, such as:* • Appropriate measures will be in place to limit emissions and avoid nuisance from construction plant and e.g. the use of diesel or petrol powered generators should be avoided in favour of mains electricity or battery powered equipment. • Setting requirements for emissions standards for construction plant and Non-Road Mobile Machinery (NRMM). • Follow good practice dust management measures in accordance with IAQM guidance/industry best practice, to reduce dust during transportation and storage of materials; use of haul routes; demolition, excavation and earthworks activities; and conveying, processing, crushing, cutting and grinding activities. • Setting appropriate monitoring arrangements, which could include undertaking on and off-site visual inspections to monitor dust, or having temporary dust monitoring equipment in place at work-sites. • Covering or treating of materials and stockpiles to reduce risk of dust.

Category	Topic	Examples of mitigation
Effects on people	Traffic and transport	*Contractors will be required to limit undue inconvenience to the public arising from increased traffic flows and disruptive impacts of construction traffic, as far as reasonably practicable, and ensure that legal requirements for works affecting highways are implemented and undertake the works in such a way as to maintain, as far as reasonably practicable, existing public access routes and rights of way during construction. This will include a range of measures such as:* • Construction traffic management and routes. • Management of deliveries including timings, and lorry movements. Site access arrangements including workforce travel plans.
Effects on natural and historic environment	Biodiversity/ecology	*The contractor will be required to control and minimise damage and disturbance to areas of nature conservation interest and protected species in accordance with relevant legislative requirements and accepted industry practice. This will include a range of measures such as:* • Following licencing requirements for protected species. • Having an environmental clerk of works available to advise, supervise and report on biodiversity (ecology) matters. Implementing tree protection where possible, such as fencing encompassing the full extent of the root protection zone.
Effects on natural and historic environment	Historic environment	*The contractor will be required to control and minimise damage and disturbance to designated heritage assets and non-designated heritage assets, archaeological sites, remains and deposits, buildings of historical and architectural interest. This will include a range of measures such as:* • A programme of historic environment site investigation and mitigation. • Temporary support, hoardings, barriers, screening and buffer zones around heritage assets and archaeological mitigation areas within and adjacent to the work sites. • Advance assessment to inform the types of plant and working methods for use where heritage assets are close to work sites or attached to structures that form part of work sites. • Care in operating machinery in areas known to be particularly archaeologically sensitive. In exceptional cases (e.g. nationally significant remains) exclusion zones may

Category	Topic	Examples of mitigation
		apply and in the remaining cases safeguards may include appropriate methods for installing and operating machinery. Security procedures to prevent unauthorised access to heritage assets and archaeological investigations and damage to or theft from them, including by the use of metal detectors.
Effects on natural and historic environment	Water resources and flood risk	*The contractor will be required to implement working methods to protect surface and groundwater from pollution and other adverse impacts including changes to flow volume, water levels and quality in accordance with relevant legislative requirements and appropriate industry best practice. This will include a range of measures such as:* • Measures to control and prevent pollution to water, such as using bunded storage and drip trays. • Controls to be implemented during construction to protect the quality of surface water and ground water resources through controls to manage the rate and volume of run-off. Controls to meet requirements to avoid any significant increase of flood risk.
Effects on natural and historic environment	Landscape and visual	*Contractors will be required to protect visual amenity in rural and urban areas including designated landscape areas, parks and open spaces and smaller green spaces in urban areas. This will include a range of measures such as:* • Compliance with the relevant statutory provisions in respect of the protection of areas of nature conservation interest and of protected species. • Construction activities screened to protect nature conservation sites notable landscape elements, where appropriate, to ensure adverse visual impacts from views of construction activity are controlled. • Control of light spillage by shielding lights or reducing lux levels and dimmed or switched off when not in use. Reinstatement of open spaces, sport and recreation facilities to their former use in consultation with the local authority or other responsible statutory agency, where possible.
Effects on natural and historic environment	Ground conditions and land quality	*Contractors will be required to assess potentially contaminated land and where necessary undertake remediation, in accordance with the EAs Land Contamination Risk Management (LCRM) guidance. To develop appropriate mitigation measures to protect geological resources*

Category	Topic	Examples of mitigation
		and to mitigate the sterilisation or severance of mineral areas. This will include a range of measures such as: • Measures to control and limit the effects of settlement, for example during excavation for any below ground structures and tunnels. Specialist piling techniques to prevent mobilisation of contamination into underlying aquifers.
Effects on natural and historic environment	Materials and waste	*Contractors will ensure the requirements of the waste hierarchy are enforced and the duty of care requirements are met. They will take responsibility for protecting the interests and safety of others from the potential impacts of handling, storing, transporting and depositing of excavated materials and wastes. This will include a range of techniques such as:* • Seek to reduce the amount of excavated material and waste that will be produced through the design process. • Use excavated material that is either uncontaminated or can be remediated for site engineering and restoration purposes in accordance with the controls specified by the *CL:AIRE Definition of Waste: Development Industry Code of Practice,v2* (2011) (DoWCoP) in accordance with an appropriate environmental permit or exemption from permitting. Apply waste minimisation techniques and on-site segregation of surplus material so that it can be re-used, recycled or appropriately disposed of.
Effects on natural and historic environment	Agriculture and soils	*Contractors will be required to ensure that procedures are implemented to control and minimise damage and disturbance to areas of agricultural land and soils in accordance with relevant legislative requirements and accepted industry practice. This will include a range of measures, such as:* • Implementation of measures set out within the *Code of practice for the sustainable use of soils on construction sites* (Department for Environment, Food and Rural Affairs (Defra) 2009), (or its replacement) in relation to undertaking works on or adjacent to agricultural land. • Protection of agricultural land adjacent to construction sites with appropriate fencing.

Category	Topic	Examples of mitigation
		• Measures to minimise the risk of soil compaction such as preventing traffic movements over areas of soft ground/unprotected soils. • Measures to protect soils where they will be reinstated following construction. Maintaining details of farm accesses which may be affected by construction.

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Routewide – Environment - EIA Scoping Method Statement – Air Quality

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on air quality and should be read in conjunction with the Method Statements prepared for other aspects.

[1] *Department for Transport* (2024) *National Networks National Policy statement, GOV.UK*. Available at: https://www.gov.uk/government/publications/national-networks-national-policy-statement.

1.1.6. The air quality assessment will consider the construction and operational phase impacts of the Project on human health and ecology and how these result in either temporary construction effects, or longer term effects during the operation of the Project.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
APIS	Air pollution information system
AADT	Annual average daily traffic
AQAL	Air quality assessment level
AQMA	Air quality management area
ARN	Affected road network
ASR	Annual status report
AVDC	Aylesbury Vale District Council
BBC	Bedford Borough Council
BC	Buckinghamshire Council
CBC	Central Bedfordshire Council
CCC	Cambridge City Council
CDC	Cherwell District Council
CoCP	Code of construction practice
CS2	Connection Stage 2
CS3	Connection Stage 3
DCO	Development consent order
DEFRA	Department for environment, food and rural affairs
DMRB	Design manual for roads and bridges
EPUK	Environmental protection UK
ES	Environmental statement

Abbreviation	Definition
HDC	Huntingdonshire District Council
HDV	Heavy duty vehicles
IAQM	Institute of Air Quality Management
MKC	Milton Keynes Council
NH_3	Ammonia
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
NNNPS	National networks national policy statement
NRMM	Non-road mobile machinery
OCC	Oxford City Council
PM_{10}	Course particulate matter (those with a diameter of 10 micrometres or less)
$PM_{2.5}$	Fine particulate matter (those with a diameter of 2.5 micrometres or less)
SCDC	South Cambridgeshire District Council
SO_2	Sulphur dioxide
VWHDC	Vale of White Horse District Council
WODC	West Oxfordshire District Council

3. Relevant standards and guidance

3.1. Legislation

3.1.1. The following legislation will be used to inform the air quality assessment of the Project:

- The Air Quality Standards Regulations, 2010 as amended 2020[2];
- The Air Quality Standards (Amendment) Regulations, 2016[3];
- Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019[4];
- Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[5];
- Environmental Protection Act, 1990 (Section 79(1)(d))[6]
- Part IV of the Environment Act, 1995[7], as amended 2021[8];
- Air Quality (England) Regulations, 2000 (as amended)[9]; and
- The Environmental Targets (Fine Particulate Matter) Regulations 2023[10].

3.2. Policy

3.2.1. The following policy is relevant for the air quality assessment of the Project:

- NNNPS[11];
- National Planning Policy Framework[12];
- Environmental Improvement Plan 2023[13];

[2] The National Archives, (2010). *The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No.1001* [online]. Available at: https://www.legislation.gov.uk/uksi/2010/1001/contents/made (Accessed November 2023).
[3] The National Archives, (2016). *The Air Quality Standards (Amendment) Regulations 2016 – Statutory Instrument 2016 No.1184* [online]. Available at: https://www.legislation.gov.uk/uksi/2016/1184/contents/made (Accessed November 2023).
[4] The National Archives, (2019). *Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations – Statutory Instrument 2019 No. 74* [online]. Available at: https://www.legislation.gov.uk/uksi/2019/74/made (Accessed November 2023).
[5] The National Archives, (2020). *The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 - Statutory Instrument 2020 No.1313* [online]. Available at: https://www.legislation.gov.uk/uksi/2020/1313/contents/made (Accessed November 2023).
[6] Parliament of the United Kingdom (1990) *Environmental Protection Act 1990* [online]. Available at: Environmental Protection Act 1990 (legislation.gov.uk) (Accessed March 2024).
[7] The National Archives, (1995). *Environment Act 1995 - Statutory Instrument No.25* [online]. Available at: https://www.legislation.gov.uk/ukpga/1995/25/contents (Accessed November 2023).
[8] The National Archives, (2021). *Environment Act 2021.* Available online at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted (Accessed November 2023).
[9] The National Archives (2000) *The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928* [online]. Available at: https://www.legislation.gov.uk/uksi/2000/928/contents/made (Accessed November 2023).
[10] Defra (2023) *Air Quality Targets in the Environment Act* [online]. Available at: https://www.legislation.gov.uk/uksi/2023/96/contents/made (Accessed April 2024).
[11] Department for Transport (2014) *National Policy Statement for National Networks* [online]. Available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks (Accessed November 2023).
[12] Ministry of Housing, Communities and Local Government (2023) *National Planning Policy Framework* [online]. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 (Accessed November 2023).
[13] HM Government (2023) *Environmental Improvement Plan 2023: First revision of the 25 Year Environment Plan* [Online] Available at: https://www.gov.uk/government/publications/environmental-improvement-plan (Accessed April 2024).

- The Clean Air Strategy, 2019[14]; and
- Air Quality Strategy, 2023.

3.3. Standards

3.3.1. The applicable air quality standards in terms of objectives, limit values, targets and critical levels[15] relevant to the Project are summarised in Table 2 and Table 3.

3.3.2. The new long-term $PM_{2.5}$ air quality target does not need to be met until 2040, which is after the proposed development opening year of 2034. The interim target date is 2028 but is not legally binding. Nevertheless, the long-term and interim targets have been included for reference in Table 2 and existing air quality, detailed in Section 5, has been considered in the context of these future standards.

Table 2 – Relevant air quality standards for human health.

Pollutant	Averaging period	Concentration (µg/m^3)	Allowance/Target
Nitrogen dioxide (NO_2) (a)	Annual	40	-
	1 Hour	200	Not to be exceeded more than 18 times a year.
Particulate matter less than 10 micrometres in diameter (PM_{10}) (a)	Annual	40	-
	24 Hour	50	Not to be exceeded more than 35 times a year.
Particulate matter less than 2.5 micrometres in diameter ($PM_{2.5}$)	Annual	20 (b)	-
	Annual	12 (c)	Interim target concentration not to be exceeded by the end of January 2028.
	Annual	10 (d)	Target concentration not to be exceeded by the end of 2040.

[14] Department for Environment Food and Rural Affairs (2019). *Clean Air Strategy 2019* [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf (Accessed November 2023).

[15] APIS defined critical levels as *'concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge.'* Air Pollution Information Systems [Online] Available at: https://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis (Accessed April 2024).

Pollutant	Averaging period	Concentration (µg/m^3)	Allowance/Target
Sulphur dioxide (SO_2) [(a)]	15 Minute	266	Not to be exceeded more than 35 times a year.
	1 Hour	350	Not to be exceeded more than 24 times a year.
	24 Hour	125	Not to be exceeded more than 3 times a year.

Sources: (a) Air Quality (England) Regulations 2000 as amended
(b) Air Quality Standards Regulations 2010 (as amended) and Air Quality Strategy 2023
(c) Environmental Improvement Plan 2023
(d) Environmental Targets (Fine Particulate Matter) Regulations 2023

Table 3 – Critical levels of pollutants.

Pollutant	Averaging period	Concentration (µg/m^3)
Oxides of nitrogen (NO_X) [(d)]	Annual	30[(a)]
	24 Hours	75[(b)]
SO_2	Annual	20[(a)]
Ammonia (NH_3)	Annual	1 (for lichens and bryophytes)[(c)] 3 (for lichens or bryophytes) [(c)]

Sources: (a) Air Quality (England) Regulations 2000 as amended
(b) World Health Organisation (2000) Air Quality Guidelines for Europe
(c) United Nations-Economic Commission for Europe Convention on Long-range Transboundary Air Pollution 2007
Notes: (d) Designated for the protection of vegetation and ecosystems and also referred to as the 'critical level' for NO_X. The policy of the UK statutory nature conservation agencies is to apply the annual mean NO_X criterion in internationally designated conservation sites and Site of Special Scientific Interest (SSSI) on a precautionary basis, as the limit value applies only to locations more than 20km from towns with more than 250,000 inhabitants or more than 5km from other built-up areas, industrial installations or motorways.

3.3.3. It should be noted that the UK air quality objectives, as presented in Table 2, only apply at locations where members of the public might reasonably be exposed to pollutants for the respective averaging periods. Table 4 provides details of where the respective objectives should and should not apply, and therefore the types of locations that are relevant to the assessment of air quality.

Table 4 – Locations at which the air quality objectives apply.

Averaging period	Where objectives should apply	Where objectives should not apply
Annual	All locations where members of the public might be regularly exposed.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless

Averaging period	Where objectives should apply	Where objectives should not apply
	Building façades of residential properties, schools, hospitals, care homes, etc.	people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24-Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1-Hour	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations, etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-Min	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	N/A

3.4. Guidance

3.4.1. The following guidance documents will be used to inform the air quality assessment of the Project:

- Institute of Air Quality Management (IAQM) and environmental protection UK (EPUK) Land-Use Planning & Development Control: Planning for Air Quality[16];
- IAQM Guidance on the assessment of dust from demolition and construction[17];

[16] Environmental Protection UK and Institute of Air Quality Management (2017) Land-Use Planning and Development Control: Planning for Air Quality.
[17] Institute of Air Quality Management (2024) Guidance on the assessment of dust from demolition and construction Version 2.2.

- IAQM A guide to the assessment of air quality impacts on designated nature conservation sites[18];
- IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning[19];
- Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (TG22)[20]; and
- The design manual for roads and bridges (DMRB) LA 105 Air Quality[21].

3.5. Study area

3.5.1. Different study areas for the air quality assessment may be required for construction and operational stages of the Project, as defined within the guidance documents which inform the air quality assessment as set out in section 3.4.1.

3.5.2. For the construction phase, the IAQM construction dust guidance requires consideration of potential dust impacts within 250m of construction activities (dust impacts beyond 250m are likely to be negligible and are not likely to result in a significant effect).

3.5.3. The study area for the assessment of construction and operational changes in road traffic will include human health receptors and ecologically designated sites within 200m of the affected road network (ARN). The ARN will be determined based on criteria set out in DMRB LA 105[21]. The criteria are:

- The total annual average daily traffic (AADT) (all motorised vehicle types) flow changes by 1,000 or more; or
- The AADT flow of heavy-duty vehicles (HDV) (including heavy goods vehicles, buses and coaches over 3.5 tonnes gross weight) changes by 200 or more; or
- A change in daily average speed of 10kph or more[22]; or
- Road alignment change of 5m or more.

3.5.4. DMRB LA 105 advises that 1,000 vehicles and 200 HDVs represents the lowest threshold above which traffic models can represent a change in traffic conditions to a reasonable level of confidence. Any changes below this

[18] Institute of Air Quality Management (2019) A guide to the assessment of air quality impacts on designated nature conservation sites Version 1.0.
[19] Institute of Air Quality Management (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning v1.1.
[20] Defra (2022) *Part IV of The Environment Act 1995 as amended by the Environment Act 2021, Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance (TG22)* [online]. Available at: https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf (Accessed November 2023).
[21] DMRB (2019) LA 105 Air Quality.
[22] DMRB LA 105 applies a speed banding method to define study area and generate exhaust emissions based on levels of congestion. This approach is more suited to interventions made to the strategic road network where reductions in congestion is one of the primary objectives. On this basis, a daily average speed criteria has been adopted to screen roads for changes in speed.

threshold are considered to be negligible and would not result in a significant effect.

3.5.5. There is no defined study area for stationary combustion sources as emission to air. The Project intent is to establish an energy strategy that eliminates the use of combustion sources for meeting the heating and cooling requirements of facilities. As such, emissions from combustion sources are scoped out as discussed in Section 7.1.5. There is also no defined study area for non-road mobile machinery (NRMM) emissions, see Section 7.2.7 for details.

3.5.6. Where there is an increase in the number of diesel-powered freight trains, an initial screening assessment will be undertaken following Defra's TG22 guidance. The TG22 guidance advises that sensitive receptors should be considered where:

- For stationary diesel trains there is relevant exposure within 15m and the locomotives are regularly (more than three times a day) stationary for periods of 15 minutes or more; or
- For moving diesel trains there is relevant exposure within 30m of the relevant railway tracks and annual mean background NO_2 concentrations are above 25µg/m^3.

3.5.7. Where the above criteria are met, further assessment of emissions from diesel trains may be required and would include assessment of sensitive receptors within the TG22 screening distances in section 3.5.6.

3.6. Consultation

3.6.1. Consultation will be ongoing to inform the assessment of air quality as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

4. Establishing the baseline

4.1. Document records

4.1.1. Information on air quality in the UK can be obtained from a variety of sources including local authorities, national network monitoring sites and other sources. Baseline air quality has been assessed with reference to the following data sources:

- Bedford Borough Council (BBC) Air Quality Annual Status Report (ASR)[23];
- Buckinghamshire Council (BC) ASR[24];
- Cambridge City Council (CCC) ASR[25];
- Central Bedfordshire Council (CBC) ASR[26];
- Cherwell District Council (CDC) ASR[27];
- Huntingdonshire District Council (HDC) ASR[28];
- Milton Keynes Council (MKC) ASR[29];
- Oxford City Council (OCC) ASR[30];
- South Cambridgeshire District Council (SCDC) ASR[31];
- Vale of White Horse District Council (VWHDC) ASR[32];
- Environment Agency's Public Register for Permitted Installations[33];
- Defra air quality management areas (AQMAs)[34];
- Defra's background air pollutant mapping[35];
- Project specific survey; and
- Air pollution information system (APIS)[36].

4.2. Surveys

4.2.1. A Project specific diffusion tube monitoring survey has been commissioned to gather data on current NO_2 concentrations to inform the baseline and model

[23] BBC June 2022 Air Quality ASR
[24] BC June 2023 Air Quality ASR
[25] CCC June 2023 Air Quality ASR
[26] CBC June 2022 Air Quality ASR
[27] CDC June 2023 Air Quality ASR
[28] HDC June 2023 Air Quality ASR for the year 2022
[29] MKC June 2022 Air Quality ASR
[30] OCC June 2023 Air Quality ASR
[31] SCDC August 2023 (Revision A) Air Quality ASR
[32] VWHDC June 2023 Air Quality ASR
[33] Environment Agency (2023) *Environmental Permitting Regulations – Installations* [online]. Available at: https://environment.data.gov.uk/public-register/view/search-industrial-installations (Accessed June 2023).
[34] Defra, (2022) *UK Air Information Resource – Air Quality Management Areas AQMAs* [online]. Available at: https://uk-air.defra.gov.uk/aqma/(Accessed November 2023).
[35] Defra, (2021). *Background Mapping data for local authorities -2018* [online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018 (Accessed November 2023).
[36] Air Pollution Information Systems [Online] Available at: https://www.apis.ac.uk/app (Accessed April 2024).

verification[37]. The survey began on the Connection Stage 3 (CS3) area in October 2021 and was completed in September 2022. A second round of monitoring was commissioned in the Connection Stage 2 (CS2) area in January 2023 and was complete in December 2023.

4.2.2. Summaries of the CS3 and CS2 Project specific monitoring surveys are presented in Table 5 and Table 6.

Table 5 – CS3 Project specific monitoring annual mean NO_2 concentrations for 2021.

Monitoring ID	Coordinates (X,Y)	Location description	Annual mean concentration 2021 ($\mu g/m^3$)
EWR-AQ-001	505039, 249978	A6 High Street/Lurke Street, Bedford	23.3
EWR-AQ-002	501623, 247676	A6 The Branston Way, Bedford	23.9
EWR-AQ-003	502128, 250845	A6 The Great Ouse Way, Bedford	17.9
EWR-AQ-004	503373, 252334	High Street, Clapham	15.3
EWR-AQ-005	505776, 254551	Glaze Hill, Bedford	8.1
EWR-AQ-006	506636, 254498	B660 Sunderland Hill, Ravensden	12.1
EWR-AQ-007	509566, 255145	High Street, Wilden	8.5
EWR-AQ-008	509103, 251229	A4280 St Neots Road, Bedford	27.9
EWR-AQ-009	512653, 252274	Bedford Road, Great Barford	10.9
EWR-AQ-010	515415, 254580	School Lane, Roxton	10.4
EWR-AQ-011	516292, 254012	A1, Tempsford	21.6
EWR-AQ-012	516430, 249599	A1 London Road, Sandy	20.9
EWR-AQ-013	516255, 255962	A1 Great North Road, Chawston	34.5
EWR-AQ-014	520005, 256552	Potton Road, Saint Neots	9.3
EWR-AQ-015	522493, 256717	B1046 St Neots Road, Abbotsley	9.5
EWR-AQ-016	525162, 256486	B1040 Potton Road, Saint Neots	11.0
EWR-AQ-017	521267, 260013	A428 Cambridge Road, Saint Neots	19.2
EWR-AQ-018	523257, 259974	A428 Cambridge Road, Saint Neots	22.3

[37] Model verification is the comparison of model predictions with ambient monitoring to confirm the model's ability to accurately predict pollutant concentrations

Monitoring ID	Coordinates (X,Y)	Location description	Annual mean concentration 2021 (µg/m^3)
EWR-AQ-019	526722, 259823	A428 Cambridge Road, Eltisley	18.4
EWR-AQ-020	529516, 260638	A428 Cambridge Road, Papworth Everard	20.2
EWR-AQ-021	530682, 257829	A1198, Caxton	11.7
EWR-AQ-022	532481, 255835	B1046 Fox Road, Bourn	10.0
EWR-AQ-023	532445, 260221	St Neots Road, Cambourne	16.9
EWR-AQ-024	535119, 258525	Highfields Road, Highfields	10.1
EWR-AQ-025	537310, 259755	A428 Cambridge Road, Hardwick	21.0
EWR-AQ-026	541329, 259418	A1303 Madingley Road, Coton	17.5
EWR-AQ-027	540958, 255257	A603 Wimpole Road, Barton	12.3
EWR-AQ-028	538501, 256328	B1046 Barton Road, Comberton	12.5
EWR-AQ-029	537725, 252490	A603 Cambridge Road, Harlton	13.6
EWR-AQ-030	540459, 252126	High Street, Haslingfield	10.6
EWR-AQ-031	543197, 252242	A10 Cambridge Road, Hauxton	14.9

Table 6 – CS2 Project specific monitoring annual mean NO_2 concentrations for 2023.

Monitoring ID	Coordinates (X,Y)	Location description	Annual mean concentration 2023 (µg/m^3)
EWR-AQ-001	451118, 205353	St Ebbes School, White House Road, Oxford	9.5
EWR-AQ-002	451670, 206272	A420 High Street, Oxford	29.2
EWR-AQ-003	450646, 208619	A4144 Woodstock Road, Oxford	18.1
EWR-AQ-004	450845, 210186	A40 Elsfield Way, Oxford	25.6
EWR-AQ-005	449743, 210150	A40/4144 Wolvercote Roundabout, Oxford	32.0
EWR-AQ-006	452836, 207299	B4150 Marston Road, Oxford	15.9
EWR-AQ-007	450283, 213521	Bicester Road, Kidlington, Oxfordshire	20.7
EWR-AQ-008	452531, 214352	B4027 Bletchingdon Road Islip, Kidlington, Oxfordshire	14.4
EWR-AQ-009	453129, 216966	A34 Oxford Road, Gosford, Oxford	24.5
EWR-AQ-010	457599, 221681	A41 Oxford Road, Bicester	23.9

Monitoring ID	Coordinates (X,Y)	Location description	Annual mean concentration 2023 (µg/m^3)
EWR-AQ-011	458870, 222391	Launton Road, King's End, Bicester	18.7
EWR-AQ-012	460139, 222812	A4421 Charbridge Lane, Bicester	19.1
EWR-AQ-013	457438, 222380	Middle Stoney Road, Bicester Village	13.5
EWR-AQ-014	457427, 222348	Goodwood Close, Bicester Village	10.1
EWR-AQ-015	458186, 224234	B4100 Banbury Road, Woodfield, Bicester	16.0
EWR-AQ-016	457975, 221822	A41 Bicester	22.4
EWR-AQ-017	470983, 226408	Queen Catherine Road, Steeple Claydon, Buckingham	6.4
EWR-AQ-018	477192, 227548	A413 Sheep Street, Winslow, Buckingham	13.0
EWR-AQ-019	476585, 228428	A413 Buckingham Road, Buckingham	14.5
EWR-AQ-020	483860, 233369	A421 Standing Way, Bletchley, Tattenhoe, Milton Keynes	35.8
EWR-AQ-021	486940, 233583	B4034 Buckingham Road, Bletchley, Milton Keynes	30.4
EWR-AQ-022	487706, 234764	Bletcham Way, Bletchley, Milton Keynes	25.7
EWR-AQ-023	487202, 233848	Barons Close, Bletchley, Milton Keynes	15.4
EWR-AQ-024	487377, 235713	A5 Layby, Bletchley, Milton Keynes	24.3
EWR-AQ-025	485073, 239138	North Eighth Street, Milton Keynes	13.7
EWR-AQ-026	483885, 238524	A509 Elder Gate/ Portway, Milton Keynes	31.0
EWR-AQ-027	489651, 234983	V10 Brickhill Street, Caldecotte, Milton Keynes	23.1
EWR-AQ-028	488640, 237644	A421 H8 Standing Way, Kents Hill, Milton Keynes	34.0
EWR-AQ-029	496506, 237444	Station Road, Ridgmont, Bedford	14.8
EWR-AQ-030	500743, 243324	A421, Bedford	22.8
EWR-AQ-031	504064, 246976	B530 Ampthill Road, Kemptson, Bedford	28.1
EWR-AQ-032	504870, 248852	A5141 Ampthill Road, Kempston, Bedford	25.6
EWR-AQ-033	505402, 249296	Ray's Close, Bedford	14.4

5. Baseline conditions

5.1. Air quality management areas

5.1.1. Areas in which local authorities determine that the national air quality objectives are likely to be exceeded are declared as AQMAs. There are nine AQMAs to consider within 4km of the Project, presented in Table 7. All nine AQMAs have been declared for exceedances of the annual mean NO_2 objective.

5.1.2. The Project has been divided into eight route sections, these comprise of:

- Oxford to Bletchley;
- Fenny Stratford to Kempston;
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

5.1.3. All local authorities have aligned route sections as is illustrated in Table 7.

Table 7 – AQMAs within 4km of the Project.

Local authority	Name	Extent	Year declared	Distance from the Project (km)[(a)]
Oxford to Bletchley				
VWHDC	Botley AQMA	The declared area encompasses a number of properties along Westminster Way, Coles Court, Stanley Close and the A34 Southern Bypass Road, in Botley, Oxford.	2008	1.3
OCC	The City of Oxford AQMA	The declared area covers the City of Oxford.	2010	0
CDC	CDC AQMA No.3	The declared area incorporates a section of Bicester Road, to the north of its junction with Water Eaton Lane in Kidlington, Oxfordshire.	2014	0.7
	AQMA No.4	The declared area incorporates a section of Queens Avenue between Middleton Stoney Road and Banbury Road, and extends into parts of Kings End, Field Street and St Johns Street in Bicester, Oxfordshire.	2015	0.7
Fenny Stratford to Kempston				

Local authority	Name	Extent	Year declared	Distance from the Project (km)[a]
CBC	AQMA No.3 Ampthill	The declared area incorporates parts of Bedford Street, Church Street, Woburn Street, and Dunstable Street in Ampthill, Bedford.	2015	2.1
Bedford				
BBC	Bedford Town Centre AQMA	The declared area encompasses the majority of properties within Bedford Town Centre and spans east from Bedford railway station to Brookfield Road and south from Manton Lane to Offa Road in Bedford.	2009	0
Clapham Green to Colesden				
CBC	AQMA No.4 Sandy[b]	The declared area incorporates a section of the A1 London Road adjacent to Sandy from Georgetown Road and spans south along London Road to Sandy Roundabout.	2015	3.9
Roxton to east of St Neots				
HDC	St Neots AQMA	The declared area incorporates the junction of the B1428 High Street, with the B1041 New Street and South Street in St Neots, Huntingdonshire.	2005	2.0
Croxton to Toft				
There are no AQMAs in close proximity to the Project within Croxton to Toft. The nearest AQMAs are within CCC and HDC.				
Comberton to Shelford				
There are no AQMAs in close proximity to the Project within Comberton to Shelford. The nearest AQMA is within CCC.				
Cambridge				
CCC	Cambridge AQMA	The declared area encompasses the inner ring road of Cambridge and all the land within it (including a buffer zone around the ring road and its junctions with main feeder roads). This is a city-wide designation.	2004	0

Source: https://uk-air.defra.gov.uk/aqma/list
Notes: (a) Where distance to the Project is zero (0), the Project intersects the AQMA.
(b) AQMA declared for both the 1-hour and annual mean NO_2 objective.

5.2. Local authority monitoring

5.2.1. Air quality monitoring locations in each of the route sections are shown in Figures 2-10 in EIA Scoping - Figures. The Project crosses nine local authority boundaries with eight undertaking automatic monitoring of NO_2 and all nine undertaking passive NO_2 diffusion tube monitoring within their administrative boundaries. Monitoring of PM_{10} and $PM_{2.5}$ is also undertaken by five of the local authorities.

5.2.2. SO_2 monitoring is not undertaken by any of the local authorities. However, it should be noted that diesel trains can elevate short-term SO_2 concentrations near railway stations, tracks and depots. The Project may contribute to rail emissions of SO_2. As such, Defra background concentrations of SO_2 are presented in Section 5.8.

5.2.3. The most recent full year of monitoring data available for all of the local authorities is for 2022 at the time of writing. Monitoring data for 2020 and 2021 is unlikely to be representative of 'normal' conditions at the monitoring sites, due to the effects associated with the coronavirus pandemic such as reductions in traffic movements resulting in reduced monitored pollutant concentrations. Therefore, the monitoring data is presented for reference only. Local authority monitoring data for 2022 is considered to be representative of 'normal conditions' (i.e. not affected by travel restrictions imposed during the coronavirus pandemic) and as such have been used to inform the baseline.

5.3. Automatic monitoring

5.3.1. There are 20 automatic monitoring locations across the nine local authorities. To establish a long-term trend, summaries of the annual mean NO_2 automatic monitoring data from each local authority from the last five years has been provided for each route section. Where available, automatic monitoring results for PM_{10} and $PM_{2.5}$ are also presented. Some local authorities extend across more than one route section and as such local authorities are assigned to the route section that has the majority of monitoring points. Table 8 to Table 23 present all of the available NO_2, PM_{10} and $PM_{2.5}$ monitoring data within each local authority's administrative boundary.

5.3.2. The tables presenting NO_2 concentrations demonstrate that the annual mean NO_2 objective was met at all of the automatic monitoring stations in every route section in 2022. The most recent occurrences of monitored concentrations above the relevant air quality objectives were recorded at CM1 and CM2 by OCC within the Oxford to Bletchley route section in 2019. The highest recorded annual mean NO_2 concentration in 2022 was 34µg/m^3 in Bedford at the CM1 monitor which is a roadside site on Prebend Street, Bedford within the Bedford

Town Centre AQMA. The long-term trend of the monitoring shows a general decrease in concentrations at most monitoring sites in all route sections since 2018. The 1-hour mean objective of 200µg/m^3 (not to be exceeded more than 18 times per year) has been met during this time.

5.3.3. The monitored annual mean PM_{10} concentrations within each local authority show that the annual mean PM_{10} objective of 40µg/m^3 was met between 2018 to 2022 and that monitoring shows a generally decreasing trend in annual mean PM_{10} concentrations at most monitoring sites since 2018. The 24-hour mean PM_{10} objective was met at all monitoring sites between 2018 and 2022 within all route sections.

5.3.4. All monitored $PM_{2.5}$ concentrations met the annual mean objective of 20µg/m^3 between 2018 to 2022. Furthermore, the annual mean $PM_{2.5}$ concentrations are also within the target objectives of 12µg/m^3 by 2028 and 10µg/m^3 by 2040 at most of the monitoring locations. There is a generally decreasing trend in recorded $PM_{2.5}$ concentrations. The highest concentration recorded in 2022 was 15µg/m^3, which was recorded at CM1 by CCC in Cambridge.

Oxford to Bletchley

5.3.5. The following summarises automatic monitoring for local authorities from Oxford to Bletchley.

Table 8 – Annual and hourly mean NO_2 automatic monitoring results for local authorities from Oxford to Bletchley.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)	Annual mean NO_2 concentrations (µg/m^3) with number of hourly means >200µg/m^3 in brackets				
			X	Y		2018	2019	2020	2021	2022
Oxford City Council										
CM1	Roadside	0.7	451359	206157	100	39 (1)	**42** (3)	28 (0)	33 (0)	33 (1)
CM2	Roadside	1.0	451677	206272	100	38 (0)	**40** (2)	26 (1)	30 (0)	31 (0)
CM3	Urban Background	0.5	451118	205353	100	15 (0)	16 (0)	11 (0)	11 (0)	12 (0)
Buckinghamshire Council										
CM1	Suburban	26.0	476604	195436	97	29 (0)	29 (0)	21 (0)	18 (0)	19 (0)
CM2	Roadside	32.0	486352	192478	97	-	-	23 (0)	26 (0)	28 (0)

Notes: NO_2 1-hour mean objective of 200µg/m^3 is not to be exceeded more than 18 times per year.
All exceedances are highlighted in **bold**.

Table 9 – Annual and daily mean PM_{10} automatic monitoring results for local authorities from Oxford to Bletchley.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)	Annual mean PM_{10} concentrations (µg/m^3) with number of daily means >50µg/m^3 in brackets				
			X	Y		2018	2019	2020	2021	2022
Oxford City Council										
CM2	Roadside	1.0	451677	206272	77	18 (0)	19 (7)	16 (0)	14 (0)	16 (2)
CM3	Urban Background	0.5	451118	205353	100	12 (1)	14 (5)	11 (0)	11 (1)	12 (0)

Notes: PM_{10} 24-hour mean objective of 50µg/m^3 is not to be exceeded more than 35 times per year.
All exceedances are highlighted in **bold**.

Table 10 – Annual mean $PM_{2.5}$ automatic monitoring results for local authorities from Oxford to Bletchley.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[(a)]	Annual mean $PM_{2.5}$ concentration (µg/m^3)				
			X	Y		2018	2019	2020	2021	2022
Oxford City Council										
CM2	Roadside	1.0	451677	206272	41	-	-	-	-	6
CM3	Urban Background	0.5	451118	205353	100	10	9	7	7	7

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22

Fenny Stratford to Kempston

5.3.6. The following summarises automatic monitoring for local authorities within Fenny Stratford to Kempston.

Table 11 – Annual and hourly mean NO_2 automatic monitoring results for local authorities from Fenny Stratford to Kempston.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean NO_2 concentrations ($\mu g/m^3$) with number of hourly means >200$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
Central Bedfordshire Council										
MD3	Roadside	4.7	516436	249600	98	27 (2)	28 (0)	20 (0)	20 (0)	20 (0)
Milton Keynes Council										
Fixed	Urban Centre	3.9	485070	239131	88	16 (0)	24 (0)	16 (0)	17 (0)	12 (0)
Roadbox 1	Roadside	7.9	486290	243344	89	26 (0)	27 (0)	24 (0)	30 (0)	25 (0)
Roadbox 2	Roadside	13.6	488922	251157	78	20 (0)	24 (0)	18 (0)	18 (0)	16 (0)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22
NO_2 1-hour mean objective of 200$\mu g/m^3$ is not to be exceeded more than 18 times per year.
All exceedances are highlighted in **bold**.

Table 12 – Annual and daily mean PM_{10} automatic monitoring results for local authorities from Fenny Stratford to Kempston.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean PM_{10} concentrations ($\mu g/m^3$) with number of daily means >50$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
Central Bedfordshire Council										
MD3	Roadside	4.7	516436	249600	88	18 (1)	18 (4)	17 (0)	16 (0)	17 (2)
Milton Keynes Council										
Fixed	Urban Centre	3.9	485070	239131	98	15 (1)	16 (10)	12 (0)	12 (1)	12 (1)

Notes: PM_{10} 24-hour mean objective of 50$\mu g/m^3$ is not to be exceeded more than 35 times per year.
All exceedances are highlighted in **bold.**

Table 13 – Annual mean $PM_{2.5}$ automatic monitoring results for local authorities from Fenny Stratford to Kempston.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean $PM_{2.5}$ concentration ($\mu g/m^3$)				
			X	Y		2018	2019	2020	2021	2022
Central Bedfordshire Council										
MD3	Roadside	4.7	516436	249600	87	13	10	9	9	8
Milton Keynes Council										
Fixed	Urban Centre	3.9	485070	239131	98	-	11	8	8	8

Bedford

5.3.7. The following summarises automatic monitoring for local authorities from Bedford. Local authorities in Bedford did not undertake any PM_{10} or $PM_{2.5}$ monitoring.

Table 14 – Annual and hourly mean NO_2 automatic monitoring results for local authorities from Bedford.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)	Annual mean NO_2 concentrations ($\mu g/m^3$) with number of hourly means >200$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
Bedford Borough Council										
CM1	Roadside	0.1	504496	249625	92	29 (0)	32 (0)	26 (0)	32 (0)	34 (0)
CM2	Roadside	0.7	505044	249980	87	26 (0)	30 (0)	21 (0)	18 (0)	21 (0)

Notes: NO_2 1-hour mean objective of 200$\mu g/m^3$ is not to be exceeded more than 18 times per year.
All exceedances are highlighted in **bold**.

Clapham Green to Colesden

5.3.8. There is no local authority automatic monitoring within Clapham Green to Colesden.

Roxton to east of St Neots

5.3.9. The following summarises automatic monitoring for local authorities from Roxton to east of St Neots.

Table 15 – Annual and hourly mean NO_2 automatic monitoring results for local authorities from Roxton to east of St Neots.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean NO_2 concentrations ($\mu g/m^3$) with number of hourly means >200$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
Huntingdonshire District Council										
PFH	Roadside	10.1	524102	271540	74	28 (0)	37 (0)	25 (0)	27 (0)	28 (0)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22
NO_2 1-hour mean objective of 200$\mu g/m^3$ is not to be exceeded more than 18 times per year.
All exceedances are highlighted in **bold**.

Table 16 – Annual and daily mean PM_{10} automatic monitoring results for local authorities from Roxton to east of St Neots.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean PM_{10} concentrations ($\mu g/m^3$) with number of daily means >50$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
Huntingdonshire District Council										
PFH	Roadside	10.1	524102	271540	63	-	16 (0)	14 (0)	15 (1)	15 (1)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22
PM_{10} 24-hour mean objective of 50$\mu g/m^3$ is not to be exceeded more than 35 times per year.
All exceedances are highlighted in **bold.**

Table 17 – Annual mean $PM_{2.5}$ automatic monitoring results for local authorities from Roxton to east of St Neots.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean $PM_{2.5}$ concentration ($\mu g/m^3$)				
			X	Y		2018	2019	2020	2021	2022
Huntingdonshire District Council										
PFH	Roadside	10.1	524102	271540	63	12	9	8	8	8

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22

Croxton to Toft

5.3.10. There is no local authority automatic monitoring from Croxton to Toft.

Comberton to Shelford

5.3.11. The following summarises automatic monitoring for local authorities from Comberton to Shelford.

Table 18 – Annual and hourly mean NO_2 automatic monitoring results for local authorities from Comberton to Shelford.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean NO_2 concentrations ($\mu g/m^3$) with number of hourly means >200$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
South Cambridgeshire District Council										
IMP	Roadside	3.8	543739	261625	92	19 (0)	16 (0)	13 (0)	16 (0)	16 (0)
ORCH	Urban Background	3.0	544558	261579	90	14 (0)	15 (0)	11 (0)	11 (0)	12 (0)
GIRT	Roadside	4.5	542676	260667	36	18 (0)	17 (0)	12 (0)	12 (0)	13 (0)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22
NO_2 1-hour mean objective of 200$\mu g/m^3$ is not to be exceeded more than 18 times per year.
All exceedances are highlighted in **bold**.

Table 19 – Annual and daily mean PM_{10} automatic monitoring results for local authorities from Comberton to Shelford.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean PM_{10} concentrations ($\mu g/m^3$) with number of daily means >50$\mu g/m^3$ in brackets				
			X	Y		2018	2019	2020	2021	2022
South Cambridgeshire District Council										
IMP	Roadside	3.8	543739	261625	80	17 (1)	16 (2)	15 (0)	15 (0)	18 (2)
ORCH	Urban Background	3.0	544558	261579	62	14 (1)	14 (1)	12 (0)	12 (0)	13 (0)
GIRT	Roadside	4.5	542676	260667	35	17 (1)	17 (3)	14 (0)	15 (0)	15 (0)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22
PM_{10} 24-hour mean objective of 50$\mu g/m^3$ is not to be exceeded more than 35 times per year.
All exceedances are highlighted in **bold.**

Table 20 – Annual mean $PM_{2.5}$ automatic monitoring results for local authorities from Comberton to Shelford.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[a]	Annual mean $PM_{2.5}$ concentration ($\mu g/m^3$)				
			X	Y		2018	2019	2020	2021	2022
South Cambridgeshire District Council										
ORCH	Urban Background	3.0	544558	261579	72	-	-	13	12	12
IMP	Roadside	3.8	542676	260667	26	11	11	10	13	8

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22

Cambridge

5.3.12. The following summarises automatic monitoring for local authorities from Cambridge.

Table 21 – Annual and hourly mean NO_2 automatic monitoring results for local authorities from Cambridge.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)[(a)]	Annual mean NO_2 concentrations (µg/m^3) with number of hourly means >200µg/m^3 in brackets				
			X	Y		2018	2019	2020	2021	2022
Cambridge City Council										
CM1 Gonville Place	Roadside	0.8	545508	257828	36	30 (0)	28 (0)	20 (0)	21 (0)	22 (0)
CM2 Montague Road	Roadside	1.0	546057	259487	99	25 (1)	22 (0)	16 (0)	18 (1)	18 (0)
CM3 New Market Road	Roadside	0.4	546317	258900	89	25 (0)	22 (0)	18 (0)	20 (0)	17 (0)
CM4 Parker Street	Roadside	1.1	545366	258391	93	32 (0)	33 (0)	24 (0)	23 (0)	24 (0)
CM5 Regent Street	Roadside	1.1	545289	258118	96	26 (0)	27 (0)	22 (0)	23 (0)	24 (0)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22
NO_2 1-hour mean objective of 200µg/m^3 is not to be exceeded more than 18 times per year.
All exceedances are highlighted in **bold**.

Table 22 – Annual and daily mean PM_{10} automatic monitoring results for local authorities from Cambridge.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)	Annual mean PM_{10} concentrations (µg/m^3) with number of daily means >50µg/m^3 in brackets				
			X	Y		2018	2019	2020	2021	2022
Cambridge City Council										
CM1 Gonville Place	Roadside	0.8	545508	257828	33	19 (1)	19 (2)	15 (0)	14 (0)	16 (1)
CM2 Montague Road	Roadside	1.0	546057	259487	99	21 (1)	22 (6)	19 (0)	15 (0)	17 (0)
CM4 Parker Street	Roadside	1.1	545366	258391	99	23 (1)	21 (5)	17 (0)	18 (2)	21 (2)

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22

PM_{10} 24-hour mean objective of 50µg/m^3 is not to be exceeded more than 35 times per year.
All exceedances are highlighted in **bold.**

Table 23 – Annual mean $PM_{2.5}$ automatic monitoring results for local authorities from Cambridge.

Site ID	Site type	Approx. distance to Project (km)	National grid reference		Data capture 2022 (%)	Annual mean $PM_{2.5}$ concentration (µg/m^3)				
			X	Y		2018	2019	2020	2021	2022
Cambridge City Council										
CM1 Gonville Place	Roadside	0.8	545508	257828	32	15	14	11	12	15
CM3 New Market Road	Roadside	0.4	546317	258900	82	10	10	8	8	7

Notes: (a) Annualisation has been conducted where data capture <75% and >25% in line with TG22

5.4. Passive monitoring

5.4.1. There are more than 500 passive NO_2 diffusion tube monitoring locations across the nine local authorities. A summary of the range of concentrations within each local authority and monitoring type is provided in Table 24 showing monitoring data from 2022.

5.4.2. The diffusion tube results show that there have been monitored exceedances of the annual mean NO_2 objective at several locations in the Oxford to Bletchley within the BC, CDC, and OCC administrative boundaries in 2022.

5.4.3. There were two monitored exceedances of the annual mean NO_2 objective recorded within CDC. Annual mean NO_2 concentrations of 67.1µg/m^3 and 62.1µg/m^3 were measured in 2022 within CDC which exceeded the annual mean NO_2 objective of 40µg/m^3 and indicatively exceeded the 1-hour objective of 200µg/m^3. These monitors are located adjacent to the A422 Hennef Way, Banbury and are also situated within AQMA No.1. This AQMA incorporates Hennef Way between the junctions with Ermont Way and Concorde Avenue and is declared for exceedances of the one hour and annual mean NO_2 air quality objectives. The next highest monitored annual mean NO_2 concentration within CDC is 33.7µg/m^3 and therefore does not exceed the annual mean objective of 40µg/m^3.

5.4.4. There was one monitored exceedance of the annual mean NO_2 objective recorded within BC. An annual mean NO_2 concentration of 41.6µg/m^3 was

measured in 2022 at a site located within the Friarage AQMA adjacent to the A41 (Friarage Road) in the town of Aylesbury, which exceeds the annual mean air quality objective of 40µg/m^3. The monitoring site is at a location of relevant exposure and was commissioned in 2022 to help adequate monitoring of the AQMA. Therefore, only monitoring data for 2022 is currently available at this location. However, the long-term monitoring undertaken at another monitoring site on the A41 (Friarage Road) approximately 180m away showed a decrease in concentrations since 2018 and measured an NO_2 concentration of 38.6µg/m^3 in 2022.

5.4.5. There was one monitored exceedance of the annual mean NO_2 objective recorded within OCC at locations of relevant exposure. An annual mean NO_2 concentration of 43µg/m^3 was measured in 2022 at a pedestrian crossing on St Clements Street in the centre of Oxford. Additionally, OCC has declared a citywide AQMA for exceedances of the annual mean NO_2 objective. There were no further monitored exceedances of the relevant air quality objectives within OCC.

5.4.6. Other notably elevated concentrations of annual mean NO_2 (those above 35µg/m^3 but below 40µg/m^3) recorded at monitoring sites within these local authorities were all measured at roadside, kerbside and urban centre locations where complex or busy junctions, pedestrian crossings and proximity to primary roads or motorways were characteristic of the monitoring sites' surroundings.

Table 24 – Summary of all local authority NO_2 diffusion tube monitoring for the Project in 2022.

Local authority	Annual mean NO_2 concentration 2022 (µg/m^3)					
	Urban centre	Urban background	Roadside	Kerbside	Rural	Suburban
Oxford to Bletchley						
OCC	-	9.0 – 13.0	10.0 – **43.0**	-	-	-
CDC	-	9.2 – 13.4	16.6 – **67.1**	18.1 – 31.8	-	-
BC	18.4 – 35.2	8.6 – 21.1	10.4 – **41.6**	27.6 – 29.9	-	18.4 – 21.2
Fenny Stratford to Kempston						
MKC	13.1	12.0 – 20.0	10.3 – 39.1	16.0 – 18.3	-	6.7 – 15.1
CBC	-	-	14.9 – 24.2	15.3 – 38.5	-	-
Bedford						
BBC	25.2 – 35.8	23.7	13.5 – 39.4	23.1 – 26.9	-	10.8 – 18.7
Clapham Green to Colesden						
There is no local authority NO_2 diffusion tube monitoring within Clapham Green to Colesden						

Local authority	Annual mean NO_2 concentration 2022 (µg/m^3)					
	Urban centre	Urban background	Roadside	Kerbside	Rural	Suburban
Roxton to east of St Neots						
HDC	-	11.2 – 13.4	10.7 – 28.2	13.9 – 23.2	10.6 – 13.2	9.1 – 17.6
Croxton to Toft						
SCDC	-	9.2	10.3 – 11.2	-	-	-
Comberton to Shelford						
SCDC	-	8.0 – 17.1	10.3 – 19.9	-	-	-
Cambridge						
CCC	-	8.6 – 14.7	13.8 – 30.7	13.6 – 29.1	-	-

Note: Exceedances are highlighted in **bold**.

5.5. Local emission sources

5.5.1. A review of the Environment Agency's public register[38] found there to be 152 permitted installations across the ten local authorities. A thorough review of these installations will be required to determine the likelihood of significant impacts on surrounding air quality from the cumulative operation of the Project and nearby industrial installations. However, it is anticipated that where installations are regulated and require an environmental permit to operate, they would be captured by the National Atmospheric Emissions Inventory and as such included in Defra's air quality modelling. Therefore, these emissions will be incorporated into the Project background concentrations presented in section 5.7.1.

5.6. Summary of existing baseline

5.6.1. The baseline assessment indicates that there have been a number of exceedances of the annual mean NO_2 objectives within the local authorities in 2022. However, these exceedances were recorded at highly localised areas representative of urban traffic at congested junctions. Additionally, there have been no recorded exceedances of the annual mean PM_{10} or $PM_{2.5}$ objectives at any monitoring site since 2018.

5.6.2. There have been no exceedances of the 1-hour mean NO_2 or 24-hour mean PM_{10} objectives recorded at any of the monitoring sites in the vicinity of the

[38] Environment Agency. Available at https://environment.data.gov.uk/public-register/view/search-industrial-installations

Project in the last six years. Furthermore, while the $PM_{2.5}$ interim target of 12µg/m^3 by 2028 is not legally binding, and the annual mean target of 10µg/m^3 does not need to be met until 2040, the target objectives have been achieved at most of the monitoring locations within each route section.

5.7. Future baseline

5.7.1. Ambient pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ are generally predicted to decrease into the future, due to uptake of cleaner vehicles and technologies. As such, it is considered that air quality conditions at the Project and surrounds would improve in future years. Reductions in pollutant concentrations within local authority AQMAs may also arise from successful implementation of local interventions and strategies within Air Quality Action Plans.

5.7.2. Any committed developments with the potential to generate traffic will be accounted for within the traffic model that is developed for the Project. As such, the future baseline will include relevant committed development and would form part of the baseline for assessment within the ES.

5.7.3. Currently, Defra provides estimates of background pollutant concentrations for all years between 2018 and 2030. The 2030 background pollutant concentrations would be applied to future assessment years beyond 2030. However, should Defra release new background pollutant concentration datasets with additional future years, the appropriate assessment year would be adopted instead of 2030.

5.7.4. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the Project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, such events, and extreme cold snaps remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.7.5. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate baseline.

5.7.6. The potential air quality impacts in combination with climate change are discussed further in paragraphs 7.1.6 to 7.1.8 for the operation phase and

7.2.10 to 7.2.12 for the construction phase in relation to its consideration within the assessment of future air quality and mitigation.

5.8. Defra projected background concentrations

5.8.1. Total air pollutant concentrations comprise a background and local component; both of which have to be independently considered for the air quality assessment. The background component is determined by regional, national and international emissions, and often represents a significant proportion of the total pollutant concentration. The local component is affected by emissions from sources such as roads and chimney stacks, which are less well mixed locally, and add to the background concentration.

5.8.2. Defra provides estimates of background pollutant concentrations for NO_X, NO_2, PM_{10}, $PM_{2.5}$ for each 1km x 1km grid square across the UK for all years between 2021 and 2040 and for SO_2 for the previous calendar year. Future year projections have been developed from the base year of the background maps which is currently 2021. Defra background concentrations are averaged over a wide area (1km x 1km) and provide a broad indication of air quality in the study area in both current and future years.

5.8.3. Table 25 presents the ranges of background concentrations for the 1km x 1km grid squares which overlap with the Project for the current year of 2024 for each local authority, except SO_2 which is presented for the year 2023 (the latest year of available data at the time of writing). The Project covers numerous 1km x 1km grid squares. The maximum background concentrations at the Project are well below the relevant air quality objectives.

5.8.4. The Defra background concentration also meets the interim target of 12µg/m^3 by 2028 and the new long-term $PM_{2.5}$ air quality target of 10µg/m^3 by 2040.

Table 25 – Defra projected background concentrations 2024 (µg/m^3).

Local authority	Projected background concentration range 2024 (µg/m^3)				
	NO_2	NO_X	PM_{10}	$PM_{2.5}$	SO_2[(a)]
Oxford to Bletchley					
OCC	8.1 - 12.5	10.4 - 16.8	13.1 - 16.2	6.8 - 7.6	1.0 - 1.4
CDC	6.0 - 9.4	7.5 - 12.2	12.8 - 16.7	6.5 - 7.4	0.8 - 2
BC	5.6 - 8.7	7.1 - 11.3	12.3 - 14.5	6.3 - 7.8	0.7 - 2.3
Fenny Stratford to Kempston					
MKC	7.6 - 11.7	9.8 - 15.6	13.2 - 14.9	6.8 - 7.5	1.4 - 2.5
CBC	6.3 - 12.5	8.0 - 16.6	11.8 - 16.1	6.4 - 8.5	1.0 - 2.1
Bedford					

Local authority	Projected background concentration range 2024 (µg/m^3)				
	NO_2	NO_X	PM_{10}	$PM_{2.5}$	SO_2[(a)]
BBC	6.0 - 10.7	7.6 - 14.1	11.6 - 14.8	6.4 - 7.6	1.0 - 3.1
Clapham Green to Colesden					
BBC[(b)]	6.0 - 10.7	7.6 - 14.1	11.6 - 14.8	6.4 - 7.6	1.0 - 3.1
Roxton to east of St Neots					
HDC	5.5 - 8.7	6.9 - 11.3	12.2 - 14.6	6.2 - 7.3	0.8 - 1.9
Croxton to Toft					
SCDC/HDC[(c)]	5.2 - 9.6	6.5 - 12.5	10.9 - 14.6	6.1 - 6.9	0.8 - 1.9
Comberton to Shelford					
SCDC	5.2 - 9.6	6.5 - 12.5	10.9 - 14.6	6.1 - 6.9	0.8 - 1.6
Cambridge					
CCC	6.9 – 10.0	8.7 - 13	11.6 - 13.8	6.7 - 7.6	1.1 - 2.3

Source: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018 and https://uk-air.defra.gov.uk/data/pcm-data
Note:
(a) The latest background map for SO_2 is 2023.
(b) The Clapham Green to Colesden is completely within BBC and therefore concentrations are the same as the Bedford.
(c) Both HDC and SCDC are within the Croxton to Toft. The NO_2, NOx concentrations are presented are for SCDC. PM_{10}, $PM_{2.5}$ and SO_2 concentrations are from HDC. These are the largest background concentrations and range from each of the two local authorities.

5.9. Pollution climate mapping

5.9.1. Defra uses the pollution climate mapping (PCM) model[39] to report compliance with limit values on an annual basis as required by the UK's Air Quality Standards Regulations (2010)[2] and the Environment Act (2021)[8]. PCM projections are available for all years from 2021 to 2040 and these are derived from the base year of 2021. The PCM model predicts that pollutant concentrations associated with road traffic emissions will decline in the future, mainly in response to cleaner vehicles and technologies, and actions in Defra's air quality action plan[40]. The most recent PCM model was published in 2020.

5.9.2. A summary of the maximum concentrations on PCM links[41] that overlap with the roads included within the validated strategic traffic model for each local authority within the relevant route section is presented in Table 26. The PCM link with the largest modelled NO_2 concentration of 31.5µg/m^3 in 2024 is the

[39] Defra (2018) National pollution climate mapping (PCM) modelled background concentrations [online] available at: data.gov.uk (last accessed July 2022).
[40] Defra, Air quality plan for nitrogen dioxide in UK (2017) [online] available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017 ://laqm.defra.gov.uk/aqap/ (last accessed October 2024).
[41] PCM links are specific roads included in the model.

A34 Southern By-Pass Road (Census ID: 802077436), Botley, Oxfordshire (within VWHDC).

Table 26 – Maximum NO_2 concentrations predicted by the PCM model close to the Project (µg/m^3).

Route section	Local authority	Maximum PCM NO_2 concentration 2024 (µg/m^3)
Oxford to Bletchley	WODC	14.5
	VWHDC	31.5
	OCC	27.4
	CDC	20.6
	AVDC	21.4
Fenny Stratford to Kempston	MKC	22.0
	CBC	21.9
Bedford	BBC	21.4
Clapham Green to Colesden	BBC	21.4
Roxton to east of St Neots	HDC	20.5
Croxton to Toft	HDC	20.5
Comberton to Shelford	SCDC	13.0
Cambridge	CCC	20.9

6. Sources of impact

6.1.1. The following potential sources of impacts on local air quality have been identified:

- Exhaust emissions of NO_2, PM_{10}, $PM_{2.5}$ and NH_3 from road traffic during operational phase from traffic generated, displaced or reduced from modal shift during the operational phase associated with new and existing stations, relocations or closure of stations, road closures, new roads or alteration in passengers using train services;
- Exhaust emissions of SO_2 and NO_2 from diesel trains using the Project (including idling) during the operational phase;
- Exhaust emissions of NO_2 from any proposed combustion sources (e.g., for heating and cooling of facilities) during the operational phase;
- Construction activities with potential to generate dust;
- Exhaust emissions of NO_2, PM_{10}, $PM_{2.5}$ from construction plant and NRMM during the construction phase; and
- Exhaust emissions of NO_2, PM_{10}, $PM_{2.5}$ and NH_3 from road traffic during the construction phase including the Project associated heavy goods vehicles and workers vehicles on the road network as well as rerouting of existing traffic.

7. Potential impacts and effects

7.1. Potential permanent and operational effects

7.1.1. A list of the potential permanent impacts and effects is provided in Table 27.

Table 27 – Potential permanent impacts and effects.

Receptor	Impact	Description of likely effect	Activity
Human and ecological receptors	Change in emissions to air at sensitive human health and ecological receptors from operational phase road traffic leading to a change in air pollutant concentrations and nitrogen deposition.	Effect on human health receptors due to a change in air pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) Effect on ecological receptors due to a change in atmospheric NO_X and nitrogen deposition from NO_2 and NH_3.	Change in traffic flows due to additional commuters, new stations and roads, relocations or closure of stations and roads, or alteration in passengers using train services.
Human and ecological receptors	Change in emissions to air at sensitive human health and ecological receptors from operational phase diesel freight trains leading to a change in air pollutant concentrations and nitrogen/acid deposition.	Effect on human health receptors due to a change in air pollutant concentrations (NO_2 and SO_2) Effect on ecological receptors due to a change in atmospheric NO_X, SO_2 and a change in nitrogen deposition and acid deposition.	Operation of diesel trains on the railway.
Human and ecological receptors	Change in emission to air from any proposed combustion sources (e.g., for heating and cooling of facilities) during the operational phase leading to a change in air pollutant concentrations and nitrogen deposition.	Effect on human health receptors due to a change in air pollutant concentrations (NO_2). Effect on ecological receptors due to a change in atmospheric NO_X and nitrogen deposition from NO_2 and NH_3.	For meeting heating and cooling requirements of facilities such as railway stations.

Operational road traffic

7.1.2. A detailed quantitative assessment of the effects of vehicle exhaust emissions on local air quality will be undertaken based on the outputs of detailed transport modelling undertaken for the Project. Dispersion modelling will be undertaken using the latest version of ADMS-Roads where operational phase traffic flows exceed the screening criteria presented in section 3.5.3.

7.1.3. To manage uncertainties and assumptions, the dispersion model outputs will be verified against local authority monitoring and the model calibrated where required in line with the LAQM TG22 guidance.

Operational diesel trains

7.1.4. An assessment of the effects of diesel train exhaust emissions will be undertaken where the screening criteria outlined in section 3.5 is met. Should further assessment of emissions from diesel trains be required, any approach to quantitative assessment would be agreed in consultation with relevant statutory consultees and the Rail Safety and Standards Board (RSSB).

Operational combustion sources

7.1.5. Emissions to air from combustion sources are unlikely to have significant impacts on air quality. The Project intent is to establish an energy strategy that eliminates the use of combustion sources for meeting the heating and cooling requirements of facilities. As such, emissions from combustion sources are scoped out and will not be assessed further.

Operational impacts in-combination with climate change

7.1.6. Due to climate change, future meteorological conditions are expected to vary from existing conditions. There is limited evidence on whether this would increase or decrease the impacts of pollutant emissions from transport sources such as road traffic and diesel-powered trains. Climate change could lead to changes in key meteorological parameters used for dispersion modelling of air emissions, including ambient temperature, atmospheric stability and wind patterns/direction.

7.1.7. Baseline air quality may also be affected by climate change; for example, there could be higher PM_{10} and $PM_{2.5}$ background concentrations in summer months due to longer periods of hot dry weather and droughts or changes to emissions of NOx from combustion-based energy sources due to increased air conditioning/cooling equipment. This would be offset by an increased proportion of energy being supplied by renewable sources in efforts to address climate change.

7.1.8. As assessment of operational phase sources would rely on dispersion modelling and determination of background concentrations, there is uncertainty in how the accuracy of model predictions will be affected by climate change. Given the uncertainty in future atmospheric conditions, it is not possible to specifically assess air quality using future climate conditions; however, the approach will be based on the latest guidance from Defra and the IAQM for undertaking the air quality assessment, including use of background pollution data in future years. A conservative approach will be adopted where practicable to improve the robustness of any model predictions.

7.2. Potential temporary construction effects

7.2.1. A list of the temporary impacts and effects is provided in Table 28.

Table 28 – Potential temporary impacts and effects.

Receptor	Impact	Description of likely effect	Activity
Human and ecological receptors	Deposition of construction dust at sensitive human health and ecological receptors.	Dust soiling and health/amenity effects from increased PM_{10} and $PM_{2.5}$ concentrations at human and ecological receptors.	Activities including demolition, earthworks, construction and track out. This could include, but is not limited to, work to existing stations, erection of new infrastructure such as rail tracks, roads and bridges, restructuring and creating new cuttings, culverts and embankments, and road realignments. Could also include borrow pits used to obtain material for construction e.g., embankments for the Project.
Human and ecological receptors	Change in emissions to air from site plant i.e. NRMM leading to a change in air pollutant concentrations and nitrogen deposition.	Effect on human health receptors due to a change in air pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) Effect on ecological receptors due to a change in atmospheric NO_X and nitrogen deposition from NO_2 and NH_3.	Operation of NRMM within construction areas.
Human and ecological receptors	Emissions to air from construction phase traffic at sensitive human health and ecological receptors leading to a change in	Effect on human health due to a change in air pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) Effect on ecological receptors due to a change in	Construction vehicle movements needed for activities such as: Movement of material between work sites (mass haul).

Receptor	Impact	Description of likely effect	Activity
	air pollutant concentrations and nitrogen deposition.	atmospheric NO_X and nitrogen deposition from NO_2 and NH_3.	Delivery of materials to construction areas. Construction workers travelling to and from site. Rerouting of existing traffic due to traffic management.

Construction dust

7.2.2. The construction dust assessment will be carried out using the risk-based approach outlined in the IAQM construction dust guidance, which assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and trackout.

7.2.3. As the design progresses, a preliminary assessment of construction dust will be undertaken to define the risk of construction dust impacts in the surrounding areas of the Project. As the Project is long and linear in nature it will pass through both rural and urban areas with differing levels of sensitivity and therefore risk. As such, the approach outlined below is considered to be the most suitable for identifying risk associated with construction activities:

- The identification of emission sources and construction activities and the estimation of their potential dust emission magnitude;
- Defining the sensitivity of the surrounding area based on the sensitivity of receptors in conjunction with their distance from dust emission sources;
- Defining the risk of impacts, considering the potential dust emission magnitude and sensitivity of the surrounding areas; and
- The definition of appropriate best practice mitigation measures where necessary, proportionate to the identified risk level.

7.2.4. General best practice measures will be included within the code of construction practice (CoCP) for areas identified as low and medium risk. With the implementation of these measures, the risk would be reduced to a level where the impacts would be negligible and as such, these areas would be scoped out for further assessment in the ES.

7.2.5. The areas identified as high risk, which would likely include moderate to densely populated urban settlements where the number of sensitive receptors is higher, will require additional best practice and site-specific mitigation measures to be included within the CoCP in order to reduce impacts. The ES would focus on the high-risk areas to identify the additional best practice measures required and any residual effects.

7.2.6. Should borrow pits form part of the construction phase of the Project, the IAQM mineral dust guidance[19] will be used to assess the risk of potential dust and PM_{10} impacts from these sources.

Site plant

7.2.7. IAQM guidance on the assessment of dust from demolition and construction[17] notes that '*experience of assessing the exhaust emissions from on-site plant (NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed*'. Generally, effects of construction plant emissions on local air quality are considered of negligible impact relative to the existing background concentrations, which include contributions from other sources such as road traffic. Therefore, it is proposed to scope out from the EIA the assessment of NRMM emissions. However, given the scale of the construction works, where suitable information is available as design progresses, the location and number of site plant used during working hours will be reviewed with respect to baseline conditions and distance to nearby receptors. The qualitative review will be undertaken to support the scoping out assessment by confirming that significant effects are unlikely to occur based upon professional judgement.

Construction road traffic

7.2.8. A detailed quantitative assessment of the effects of vehicle exhaust emissions on local air quality will be undertaken based on the outputs of detailed transport modelling undertaken for the Project. Dispersion modelling will be undertaken using the latest version of ADMS-Roads where construction phase traffic flows exceed the screening criteria presented in section 3.5.3 and where construction activities are programmed to last for more than two years.

7.2.9. Where the duration of construction activities is less than two years it is unlikely that the construction activities would constitute a significant air quality effect given the short-term duration as opposed to the long-term operation of the Project.

Construction impacts in-combination with climate change

7.2.10. Due to climate change, future climate conditions, together with the air quality impacts of the Project on human health and ecological receptors, may exacerbate or, in some cases, ameliorate the significance of the Project construction phase effects.

7.2.11. The effects of climate change may increase the dust raising potential from construction activities due to projected longer drier periods in summer, and

thereby increase the deposition of construction dust at sensitive human health and ecological receptors. The construction phase would occur over the relatively short-term in climate change terms, and projections of changes are relatively small over this period. However, the effects of climate change have been observed in recent years with evidence of overall warming, warmer winters and summers and increased frequency of heatwaves. On this basis, the potential for increased dust emissions associated with climate change would be managed through appropriate control measures and contingency plans set out in air quality/dust management plans. While climate change may influence the magnitude of Project-related dust impacts during the construction phase, this factor will not be specifically incorporated into the assessment process. This is because the implementation of appropriate control measures and contingency plans should prevent any significant effects arising at sensitive receptor locations. As a result, the residual effect will normally be not significant.

7.2.12. As the construction of the Project will be undertaken in the near future, it is unlikely that the in-combination effect of climate change with emissions from site plant and construction road traffic would change the significance of effects on air quality receptors from the Project. The influence of climate change in exacerbating or ameliorating the significance of project effects during the construction phase will not be incorporated within the evaluation stage given that climate change effects in the short-term are unlikely to change air quality effects.

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a project's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on cultural and heritage assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce or otherwise mitigate potentially likely significant effects. The Project proposals will therefore have embedded within them various mitigation measures, and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The draft Order Limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. During construction, potential air quality impacts will be controlled using a range of mitigation measures which will be set out in the CoCP. The general approach for air quality is to design out or avoid emissions, and where this cannot be avoided, to reduce the emissions at source or locate the emission sources away from receptors. Additionally, the CTMP will detail measures designed to minimise construction traffic related impacts. Strategic routing of construction traffic to avoid sensitive areas such as AQMAs may be considered.

8.1.5. Traffic emissions are the principal concern during the operational phase of the Project. Embedded mitigation measures, such as upgrading and providing station access facilities (e.g. vehicle/cycle parking, bus facilities and pedestrian/cycling facilities) to promote active travel and use of public transport, will aim to reduce the impacts associated with operational traffic.

8.1.6. The potential for climate change to increase the deposition of construction dust at sensitive human health and ecological receptors would be managed through climate change specific control measures and contingency plans identified in air quality/dust management plans.

8.2. Design principles

8.2.1. Key design requirements and best practice will be applied to meet the strategic objective for air quality, which is to *'protect local air quality'*[42].

8.2.2. In accordance with the mitigation hierarchy, at the earliest stages of the design and on an ongoing basis, air quality should be taken into consideration to determine sources of air pollution that can be avoided or designed out. Where this is not possible, emissions should be minimised at source. Once the sources of air emissions have been controlled as far as reasonably practicable, steps should be taken to avoid significant adverse effects or to mitigate and minimise adverse effects. Finally, where other options to avoid significant adverse effects have been exhausted, mitigation at the receptor location (e.g. property) should be considered where practicable.

8.2.3. No potential sources of odour that would give rise to nuisance (and likely significant effects) are anticipated from the operational railway and associated infrastructure. During construction, potential odour sources could arise, such as from the disturbance of potentially contaminated ground or from spillages of odorous liquids such as fuels. The control of effects during construction works, as far as reasonably practicable and in accordance with best practicable means (BPM), would be secured within the Project CoCP and there would be no likely significant effect. On this basis, effects from odour have been scoped out.

8.2.4. With regards to future climate conditions:

- Risks relating to change in transportation emissions will be managed passively in response to national changes in policy relating to vehicle technologies, fuel types and modes of travel and would not be addressed further within the design of the Project; and
- Risks relating to stationary combustion sources will be managed through the Project's intent to establish an energy strategy that eliminates the use of combustion sources for meeting the heating and cooling requirements of facilities such as new stations.

8.2.5. It is assumed that mitigation measures are designed which take climate change into account, for example through the mitigation design and timing. However, no effects on mitigation will be identified or recorded within this section of the Method Statement.

[42] East West Rail (October 2024),'Environment Sustainability Strategy' available online at https://eastwestrail.co.uk/planning/environment-sustainability (last accessed 27/11/2024)

8.3. Code of construction practice

8.3.1. Construction work can be one of the chief causes of environmental impact. A draft CoCP will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

8.3.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce significant adverse effects on people and on natural and cultural assets. The environmental assessment of air quality impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

8.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on air quality may include the following generic categories:

- Fire prevention;
- Pollution prevention and incident control;
- Environmental Matters – Air quality;
- Vehicle and plant emissions;
- Dust;
- Transportation, storage and handling of materials;
- Haul routes;
- Demolition activities;
- Excavations and earthworks activities;
- Conveying, processing, crushing, cutting and grinding activities;
- Site specific measures; and
- Monitoring.

8.3.4. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

9. Evaluating significance

9.1. Construction phase dust

9.1.1. The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects arising from construction dust at sensitive receptor locations and therefore the residual effect will normally be not significant. The level of mitigation measures relevant to the Project will be determined by the level of risk identified. The mitigation measures will be implemented in accordance with the CoCP.

9.2. Construction and operational phase road traffic and train emissions

9.2.1. With regard to the determination of the significance of air quality effects from exhaust emissions, a level of significance beyond either ‘significant’ or ‘not significant’ is not appropriate in terms of air quality. Full details of how the significance of air quality effects will be determined are as follows.

Human receptors

9.2.2. The assessment of air quality will be undertaken in accordance with the EPUK/IAQM ‘Land-Use Planning & Development Control: Planning for Air Quality’ guidance[16]. This is to enable a clear, consistent description of effects within the assessment and in accordance with the latest guidance. Definitions for the assessment of air quality concentration changes at individual human health receptors will be adopted. Table 29 provides impact descriptors for annual changes, NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the Project.

9.2.3. The magnitude of any concentration change identified will be considered in relation to the air quality assessment level (AQAL), which may be an air quality objective, limit value or target value.

9.2.4. EPUK/IAQM recognises that professional judgement is required in the interpretation of air quality assessment significance. Table 29 is intended as a tool to help interpret the results of the air quality assessment and would therefore be employed in conjunction with professional judgement.

Table 29 – Long term impact descriptors for individual receptors.

Long term average concentration at receptors 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% 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

Notes:

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives given in Table 2.

Where the %change in concentrations is <0.5%, the change is described as 'negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without project' concentration should be used where there is a decrease in pollutant concentration and the 'with project;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

9.2.5. In relation to road traffic emissions, Defra's TG22[20] guidance indicates that the hourly NO_2 air quality objective of 200µg/m^3 (not to be exceeded more than 18 times per year) is likely to be met at roadside locations where the annual mean concentration is less than 60µg/m^3. If the annual modelled mean NO_2 concentrations are found to be less than 60µg/m^3, they will be considered to meet the hourly objective for NO_2. In accordance with TG22[20], a similar assumption will be made with reference to the daily PM_{10} objective; if the annual mean PM_{10} concentration is less than 32µg/m^3, the objective will be considered to be met.

9.2.6. Where there is a requirement to model diesel train emissions, the IAQM/EPUK guidance recommends using the Environment Agency threshold of 10% of the short-term AQAL as a screening criterion for the maximum short-term impact (i.e., impact excludes background concentrations). Where the modelled short-term concentration is less than 10% of the short-term AQAL, it can be assumed that the impact is sufficiently small as to have an insignificant effect. Table 30 provides impact descriptors for short-term impacts; this table will be used in combination with professional judgement when determining a significant effect.

Table 30 – Short term impact descriptors for individual receptors.

Short-term concentration at receptors in assessment year	Magnitude of impact	Severity of impact
10% or less of AQAL	Negligible	N/A
10%-20% of AQAL	Small	Slight
20%-50% of AQAL	Medium	Moderate
50% or more of AQAL	Large	Substantial

Notes: AQAL = Relates to the UK Air Quality Strategy objectives given in Table 2.

Ecological receptors

9.2.7. IAQM's 'Guide to the assessment of air quality impacts on designated nature conservation sites' [18] advises for ecological receptors, where the change in relevant predicted pollutant concentrations as a percentage of the relevant critical level or load is less than 1%, effects are deemed in be not significant.

9.2.8. Where the 1% thresholds are exceeded and the total NOx and SO_2 concentrations are less than the critical level or the nitrogen deposition and acid deposition rates are less than the applicable critical load, significant effects are not anticipated.

9.2.9. The Project ecologist will be consulted where the change in relevant predicted pollutant concentrations as a percentage of the relevant critical level or load is greater than 1%. A change greater than 1% does not automatically indicate a significant effect; to determine significance, the results will be assessed further within the aspect of ecological effects and reported within the Biodiversity chapter of the ES and/or Habitats Regulations Assessment.

9.2.10. In determining significance, greater weight is applied to the relevant critical local as these are specific to each site. The critical level does not differentiate between the role of deposition, it is a precautionary general threshold not specific to a particular habitat, plant species or impact pathway and some species or habitats may not show adverse effects until higher concentrations are present.

10. Proposed scope

10.1.1. The impacts proposed to be scoped in and out of the air quality assessment are summarised in Table 31.

Table 31 – Scoping summary.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St. Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Emissions to air from operational phase road traffic	✓	✓	✓	✓	✓	✓	✓	✓
Emission to air from operational phase diesel freight trains	✓	✓	✓	✓	✓	✓	✓	✓
Emission to air from operational phase diesel passenger trains	×	×	×	×	×	×	×	×

Emission to air from any proposed combustion sources (e.g., for heating and cooling of facilities) during the operational phase	✗	✗	✗	✗	✗	✗	✗	✗
Construction dust generation	✓	✓	✓	✓	✓	✓	✓	✓
Emissions to air from construction plant and NRMM	✗	✗	✗	✗	✗	✗	✗	✗
Emission to air from construction phase traffic	✓	✓	✓	✓	✓	✓	✓	✓

Notes: ✓ - scoped in

✗ - scoped out

10.1.2. No potential sources of odour that would give rise to nuisance (and likely significant effects) are anticipated from the operational railway and associated infrastructure. During construction, potential odour sources could arise, such as from the disturbance of potentially contaminated ground or from spillages of odorous liquids such as fuels. The control of effects during construction works, as far as reasonably practicable and in accordance with best practicable means (BPM), would be secured within the Project CoCP and there would be no likely significant effect. On this basis, effects from odour have been scoped out.

11. Assumptions and risks

11.1. Assumptions

11.1.1. The assessment will utilise the latest available versions of Defra's Local Air Quality Management toolkit, including the Emissions Factors Toolkit, Defra projected background concentrations and NO_X to NO_2 calculator, as well as the National Highways ammonia nitrogen deposition tool.

11.1.2. The air quality effect associated with changes in road traffic emissions caused by the Project during the construction and operational phases would be based on the latest available traffic data provided by the Project's traffic consultants at the time of the assessment.

11.2. Risks

11.2.1. The air quality modelling predictions will be based on the most reasonable, robust and representative methodologies. However, there is an inherent level of uncertainty associated with the model predictions, due to:

- Uncertainties with model input parameters such as surface roughness (defined by land use) and minimum Monin-Obukhov length (used to calculate stability in the atmosphere);
- Uncertainties with vehicle emission predictions;
- Uncertainties with background air quality data;
- Uncertainties with recorded meteorological data; and
- Simplifications made in the model algorithms or post processing of the data that represent atmospheric dispersion or chemical reactions.

11.2.2. To best manage these uncertainties:

- Traffic data used in the air quality assessment will be derived from a validated strategic traffic model; and
- Outputs from the ADMS-Roads dispersion model will be evaluated using the results from air quality monitoring to verify model outputs. This model verification process will be undertaken in line with Defra's TG22[20] guidance. This is achieved by comparing modelled and monitored pollutant concentrations and, if necessary, adjusting the model output to account for systematic bias.

11.3. Opportunities

11.3.1. Ongoing consultation with environmental health departments at local authorities will ensure the most up to date baseline information is used within the air quality assessment and will help to identify local air quality concerns and factor in local considerations or circumstances where practicable.

11.3.2. A Project specific diffusion tube monitoring survey (see section 4.2) was undertaken to gather data on current NO_2 concentrations to inform the baseline and to provide additional information for the model verification process discussed in paragraph 11.2.2.

11.3.3. Opportunities presented in the Traffic & Transport Method Statement may help to improve air quality by alleviating congestion or moving traffic away from sensitive receptor locations. Examples include:

- Improving junction capacity at identified ‘bottlenecks’ thereby alleviating congestion;
- promoting the use of active travel to reduce reliance on private vehicles; and
- Influencing permanent diversion routes during design stage to move traffic away from sensitive receptor locations.

EWR-MWJV Technical Partner

Routewide – Environmental – EIA Scoping Method Statement – Agriculture and Soils

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on agriculture and soils and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The agriculture and soils assessment will consider agricultural land (including the presence of best and most versatile (BMV) agricultural land), soil resources (agricultural soils and all other soils), and agricultural land holdings (land and

[1] *Department for Transport* (2024) *National Networks National Policy statement, GOV.UK*. Available at: https://www.gov.uk/government/publications/national-networks-national-policy-statement

associated infrastructure used for the purposes of agricultural production including, if present, the commercial production of timber).

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
ALC	Agricultural land classification
BNG	Biodiversity net gain
BMV	Best and most versatile
CoCP	Code of construction practice
DCO	Development consent order
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental impact assessment
EWR Co	East West Railway Company
ES	Environmental statement
FBI	Farm business interview
FCD	Field capacity days
IEMA	Institute of environmental management and assessment
MAFF	Ministry of Agriculture, Fisheries and Food
NNNPS	National networks national policy statement
SMP	Soil management plan
SNS	Soil nutrient survey
SRS	Soil resource survey
VESS	Visual assessment of soil structure

3. Relevant standards and guidance

3.1.1. In addition to the overarching legislation, policy and guidance set out in the EIA Scoping Report the following standards and guidance, specific to agriculture and soils, has been considered:

- A New Perspective on Land and Soil in Environmental Impact Assessment[2];
- The 2018 25 Year Environment Plan[3] and the 2023 revision[4];
- Safeguarding our Soils: A Strategy for England[5];
- Agricultural Land Classification of England and Wales[6]; and
- Design Manual for Roads and Bridges (LA112, population and human health)[7].
- The Department for Environment, Food and Rural Affairs (Defra) 'Code of Practice for the Sustainable Use of Soils on Construction Sites'[8]
- The Institute of Quarrying 'Good Practice Guide for Handling Soils in Mineral Workings'[9]

[2] IEMA (2022). *A New Perspective on Land and Soil in Environmental Impact Assessment*. IEMA: Lincoln
[3] Defra (2018). *The 25 Year Environment Plan*. [online] Available at: https://assets.publishing.service.gov.uk/media/5ab3a67840f0b65bb584297e/25-year-environment-plan.pdf [Accessed: 16 April 2024]
[4] Defra (2023). *Environmental Improvement Plan 2023*. [online] Available at: https://assets.publishing.service.gov.uk/media/64a6d9c1c531eb000c64fffa/environmental-improvement-plan-2023.pdf [Accessed: 16 April 2024]
[5] Defra (2019). *Safeguarding our Soils: A Strategy for England*. [online] Available at: https://assets.publishing.service.gov.uk/media/65fd6fddf1d3a0001132adb8/CD1.I_DEFRA__Safeguarding_our_Soils_A_Strategy_for_England.pdf [Accessed: 16 April 2024]
[6] Ministry of Agriculture, Fisheries and Food (1998). *Agricultural Land Classification of England and Wales*.
[7] Design Manual for Roads and Bridges (2020) LA112, population and human health.
[8] Defra (2009). *Code of Practice for the Sustainable Use of Soils on Construction Sites*. [online] Available at: https://assets.publishing.service.gov.uk/media/5b2264ff40f0b634cfb50650/pb13298-code-of-practice-090910.pdf [Accessed 13 May 2024]
[9] Institute of Quarrying (2021). *Good Practice Guide for Handling Soils in Mineral Workings*. [online] Available at: https://www.quarrying.org/soils-guidance [Accessed 13 May 2024]

4. Establishing the baseline

4.1. Documentary records

4.1.1. The agriculture and soil baseline will be established with reference to published sources and field survey. The datasets that have been or will be reviewed are listed in Table 2.

Table 2 – Datasets informing the scoping assessment.

Dataset	Source
Provisional agricultural land classification (ALC) maps	Natural England
Post-1988 ALC maps	Natural England
National Soil Association data	Cranfield University
Peaty Soils Map	Natural England
Environmental stewardship scheme agreements	Natural England, October 2023
Woodland Grant Scheme 1, 2 and 3	Defra MAGIC map
EWR Co (Ardent, land referencing agent) land parcels	Information received October 2023 (ongoing)
Satellite Imagery	MWJV/EWR GIS licenced satellite dataset
Land use change statistics	Department for Levelling Up, Housing & Communities, 2023

Agricultural land

4.1.2. The assessment of agricultural land is based on the ALC framework[6] which categorises agricultural land quality in England and Wales into five grades based on local climatological data, topography, flooding, and soil properties. This provides a basis for seeking to retain land of higher quality (Grades 1, 2 and Subgrade 3a, deemed BMV) for agricultural use where possible, and directing development towards lower quality land (Subgrade 3b, Grades 4 and 5).

4.1.3. The approach to the ALC survey of land within the draft Order Limits will be undertaken in three parts:

- An interpretation of published geological, topographical, soil and agro-climatic information will be undertaken in accordance with the ALC guidelines to provide a prediction of the likely grades of agricultural land that will be affected;

- Then, the predictive ALC will be augmented with post-1988 ALC surveys undertaken by the Ministry of Agriculture, Fisheries and Food (MAFF) or Department for Environment, Food and Rural Affairs (Defra) and by other recognised sources within or adjacent to the route corridor of the Project; and
- Finally, detailed field surveys will be undertaken along the route of the Project to validate the findings, where required and where practicable.

Soil resources

4.1.4. The baseline assessment of soil resources will consider their role as a component of agricultural land as well as a crucial ecosystem service, particularly in the context of biodiversity and biodiversity net gain (BNG).

4.1.5. National Soil Association mapping and LandIS data will be examined to obtain digitised information on soil properties such as texture, permeability, soil profile depth, resilience to damage during handling, and presence of peat. The Natural England peaty soils map will be reviewed to complement information from the National Soil Map. Satellite imagery and Natural England's woodland mapping will be examined to determine the presence of woodland soils within the Project.

Agricultural land holdings

4.1.6. The term 'agricultural land holding' is used in a wide sense and is taken to include holdings associated with arable cropping, livestock rearing, field-scale and glasshouse horticulture (of edible and non-edible crops), and commercial timber production. The farm business is the activity within the agricultural land holding that generates income. The agricultural land refers to the land used for agricultural production.

Commercial forestry

4.1.7. No commercial forestry has been identified within the current draft Order Limit for the scheme and therefore we are proposing to exclude it from the assessment at this stage.

4.2. Surveys

Agricultural land

4.2.1. As the Project progresses it is intended that detailed field surveys will be undertaken to determine the ALC and soil resources of the land that will be affected by the construction of the Project.

4.2.2. The soil surveys will involve the examination of soil profiles using hand-held augers and spades (in accordance with standard methodology[6]). Samples will

be taken for laboratory analysis. The soil characteristics will then be described and analysed in terms of the MAFF guidelines to verify the grade of agricultural land.

4.2.3. The data will provide detailed baseline information on the pre-construction ALC grade and will provide a target soil profile specification for restoration of agricultural land. It will provide the necessary information to delineate, quantify and characterise the topsoils and subsoils available prior to these materials being stripped; inform the designing of climate change resilience for soils; and provide the necessary detail to assess the suitability of the different soil materials for agricultural and other restored land uses.

4.2.4. The survey data will also inform recommendations to be set out in a soil management plan (SMP) on appropriate methods for handling and storing soils to protect their main functions during construction.

Soil resources

4.2.5. The soil resources will be surveyed using hand-held augers and spades (in accordance with standard methodology[6,10,11,12,13]). Samples will be taken for laboratory analysis. The soil surveys will collect data on properties influencing soil health and its ability to fulfil ecosystem functions within agricultural land, woodlands and other open land. This will include soil physical properties, measures of nutrient, pH and organic matter, earthworm counts, and visual evaluation of soil structure will inform soil handling, soil restoration, and proposals for landscape mitigation planting, habitat creation and translocation. The surveys will set the baseline for maintaining the quality of soil as a natural capital into the future.

Agricultural land holdings

4.2.6. Farm Business Interviews (FBIs) are being conducted as face-to-face meetings with the owner/occupiers of all potentially affected holdings along the Project. The findings from these interviews will inform the ongoing design of the Project with a view to reducing impacts so far as reasonably practicable, within the context of delivering a fully mitigated Project; the data will also be used in the assessment of effects on the holdings.

4.2.7. Some FBIs were undertaken in 2021 (mainly between Bedford and Cambridge) and have provided useful baseline information on some of the holdings identified as potentially involved, at that time. Since then, the route has changed such that a new round of FBIs has commenced. These are offered to

[10] Cranfield University (2022). The Soil Survey Field Handbook. Technical Monograph No. 5.
[11] Natural England (2008). Technical Information Note TIN035 | Soil sampling for habitat recreation and restoration.
[12] Ball *et al* (2012). Visual Evaluation of Soil Structure. Scotland's Rural College.
[13] AHDB (2023) How to count earthworms. Available at: How to count earthworms | AHDB.

all the agricultural land holdings potentially affected by the construction and operation of the Project.

4.2.8. The FBI will be conducted using standardised questions which will cover:

- A description of the existing size, location and use of agricultural land holdings;
- A description of the existing scale and nature of agricultural (including the commercial production of timber) and non-agricultural enterprises based on agricultural land holdings and their associated capital and labour inputs;
- The location and layout of fixed equipment (including buildings, irrigation and slurry equipment, utilities);
- Potential impacts on the structure and operation of the holding;
- Possible options to mitigate such impacts; and
- The potential options for mitigating other significant environmental effects identified on individual holdings.

4.3. Study area

4.3.1. The study area for the soils assessment includes all land within the draft Order Limits, being land to be acquired or used permanently or temporarily by the Project.

4.3.2. For the agricultural land holdings, any holding that has land partially or completely within the draft Order Limits will be assessed. Consideration will be given to the impacts and effects of the construction and operation of the Project on all the land managed by the affected holdings.

4.3.3. The approach to wider development and cumulative effects is set out in the main scoping report.

4.4. Consultation

4.4.1. Consultation with landowners will be ongoing to inform the assessment of agriculture and soils as the DCO application progresses. A non-statutory consultation commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. The following section considers the key available baseline information for agricultural land, soil resources and agricultural land holdings.

5.2. Agricultural land

Provisional ALC maps

5.2.1. The provisional ALC mapping was reviewed to determine the expected distribution of ALC grades across the Project. This indicated that BMV Grade 2 agricultural land represents the largest proportion of agricultural land within the draft Order Limits, with most of this land between Bedford and Cambridge.

Post-1988 ALC maps

5.2.2. Further detail is available in post-1988 ALC data and these cover a total of 364ha of land within the draft Order Limits. These reports broadly corroborate the provisional data, with Grade 2 agricultural land mapped between Bedford and Cambridge and no Grade 2 agricultural land mapped between Oxford and Bedford. ALC Subgrades 3a and 3b are identified across the area within the draft Order Limits.

5.2.3. Many of the post-1988 records identify a different ALC grade to that predicted by the provisional maps. ALC surveys will be undertaken across the study area as the Project develops and will be reported in the ES.

5.3. Soil resources

5.3.1. The soils across the Project primarily comprise agricultural soils, with a small proportion of soils supporting amenity land and verges. No woodland soils have been identified.

5.3.2. Although limited, simplified soil data are available on Defra's MAGIC[14] mapping, the Cranfield data are more detailed, and details of the soil associations intersecting with the Project will be reported in the ES. Natural England's Peaty Soils map does not identify peat or peaty soils within the draft Order Limits, but the presence of peat should not be ruled out until soil associations have been studied and surveys completed.

5.3.3. Baseline soil health will be reported in the ES based on standard indicators.

[14] Defra (2024). *MAGIC*. [online] Available at: https://magic.defra.gov.uk/magicmap.aspx [Accessed: 13 May 2024]

5.4. Agricultural land holdings

5.4.1. To establish a baseline for agricultural land holdings affected by the Project, the land referencing system developed by Ardent (EWR Co's land referencing agent – data received October 2023) was used in combination with publicly available information, such as the Natural England environmental stewardship scheme data.

5.4.2. Initial investigations suggest that the Project will affect more than 6,500ha of agricultural land (with more than half the agricultural land likely to be classified as BMV) and more than 100 holdings. Across the combined agricultural regions (south-east and east), agriculture accounts for approximately 2.5million hectares of land with average holding sizes being recorded as 87ha (south-east) and 123ha (east). The main agricultural products in the east agricultural region are recorded as arable (79%) and poultry, whilst a more mixed farming pattern is seen in the south-east (56% arable land).

5.4.3. Most of the rural land between Oxford and Cambridge is in commercial agricultural use and an overview of current agricultural activity has been provided by the EWR Co land referencing agents, Ardent. These data have identified all the land parcels registered with Land Registry and are used as a starting point to identify land holdings affected.

5.4.4. Further information on the pattern and extent of agricultural holdings has been obtained using Defra environmental stewardship and grant scheme information, and satellite imagery. Data on land holdings has also been requested from Defra (Rural Payments Agency).

5.4.5. Woodland is dispersed throughout the land between Oxford and Cambridge. The majority is expected to be used for non-commercial purposes, but this will be confirmed during the surveys. Where land holdings include woodland consideration is given to any commercial timber extraction. Impacts on woodland receptors concerning biodiversity, historic environment and landscape and visual are covered in their respective Method Statements.

5.5. Future baseline

5.5.1. The future baseline will have regard to land parcels where planning consent (or a planning allocation) has been granted that will have the effect of changing the use of agricultural land to built form. Where such development would take place within the construction lifetime of the Project, the effect of the Project on the agricultural resource will be omitted, or downgraded.

5.5.2. Land use in the future is likely to change, with a net shift from non-developed land (including agriculture) to developed land. In the three years from 2019-20

to 2021-22, 238,000 hectares of land in England have seen a change in use, equivalent to approximately 1.8% of England's total land area[15]. Of this 9,348ha were in the South East and 7,215ha were in the East of England. It is likely that land use will continue to shift from non-developed land to developed land in the future.

5.5.3. Climate change is predicted to have an effect on ALC grade. However, the change will vary according to the location of the land and is very difficult to predict. For example, where agricultural land is limited by drought, climate change is likely to reduce the quality of the land as the climate tends towards increased dryness[16]. However, for areas limited by wetness, climate change is likely to increase the quality of the land with reduced overall rainfall[16]. Climate change is also likely to lead to an increase in temperature, which should support greater agricultural productivity. However, without detailed ALC data across the whole Project and a robust model to predict the change in ALC grade, it is not possible to determine a future baseline for ALC grade due to climate change.

5.5.4. The physical impacts of climate change may impact the project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.5.5. Refer to section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

[15] Department for Levelling Up, Housing & Communities. Land use change statistics – hectarage 2019-20 to 2021-22 statistical release (2023).
[16] ADAS (2020) *The effect of Climate Change on Agricultural Land Classification (ALC) in Wales*. [online] Available at: https://www.gov.wales/sites/default/files/publications/2021-04/agricultural-land-classification-projected-effect-climate-change.pdf (Accessed: 15 April 2024).

6. Sources of impact

6.1.1. The potential sources of impact on agricultural land, soil resources and agricultural land holdings across the Project would include:

- Permanent work within the draft Order Limits, including:
  - Widening of existing railway corridor;
  - Construction of new railway infrastructure (including stations) and associated substructures;
  - Construction of embankments, cuttings, viaducts, and tunnels;
  - Construction of new highway diversions/links;
  - Utility diversions; and
  - Provision of environmental mitigation.
- Temporary work within the draft Order Limits, including:
  - Construction compounds;
  - Haul roads;
  - Utility diversions; and
  - Temporary environmental mitigation.
- Use of machinery causing soil compaction and deterioration, without proper consideration of sustainable soil handling practices to mitigate impacts;
- Interventions to earthworks and drainage leading to potential impacts on adjacent agricultural land;
- Activities leading to demolition of farm dwellings, buildings, and infrastructure; and
- Agricultural land holding severance.

7. Potential impacts and effects

7.1. Potential permanent and operational effects

7.1.1. A list of the potential permanent impacts and effects is provided in Table 3.

7.1.2. The influence of climate change is not anticipated to exacerbate or ameliorate the Project effects to the extent that significant effects will occur. This is partly because the Project will remove agricultural land and soil resources, which will therefore no longer be present in a future climate scenario.

Table 3 – Potential permanent impacts and effects of the Project on agricultural land, soil resources and agricultural land holdings.

Impact	Description of effect
Agricultural land	
Permanent land acquisition	Permanent removal of land from agriculture, including loss of BMV land.
Alteration to land drainage	Alteration to land drainage, leading to flooding or waterlogging of adjacent agricultural land.
Soil resources	
Irreversible deterioration of soil resources	Use of heavy machinery, inappropriate soil handling and stockpiling may lead to soil compaction and loss of soil structure and quality for agriculture and/or ecosystem services.
Loss of soil resources	Excavation without the restoration or re-use of soil would lead to loss of soil as a resource and ecosystem services, including support of ecological habitats and biodiversity; support for the landscape; protection of the historic environment; and provision of raw materials.
Deterioration of peat	Inappropriate handling of peat (if present in the Harston to Cambridge section) results in loss of peat structure, quality, and carbon store.
Agricultural land holdings	
Permanent land acquisition from agricultural land holdings	Reduced agricultural production due to loss of land.
Land acquisition of part of a land parcel	Land parcel left unfarmed due to problematic shape or size leading to reduced agricultural production.
Land severance	Reduced agricultural production due to impacts on access to land and/or infrastructure.
Alteration to land drainage	Alteration to land drainage, leading to flooding or waterlogging of adjacent agricultural land and consequent loss of production.
Loss of farm dwellings, farm buildings and other on-farm infrastructure	Loss of key infrastructure restricting future land use with potential for land use change.

7.2. Potential temporary effects

7.2.1. A list of the potential temporary impacts and effects is provided in Table 4.

Table 4 – Potential temporary impacts and effects of the Project on agricultural land, soil resources and agricultural land holdings.

Impact	Description of effect
Agricultural Land	
Temporary land acquisition	Temporary removal of land from agriculture, including removal of BMV land.
Soil Resources	
Reversible deterioration of soil resources	Use of heavy machinery, inappropriate soil handling and stockpiling may lead to soil compaction and loss of soil structure and quality for agriculture and/or ecosystem services unless soil is remediated.
Agricultural land holdings	
Temporary land acquisition from agricultural land holdings	Reduced agricultural production due to loss of land.
Temporary land severance	Reduced agricultural production due to impacts on access to land and/or infrastructure.
Construction impacts, e.g. dust and pollution on adjacent agricultural land	Reduced ability of that land to continue in its present land use. The air quality assessment considers further the effects and impacts of dust (see air quality Method Statement).

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's route; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities (including agriculture), on cultural and heritage assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project will therefore have embedded within it various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The Project limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. The overarching principles guiding mitigation include reducing the land required, handling soils appropriately and working with landowners to reduce disruption. These principles are detailed further in section 8.2.

8.1.5. The mitigation for agricultural land and soil resources relies on the completion of detailed soil resource surveys (SRS) and/or ALC survey along the route to confirm the soil resources and ALC grade present. The surveys will inform a SMP to provide guidance specific to the soil types on site. The identification of appropriate mitigation for agricultural land holdings relies on FBI to understand the nature of the holding operations.

8.1.6. As part of the DCO application the following strategies and plans are proposed:
- SRS: Non-agricultural land;
- SRS: Agricultural land (ALC survey); and
- SMP.

8.1.7. It is a voluntary commitment for successful delivery of the Project to undertake the following:
- FBI;

- Soil health assessments including a visual assessment of soil structure (VESS), earthworm counts, qualitative weed burden assessment and a soil nutrient survey (SNS); and
- Soil Resource Plan – one document prepared for each holding, including baseline information on the holding, SRS/ALC results, soil nutrient testing results, and tailored soil management steps.

8.2. Design principles

8.2.1. The Project will be designed to reduce as much as possible the amount of land required, thereby reducing the extent of disturbance to agricultural land, soil resources, and agricultural land holdings.

Agricultural land and soil resources

8.2.2. The Project will seek to reduce so far as reasonably practicable the use of BMV land (ALC Grades 1, 2 and Subgrade 3a) in favour of using non-agricultural land or land of lower ALC grade (ALC Subgrade 3b, Grades 4 and 5).

8.2.3. A SMP based on Defra's 'Code of Practice for the Sustainable Use of Soils on Construction Sites'[8] and on the Institute of Quarrying 'Good Practice Guide for Handling Soils in Mineral Workings'[9] will provide guidance for stripping, stockpiling, maintenance, reinstatement, and aftercare of soil resources. It will identify the volume of soils that will be displaced. During construction activities, it is recommended that a qualified soil scientist undertake on-site monitoring visits to ensure the best practice and guidance as stated in the SMP is followed.

8.2.4. The implementation of the SMP will seek to ensure that the function and quality of soils temporarily disturbed are suitable for their intended future land use. This includes returning disturbed agricultural land back to its original ALC grade as far as is reasonably practical.

8.2.5. Where there is a surplus of soils, the soil will be sustainably re-used such as for landscaping or habitat creation.

Agricultural land holdings

8.2.6. The Project will seek to:

- Limit permanent and temporary land-take;
- Optimise the draft Order Limits to avoid severance and fragmentation of land parcels;
- Create temporary haul routes so that farming activities can continue during construction and operation; and
- Use land that is not reliant on the spatial relationship to key agricultural infrastructure.

8.2.7. The Project will rationalise the requirements for features such as balancing ponds and borrow pits to seek to locate them in the least sensitive agricultural

locations, and on lower quality agricultural land where reasonable alternatives exist.

8.2.8. The Project will develop specific mitigation to reduce land-take and accessibility impacts and provide embedded mitigation where land-take and accessibility impacts cannot be avoided. This may include identifying alternative access routes including with the provision of haul routes, overbridges, and underbridges.

8.2.9. The Project will rationalise road realignments to limit the area of agricultural land and soil resources required.

8.2.10. The Project will consider gradients of land within the design to maximise the land that can be returned to agriculture, including locally slackened slopes to improve agricultural land use or steepened slopes to limit the area of agricultural land required.

8.3. Climate Change

8.3.1. It is possible that future climate conditions may impede the effectiveness of assumed mitigation. For example, increased risk of drought conditions may impact on the ability of soil to support mitigation planting and mitigate the effects of the Project upon visual amenity.

8.3.2. It is assumed that mitigation measures are designed which take climate change into account, for example through the mitigation design and timing. Any effects on mitigation will be identified and recorded within the ES.

8.4. Code of construction practice

8.4.1. Construction work can be one of the main causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to abide by in undertaking their work.

8.4.2. The draft CoCP will be a fundamental part of the Project and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and cultural assets. The environmental assessment of agricultural impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activities for a scheme of this nature.

8.4.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on agriculture and soils may include the following generic categories:

- Protection and reinstatement of land and soils;

- On-site working practice and amelioration;
- Site access;
- Community relations;
- Construction site layout and good ‘housekeeping’;
- Hoarding, fencing, screening and lighting;
- Construction traffic routes;
- Site drainage and watercourse and groundwater protection;
- Site specific measures;
- Extreme weather events; and
- Monitoring requirements.

8.4.4. Where agricultural uses are to be resumed on land disturbed during the construction of the Project, the design objective is to avoid any reduction in long-term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land.

8.4.5. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

9. Evaluating significance

9.1. Guiding principles

9.1.1. The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact of that magnitude. Section 9 describes the criteria applied in this section to characterise the magnitude of potential impacts and sensitivity of receptors.

9.1.2. Very large, large, and moderate effects will be considered to be significant. A significant effect is an effect that the assessment team believe should be considered by the decision makers in granting development consent.

9.1.3. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the agriculture and soils section of the ES.

9.2. Agricultural land

9.2.1. The terms used to define sensitivity and magnitude in relation to agricultural land stem from guidance published by the Institute of Environmental Management and Assessment[2] (IEMA) and set out in Table 5 and Table 6.

Table 5 – Criteria for assessing sensitivity of agricultural land.

Sensitivity	Criteria
Very high	ALC Grades 1 and 2
High	ALC Grade 3a
Medium	ALC Grade 3b
Low	ALC Grades 4 and 5
Negligible	Tenuous, and unproven links between sources of impact and soil functions.

Table 6 – Criteria for assessing impact magnitude on agricultural land.

Magnitude	Criteria
Major	Permanent, irreversible loss (including permanent sealing or land quality downgrading) over an area of more than 20ha; or Permanent improvement in ALC grade over an area of more than 20ha.
Moderate	Permanent, irreversible loss (including permanent sealing or land quality downgrading) over an area of 5- 20ha; or Permanent improvement in ALC grade over an area of 5-20ha.
Minor	Permanent, irreversible loss (including permanent sealing or land quality downgrading) or temporary reversible loss over an area of less than 5ha; or Permanent or temporary improvement in ALC grade over an area of less than 5ha.
Negligible	No discernible loss or reduction or improvement of soil functions or soil volumes that restrict current or proposed land use.

9.2.2. The overall significance of the Project for agricultural land is determined as a function of impact magnitude and receptor sensitivity. A significance rating is calculated as shown in Table 7.

Table 7 – Criteria for assessing significance of effects on agricultural land.

Sensitivity	Magnitude of Impact			
	Major	**Moderate**	**Minor**	**Negligible**
Very high	Very large	Very large/large	Large/moderate	Slight
High	Very large/large	Large/moderate	Moderate/slight	Slight
Medium	Large/moderate	Moderate	Slight	Slight/neutral
Low	Moderate	Slight	Slight/neutral	Slight/neutral
Negligible	Slight	Slight/neutral	Slight/neutral	Neutral

9.3. Soil resources

9.3.1. The terms used to define magnitude and sensitivity in relation to soil resources stem from guidance published by IEMA[2].

9.3.2. The criteria for defining sensitivity and magnitude for the assessment of impacts to soil resources are defined within Table 8 and Table 9 respectively.

Table 8 – Criteria for assessing sensitivity to handling of soil resources.

Sensitivity	Criteria
High	Soils with high clay and silt fractions and organo-mineral and peaty soils where the field capacity days (FCD) are 150 or greater; or Medium-textured soils where the FCD are 225 or greater.
Medium	Clays, silty clays, sandy clays, heavy silty clay loams, heavy clay loams, silty loams and organo-mineral and peaty soils where the FCD are fewer than 150; Medium-textured soils where FCD are fewer than 225; or Sands, loamy sands, sandy loams and sandy silt loams where the FCD are 225 or greater or are in wetness classes WCIII and WCIV.
Low	Soils with a high sand fraction (sands, loamy sands, sandy loams and sandy silt loams) where the FCD are fewer than 225.

Table 9 – Criteria for assessing impact magnitude on soil resources.

Magnitude	Criteria
Major	Permanent, irreversible loss of one or more soil functions or soil volumes (including land quality downgrading), over an area of more than 20ha, including effects from temporary developments; or Permanent improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of more than 20ha, or gain in soil-related features.
Moderate	Permanent, irreversible loss of one or more soil functions or soil volumes (including land quality downgrading), over an area of 5ha to 20ha, including effects from temporary developments.
Minor	Permanent, irreversible loss of one or more soil functions or soil volumes (including land quality downgrading), over an area of less than 5ha, including effects from temporary developments.
Negligible	No discernible loss or reduction or improvement of soil functions or soil volumes that restrict current or proposed land use.

9.3.3. Field capacity is the amount of soil moisture or water content within the soil after excess water has drained away and the rate of downward movement has decreased. This usually takes place two to three days after rain or irrigation in pervious soils of uniform structure and texture.

9.3.4. The overall significance of the Project for soil resources is determined as a function of impact magnitude and receptor sensitivity. A significance rating is calculated as shown in Table 10.

Table 10 – Criteria for assessing significance of effects on soil resources.

Sensitivity	Magnitude of Impact			
	Major	**Moderate**	**Minor**	**Negligible**
High	Very large/large	Large/moderate	Moderate/slight	Slight
Medium	Large/moderate	Moderate	Slight	Slight/neutral
Low	Moderate	Slight	Slight/neutral	Slight/neutral

9.4. Agricultural land holdings

9.4.1. The terms used to define magnitude and sensitivity in relation to farm businesses stem from guidance published by HS2[17]. This is the most comprehensive method available and considered best practice.

9.4.2. The criteria for defining sensitivity and magnitude of impacts to agricultural land holdings are defined in Table 11 and Table 12 respectively.

Table 11 – Sensitivity criteria for agricultural land holdings.

Sensitivity	Criteria
High	Farm types in which the operation of the enterprise is dependent on the spatial relationship of land to key infrastructure, and where there is a requirement for frequent and regular access between the two, or dependent on the existence of the infrastructure itself, e.g.: • Dairying, in which milking cows travel between fields and the parlour at least twice a day; • Irrigated arable cropping and field-scale horticulture, which are dependent on irrigation water supplies; and • Intensive livestock or horticultural production, which is undertaken primarily within buildings, often in controlled environments.
Medium	Farm types in which there is a degree of flexibility in the normal course of operations, e.g.: • Combinable arable farms; and • Grazing livestock farms (other than dairying).
Low	Farm types and land uses undertaken on a non-commercial basis.

[17] High Speed 2 (2013). London-West Midlands Environmental Statement Volume 5 Scope and Methodology Addendum CT-001-000/2

Table 12 – Impact magnitude criteria for agricultural land holdings.

Impact magnitude	Definitions			
	Land required	**Accessibility**	**Infrastructure**	**Disruptive effects**
Major	20% or more of the agricultural land holding	No access available to severed land, property, or infrastructure	Direct loss of property or infrastructure wholly affecting the flexibility of agricultural enterprises	Disturbance that wholly changes land use or enterprises
Moderate	10% or more but less than 20% of agricultural land holding	Access available to severed land, property, or infrastructure via the public highway	Loss of or disturbance to property or infrastructure partially affecting the flexibility of agricultural enterprises	Disturbance that necessitates partial change to land use or enterprises
Minor	5% or more but less than 10% of agricultural land holding	Access available to severed land, property, or infrastructure via private way	Loss of or disturbance to property or infrastructure that does not affect the flexibility of agricultural enterprises	Disturbance that necessitates no change to land use or enterprises
Negligible	Less than 5% of agricultural land holding	No severance	No change to property or infrastructure.	No disturbance to land use or enterprises

9.4.3. The overall significance of the Project on agricultural land holdings is determined as a function of impact magnitude and receptor sensitivity. A significance rating is calculated as shown in Table 13.

Table 13 – Criteria for assessing significance of effects on agricultural land holdings.

Sensitivity	Magnitude of impact			
	Major	**Moderate**	**Minor**	**Negligible**
High	Very large/large	Large/moderate	Moderate/slight	Slight
Medium	Large/moderate	Moderate	Slight	Slight/neutral
Low	Moderate	Slight	Slight/neutral	Slight/neutral

10. Proposed scope

10.1.1. Table 14 identifies the elements that will be scoped in and out of the assessment.

10.1.2. At present there is insufficient data to enable receptors to be scoped out from any of the route sections. Therefore, agricultural land, soil resources and agricultural land holdings remain scoped into the assessment.

Table 14 – Environmental elements scoped in

Assessment item	Soil Resources	Agricultural Land	Agricultural land holdings
Oxford to Bletchley	✓	✓	✓
Fenny Stratford to Kempston	✓	✓	✓
Bedford	✓	✓	✓
Clapham Green to Colesdon	✓	✓	✓
Roxton to east of St Neots	✓	✓	✓
Croxton to Toft	✓	✓	✓
Comberton to Shelford	✓	✓	✓
Cambridge	✓	✓	✓

11. Assumptions and risks

11.1. Assumptions and limitations

11.1.1. The data contained in this Method Statement are based predominantly on publicly available sources. The outputs of the desk-based assessment for agricultural land and soil resources are limited without the detailed data provided by an SRS or ALC survey, and the outputs of the agricultural land holding assessment are limited without information from a FBI. The baseline will be developed in the ES when further information is available.

11.1.2. Where available, post-1988 data can be used to inform on ALC grade. However, the field data from these post-1988 surveys are limited and reliant on the correct interpretation of ALC grades by the surveyor.

11.1.3. Financial compensation will be available under existing statutory arrangements to offset impacts to farm businesses. However, it is not a consideration in the assessment of effects in the EIA.

11.1.4. The assessment in the ES of residual effects on soil resources and temporary agricultural land acquisition will be based on a detailed SMP, which will be written in accordance with Defra[8] and Institute of Quarrying[9] guidance. The SMP will be appropriately implemented to protect soils and the quality of restored land.

11.2. Risks

11.2.1. The quality and quantity of survey information that will be available to inform the EIA is subject to the following risks:

- Land access for surveys being refused; and
- Landowners not providing accurate information during the FBIs.

11.3. Opportunities

11.3.1. The proposed SRS on agricultural and non-agricultural land will incorporate additional soil health metrics, including a VESS, earthworm counts, qualitative weed burden assessment and a SNS. This will provide a holistic baseline for soil health to align with IEMA guidance[2], which outlines the importance of considering soil health with respect to the maintenance of expected soil functions.

11.3.2. There is an opportunity to sustainably re-use surplus soils for ecosystem services such as landscaping or habitat creation. This will contribute to BNG as soils are used for appropriate habitat design.

11.3.3. Opportunities will be discussed during the FBIs for acquiring land for use as mitigation that the landowner considers the most advantageous to the business.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping Method Statement – Biodiversity

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) proposes to apply to the Secretary of State for a development consent order (DCO) under the Planning Act (2008) (as amended) to authorise the construction, operation and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the DCO Project). The Project forms part of East West Rail which would introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS) (May 2024)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on biodiversity and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The assessment of biodiversity will consider how changes to the study area as defined in section 4.5 will affect the area's habitats and wildlife within it, focusing on designated sites and protected species, as well as priority habitats (so called habitats of principal importance). The assessment will consider how the temporary and permanent impacts of the Project will potentially affect

[1] Department for Transport (2024) National Networks National Policy statement, GOV.UK. Available at: https://www.gov.uk/government/publications/national-networks-national-policy-statement.

protected ecological assets directly as well as in the context of wider populations or habitat occurrence.

1.1.7. The occurrence of sites that were formerly part of the European Natura 2000 network (and now referred to here as Habitat Sites) will also necessitate a Habitats Regulation Assessment (HRA) for the Project. This will inform the EIA but will address only those International Sites and the species fundamental to their designation.

1.1.8. A separate biodiversity net gain (BNG) assessment, though not directly part of the EIA, will inform both the avoidance of impacts and the enhancement and creation of wildlife-rich habitats in ways that are resilient to climate change.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
AWI	Ancient woodland inventory
BCT	Bat Conservation Trust
BNG	Biodiversity net gain
BS	British standards
CIEEM	Chartered Institute of Ecology and Environmental Management
CoCP	Code of construction practice
CSZ	Core sustenance zone
CiWS	City wildlife sites
CWS	County wildlife sites
DCO	Development consent order
DEFRA	Department for Environment, Food and Rural Affairs
DLL	District level licencing
EcIA	Ecological impact assessment
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
HPI	Habitat of Principal Importance
HRA	Habitats Regulations Assessment
HSM	Habitat suitability modelling
IPZ	Impact zone

Abbreviation	Definition
IROPI	Imperative reasons of overriding public interest
JNCC	Joint Nature Conservation Committee
LNR	Local Nature Reserve
LWS	Local Wildlife Site
LSE	Likely significant effects
NNNPS	National networks national policy statement
NSIPs	Nationally significant infrastructure projects
PSYM	Predictive system for multimetrics
SAC	Special Area of Conservation
SNCBs	Statutory nature conservation bodies
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WFD	Water Framework Directive
ZoI	Zone of influence

3. Relevant standards and guidance

3.1. Overview

3.1.1. Legislation applicable to the biodiversity assessment comprises:

- The Environment Act 2021;
- The Conservation of Habitats and Species Regulations 2017 (as amended);
- The Wildlife and Countryside Act 1981 (as amended);
- The Countryside and Rights of Way Act 2000;
- The Natural Environment and Rural Communities Act 2006;
- The Protection of Badgers Act 1992;
- Hedgerow Regulations 1997;
- The Eels (England and Wales) Regulations 2009; and
- The Salmon and Freshwater Fisheries Act 1975 (as amended).

3.1.2. In addition to the legislation listed above, the UK government has several plans that inform the protection and enhancement of biodiversity in England. These include A Green Future: Our 25 Year Plan to Improve the Environment (the 25-year plan) published in 2018 by Department for Environment, Food and Rural Affairs (DEFRA).

3.1.3. Due consideration will also be given to local planning policies where relevant.

3.1.4. The assessment of biodiversity effects will be informed by guidance set out in Table 2. The relevant standards and guidance underpinning the survey efforts for specific receptors are summarised in Table 3 and Table 4.

3.1.5. The approach and implementation of BNG is informed by legislation and guidance as detailed within the 'Approach to BNG' document.

Table 2 – Relevant guidance for the biodiversity assessment.

Guidance	Description	Relevance to the proposed assessment
Chartered Institute of Ecology and Environmental Management (CIEEM)	Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018) are the standard guidelines for ecological assessment.	The assessment will follow the guidance provided in CIEEM (2018) on the process of impact assessment for biodiversity and reporting of results of the assessment.
HRA *Advice note ten: HRA relevant to nationally significant infrastructure*	This advice note explains that when preparing an application for NSIPs under the Planning Act 2008, applicants should consider the potential effects on protected habitats. If an NSIP is likely to affect	This guidance will be used to undertake an indicative screening of the Project and its potential to cause likely significant effects (LSE) on Habitats Sites.

Guidance	Description	Relevance to the proposed assessment
Projects v8 (Planning Inspectorate, 2024)[2]	Habitats Sites, the applicant must provide a report with the application showing the site(s) that may be affected together with sufficient information to enable the decision maker to make an appropriate assessment, if required. This advice note provides advice for applicants in relation to the preparation of that report and the DCO process relating to HRA.	
British Standard (BS) 42020:2013 Biodiversity: Code of practice for planning and development	BS 42020:2013 provides advice on the approach to gathering, analysing, presenting, and reviewing ecological information at key stages of the consenting process.	The approach to biodiversity will be informed by these standards throughout the development of the Project.

[2] Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Habitats Regulations Assessments. Available at https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-advice-on-habitats-regulations-assessments

4. Establishing the baseline

4.1. Overview

4.1.1. Field and desk-based studies were conducted for earlier proposals of the Project pre-2023. Data collection to update existing information within the study area, and to inform the baseline of the biodiversity assessment, commenced in 2023 and is ongoing. Ongoing survey work will cover additional elements of the Project as the design develops, plus significant gaps in previous survey coverage (where possible).

4.1.2. The following has been used to establish the baseline for biodiversity:

- A desk study undertaken during the optioneering stages of the Bedford to Cambridge section, focused on gathering information on statutory and non-statutory nature conservation designations, and records of legally protected and notable habitats and species from the Bedfordshire & Luton Biodiversity Recording & Monitoring Centre and the Cambridgeshire & Peterborough Environmental Records Centre;
- Data gathered from site-based surveys and appraisals undertaken during the optioneering stages of the Bedford to Cambridge section between 2020-2021 (extended to the winter of 2021/22 for wintering bird surveys and 2022 for field surveys essential to inform design and a HRA in relation to barbastelle bat *Barbastellus barbastellus*); and
- A review of previous biodiversity information that informed the assessment of current or previous planning applications in the study area (where available). Information was gathered and collated from The Chiltern Railways (Bicester to Oxford Improvements), The Network Rail (East West Rail Bicester to Bedford Improvements) Order, the A428 Black Cat to Caxton Gibbet Improvements (Highways England), Bourn Airfield planning application S/3440/18/OL, Cambridge South Station (Network Rail) and The Cambourne to Cambridge project (Greater Cambridge Partnership).

4.2. Documentary records

4.2.1. The results of a desk study form a component of the baseline information which will support an EIA and HRA for the Project. The results also inform the scope of the ongoing field survey work.

4.3. Surveys

4.3.1. The type and methodologies of field and desk-based surveys conducted pre-2023 are described in Table 3.

4.3.2. It was agreed with Natural England and NatureSpace Partnerships that District Level Licensing will be applied to the Project, therefore no great crested newt (GCN) presence/absence surveys were undertaken.

Table 3 – Pre-existing field survey types and methodologies (pre-2023).

Ecological feature	Methodology	Date completed
Terrestrial habitats	Joint Nature Conservation Committee (JNCC). (2010). Handbook for Phase 1 habitat survey: A technique for environmental audit. Rodwell, J.S. (2006). National Vegetation Classification: User's Handbook. Joint Nature Conservation Committee.	2020 - 2021
Hedgerows	DEFRA (2007). Hedgerow Survey Handbook - A standard procedure for local surveys in the UK. Prepared on behalf of the Steering Group for the UK Biodiversity Action Plan for Hedgerows. 2nd Edition.	2019 - 2021
Ponds, diatoms and aquatic invertebrates	Howard, S. (2002). A guide to monitoring the ecological quality of ponds and canals using predictive system for multimetrics (PSYM): PSYM Manual, Environment Agency	2018 - 2021
River habitat survey and macrophyte survey	River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual, 2003 Version, Environment Agency	2020
Ditch vegetation	A Manual for the Survey and Evaluation of the Aquatic Plant and invertebrate Assemblages of Grazing Marsh Ditch Systems Version 6, 2013, Buglife - The Invertebrate Trust. Natural England Research Report NERR005: Surveying terrestrial and freshwater invertebrates for conservation evaluation, 2007, Natural England.	2020
Badger	Harris, S., Cresswell, P. and Jefferies, D. (1989). Surveying Badgers, Occasional publication No.9 Mammals Society. Competencies for Species Survey: Badger, 2013, Chartered Institute of Ecology and Environmental Management.	2020 - 2021
Bats	Collins, J (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London. Bat Conservation Trust (BCT), May 2022. Interim Guidance Note: Use of night vision aids for bat emergence surveys and further comment on dawn surveys. London. Williams, F. (2019). Thermal Imaging: Bat Survey Guidelines. The Bat Conservation Trust. Bat Tree Habitat Key (2018), Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Pelargic Publishing. London	2020 – 2022
Birds	Breeding Birds (excluding barn owl *Tyto alba*): the surveys comprised an adapted methodology of Marchant (1983). Marchant, J.H. (1983). Common Bird Census Instructions. British Trust for Ornithology. Gilbert, G., Gibbons, D.W. and Evans, J., Bird Monitoring Methods: A Manual of Techniques for Key UK Species, 1998, Royal Society for the Protection of Birds.	2018 – 2022
	Shawyer, C.R. (2011). Barn Owl Tyto alba: Survey Methodology and Techniques for use in Ecological Assessment. Developing Best Practice	2021

Ecological feature	Methodology	Date completed
	in Survey and Reporting. Chartered Institute of Ecology and Environmental Management. Competencies for Species Surveys: Barn Owl, 2013, Chartered Institute of Ecology and Environmental Management.	
	Pollit, M.S., Hall, C., Holloway, S.J., Hearn, R.D., Marshall, P.E., Robinson, J.A., Musgrove, A., Robinson, J. and Cranswick, P.A., 2003, The Wetland Bird Survey 2000-2001: Wildfowl & Wader Counts.	2020 - early 2022
Hazel dormouse	Presence/ absence surveys conducted – Bright, P.W., Morris, P.A. and Mitchell-Jones, A. (2006). Dormouse Conservation Handbook, 2nd Edition. English Nature, Peterborough. Chanin, P. and Woods, M., Surveying dormice using nest tubes: results and experiences from the south-west Dormice project, English Nature Research Report No. 524, 2003, English Nature. Competencies for Species Surveys: Hazel Dormouse, 2013, Chartered Institute of Ecology and Environmental Management. Available at: https://cieem.net/wp-content/uploads/2019/02/CSS-HAZEL-DORMOUSE-April-2013.pdf	2021
Reptiles	Edgar, P., Foster, J. and Baker, J. (2010) Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth. Competencies for Species Surveys: Reptiles, 2014, Chartered Institute of Ecology and Environmental Management. Available at: https://cieem.net/wp-content/uploads/2019/02/CSS-REPTILES-October-2014.pdf Froglife (1999) Froglife Advice Sheet 10: reptile survey. Froglife, Halesworth. Herpetofauna Groups of Britain and Ireland (1998) Evaluating local mitigation/translocation programmes: maintaining best practice and lawful standards. HGBI advisory notes for amphibian and reptile groups. HGBI c/o Froglife, Halesworth. (Unpublished). Joint Nature Conservation Committee (2004) Common Standards Monitoring Guidance for Reptiles and Amphibians, Version February 2004. JNCC, Peterborough.	2020 - 2021
Otter	Chanin, P., Monitoring the Otter Lutra lutra, 2003, Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature. Chanin, P., Otter surveillance in SACs: testing the protocol, 2005, English Nature Research Reports - Number 664, English Nature. Highways Agency, Design Manual for Roads and Bridges: Volume 10, Section 4, Part 4 - Nature Conservation Advise in relation to Otters, 1999, Highways Agency. Competencies for Species Surveys: Eurasian Otter, 2013, Chartered Institute of Ecology and Environmental Management.	2021
Water vole	Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series), The Mammal Society.	2021
Terrestrial invertebrates	'Drake, C.M., Lott, D.A., Alexander, K.N.A. and Webb, J. (2007). Surveying terrestrial and freshwater invertebrates for conservation	2021

Ecological feature	Methodology	Date completed
	evaluation. Natural England Research Report NERR005. Natural England, Peterborough.	
White-clawed crayfish	Peay, S., Monitoring the White-Clawed Crayfish Austropotamobius pallipes, 2003, Conserving Natura 2000 Rivers, Monitoring Series No. 1, English Nature. Competencies for Species Surveys: White-clawed crayfish, 2013, Chartered Institute of Ecology and Environmental Management.	2020 – 2021

4.3.3. Updated surveys, focussed primarily within the section between Bedford and Cambridge, commenced in 2023. Table 4 details where the survey methodology differed from the methodology applied pre-2023 due to changes in approach or to incorporate updates to standard guidance or additional guidance.

4.3.4. Hazel dormouse *Muscardinus avellanarius* was considered likely to be absent between Bedford and Cambridge and was scoped out of the 2023 surveys. Presence of this species was assumed during the previous Bletchley to Bicester works. Consideration is, therefore, being given to the inclusion of hazel dormouse surveys to inform localised areas of works between Oxford and Bedford only.

4.3.5. Based on previous survey data, the land within the boundary of the Project was considered likely to support low populations of common reptile species only. This was due to poor connectivity to large areas of optimal habitat or areas known to support large populations of these species. Low populations are highly unlikely to significantly contribute to county or regional populations, therefore further field surveys for these species were scoped out.

Table 4 – 2023/24 field survey methodology updates (Bedford-Cambridge).

Ecological feature	Guidance
Terrestrial habitats	UKHabitat User Guide: UKHab – UK Habitat Classification. Glaves, Rotherham, I.D., Wright, B., Handley, C., and Birbeck, J. (2009). The identification of ancient woodland: demonstrating antiquity and continuity- issues and approaches. Woodland Trust. BS 5837 Trees in relation to design, demolition, and construction. English Nature (now Natural England) Veteran Tree Initiative Specialist Survey Method.
Bats	BCT May 2022. Interim Guidance Note: Use of night vision aids for bat emergence surveys and further comment on dawn surveys. London. Williams, F. (2019). Thermal Imaging: Bat Survey Guidelines. The Bat Conservation Trust. Collins, J (ed.) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th ed). The Bat Conservation Trust, London.

Ecological feature	Guidance
Fish	Beaumont, W.R.C., Taylor, A.A.L, Lee, M.J., and Welton, J.S. (2002). Guidelines for Electric Fishing Best Practice R&D Technical Report W2-054/TR. Environment Agency, Bristol Environment Agency (2001). Electric fishing Code of Practice. EAS/6100/4/02. Environment Agency, Bristol. Environment Agency (2007). Technical reference material: water framework directive (WFD) electric-fishing in rivers. Operational instruction. Environment Agency, Bristol.
Otter	Liles, G. (2003) Otter Breeding Sites. Conservation and Management. Conserving Natura 2000 Rivers Conservation Techniques Series No. 5, English Nature
Water vole	Dean, M. (2021) Water Vole Field Signs and Habitat Assessment. Pelagic Publishing.
Kingfisher	BTO (1998) Waterways Breeding Bird Survey Crick, H.Q.P. (1992) A bird-habitat coding system for use in Britain and Ireland incorporating aspects of land management and human activity. Bird Study 39: 1-12 Heneberg, P. (2004) Soil Particle composition of Eurasian Kingfishers' (Alcedo atthis) nest sites. Acta Zoologica Academiae Scientiarum Hungaricae. 50(3): 185-193

4.4. Modelling

4.4.1. Results from 2020 and 2022 bat radio tracking have gathered a lot of information on barbastelle bats in the area that has been analysed to identify core foraging areas, home ranges and flight lines. For large linear projects such as this, the impact of severance and partial fragmentation is an important consideration. Habitat Suitability Modelling (HSM), as detailed in Slack et al. (2022)[3], will be conducted to predict bat-suitable habitat along the Project.

4.5. Study area

4.5.1. The study area described below will be kept under review as the design and consultation processes progress, and the Project is refined and related aspect assessment study areas are confirmed.

Study area: desk study

4.5.2. The study areas applied in the desk study, to identify sites designated for their biodiversity importance, protected and notable species, and scheduled invasive non-native plant and animal species, are presented in Table 5.

[3] Slack, G, Whittle, M and Ellis, B (2022). *Habitat Suitability Modelling for Bats.* In Practice Issue 118 pp 46- 51

Table 5 – 2024 study areas: desk study.

Ecological feature	Study area
Habitats Sites included within the UK national site network Special Areas of Conservation (SAC); and Special Protection Areas (SPA). SACs and SPAs are collectively referred to as national network sites or Habitats Sites.	Land within the draft Order Limits plus an additional search area of 2km. The search area was extended to 30km for Habitats Sites where bats are a qualifying feature.
Statutory sites designated under national legislation (Site of Special Scientific Interest (SSSI), National Nature Reserve and Local Nature Reserve (LNR)).	Land within the draft Order Limits plus an additional search area of 2km. The search area was extended to identify sites designated for mobile fauna within the range of 2 km to 5 km for notable populations of birds and 2 km to 10 km for support notable populations of bats.
Non-statutory designated sites	Land within the draft Order Limits plus an additional search area of 250m. The search area was extended to identify sites designated for mobile fauna within the range of 250m to 5 km for notable populations of birds and 250m to 10 km for support notable populations of bats.
Protected and notable species	Land within the draft Order Limits plus an additional search area of 2km, The search area was extended to 5 km for birds, 10km for fish (including migratory species) and 7 km for bats to inform the HSM (extended to 10 km of the SAC).
Scheduled invasive non-native species	Land within the draft Order Limits plus an additional search area of 250 m.

Study areas: field surveys

4.5.3. As the design develops the field survey areas will be refined and applied based on the consideration of the likely zone of influence (ZoI) of the Project on a given ecological feature. The definition of field survey areas will be developed using a combination of guidance contained within the CIEEM guidelines and good practice guidance specific to given species surveys. The current field survey areas are presented in Table 6.

4.5.4. The purpose of the on-going field survey programme is to consolidate existing data and support the ecological impact assessment (EcIA) and HRA to be undertaken for the Project.

Table 6 – 2024 study areas: field surveys.

Ecological feature	Field survey area
Habitats (including UKHabs, and hedgerow)	Land within the draft Order Limits plus a 30m buffer (extended to 200m around new station car park access points) - may extend further where impacts are possible due to hydrological connectivity.
PYSM (ponds and lakes)	Land within the draft Order Limits, those immediately adjacent to the boundary, and/or those which are hydrologically connected to it (e.g. via drainage) which are likely to be impacted directly.
Aquatic macroinvertebrates	Watercourses within the draft Order Limits or with hydrological connectivity to the Project.
White clawed crayfish	Watercourses within the draft Order Limits or with hydrological connectivity to the Project.
Fish	Watercourses within the draft Order Limits or with hydrological connectivity to the Project.
Macrophytes	Watercourses within the draft Order Limits or with hydrological connectivity to the Project.
Otter	Land within the draft Order Limits plus a 200m buffer.
Water vole	Land within the draft Order Limits plus 200-500m upstream and downstream of the Project.
Badger	Land within the draft Order Limits plus a 50m buffer. This buffer area will be extended out to 100m in areas of piling. The survey area will be extended as necessary where bait marking is required for the identification of a Main Sett.
Bats (including habitat suitability modelling)	Roost surveys – Operational sections of the Project: Land within the draft Order Limits plus 20m. Offline sections of the Project: Land within the draft Order Limits plus 50m in rural landscapes and 20m in urban landscapes. HSM - The modelled areas of high and low suitability habitat will comprise of two study areas; 7km from the draft Order Limits, extended to 10km from the Eversden and Wimpole Wood SAC boundary.
Birds (including barn owl)	Birds (breeding and non-breeding): Land within the draft Order Limits plus a buffer defined by the area within which construction and/or operational noise levels exceed 39db. Barn owl: Land within the draft Order Limits plus 1.5km.
Terrestrial invertebrates	Land within the draft Order Limits plus 100m.

4.6. Consultation

4.6.1. Consultation will be ongoing to inform the assessment of biodiversity as the DCO application progresses. A non-statutory consultation commenced in November 2024.

5. Preliminary baseline description

5.1. Overview

5.1.1. Field and desk-based surveys confirmed that land within the draft Order Limits supports habitats that are suitable for a range of protected and notable habitats and species. The baseline conditions presented below represent a review of the pre-2023 information for each of the route sections individually.

5.2. Oxford to Bletchley

Designated sites

5.2.1. There are no statutory designated sites present within the draft Order Limits. Although Oxford Meadows SAC is located adjacent to the Project. Designated for the presence of lowland, the site is underpinned by multiple SSSI including Port Meadow with Wolvercote Common and Green SSSI notified for supporting wintering and breeding birds. Two other nationally significant designated sites (Wendlebury Meads and Mansmoor Closes SSSI and Hook Meadow and The Trap Grounds SSSI) are bisected by the existing railway. These sites are known to support populations of breeding birds.

5.2.2. Six statutory designated sites with birds as a qualifying feature are present within 5km of the Project. None were identified with bats as a qualifying feature within 10km.

5.2.3. Three non-statutory designated sites intersect with the Project, including one road wildlife corridor (V4 Watling Street) and two rail wildlife corridors (Main Line and Woburn to Bletchley). The Blue Lagoon County Wildlife Site (CWS) is located within 15m of the draft Order Limits.

Habitats

5.2.4. Much of the habitat within this route section comprises existing railway, station buildings, and roads. Vegetation is largely confined to the edges of infrastructure and urban landscaping.

5.2.5. One ancient woodland inventory (AWI) site (Salden Wood) was identified adjacent to the Project. A tree listed in the ancient tree inventory is located approximately 800m west of Oxford Parkway station.

5.2.6. Five Habitats of Principle Importance (HPI) included on the Natural England Priority Habitat Inventory are present adjacent to the Project, including lowland meadow, deciduous woodland, traditional orchard, good quality semi-improved grassland and coastal and floodplain grazing marsh. These habitats occur in discrete areas within this section.

Aquatic ecology

5.2.7. The Project intersects the River Cherwell, Gallos Brook, Langford Brook, Town Brook, Langford Brook, Summerstown Ditch and Launton and Cutters Brook, and Claydon Brook within this section.

5.2.8. Environment Agency surveys in 2014 identified the following freshwater fish: bleak *Alburnus alburnus*; chub *Leuciscus cephalus*; common bream *Abramis brama*; dace *Leuciscus leuciscus*; gudgeon *Gobio gobio*; perch *Perca fluviatilis*; pike *Esox lucius*; roach *Rutilus rutilus*; ruffe *Gymnocephalus cernuus*; and silver bream *Abramis bjoerkna*. Aquatic invertebrate surveys were most recently undertaken in 1996 and did not identify any species of conservation concern (Environment Agency, 2021).

Bats

5.2.9. A range of locally common and widespread bat species are recorded, together with features such as mature trees and built structures offering potential to support roosting bats.

5.2.10. Surveys undertaken as part of the consented Chiltern Railways (Bicester to Oxford Improvements) identified the use of the Wolvercote Tunnel by bats, both as a roosting site and a commuting corridor. Common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Daubenton's *Myotis daubentoniid*, and Natterer's bat *Myotis nattereri* are known to roost in the structure, with commuting activity also recorded for pipistrelle and Myotis bat species, brown long-eared bat *Plecotus auritus* and noctule *Nyctalus noctula*.

Breeding and wintering birds

5.2.11. Wendlebury Meads and Mansmoor Closes SSSI, Hook Meadow and The Trap Grounds SSSI and Port Meadow with Wolvercote Common and Green SSSI are located adjacent the Project or within the study area. These sites are notified for both breeding and/ or wintering birds and Port Meadow with Wolvercote Common and Green SSSI additionally supports kingfisher.

5.2.12. Sites supporting mature woodland or wetland habitats such as Oxford Meadows SSSI are likely to be important bird habitat within this section and support species listed in Schedule 1.

5.2.13. Built-up areas are not likely to be important habitat, although Schedule 1 species such as red kite *Milvus milvus* may breed around the wooded fringes of Bicester. HS2 survey records and desk study identified notable bird species present within habitats along this section including Schedule 1 species (barn owl, red kite and Cetti's warbler *Cettia cetti)* and notable species (common tern *Sterna hirundo*, turtle dove *Streptopelia turtur* and nightingale *Luscinia megarhynchon)* many of which are associated with the Cavert Jubilee Nature Reserve Local Wildlife site (LWS) and Calvert Brick Pits LWS.

Riparian mammals

5.2.14. Both otter *Lutra lutra* and water vole *Arvicola amphibius* are known to be present within the Sheepwash Channel and River Thames near Oxford station. There are no watercourses or suitable habitats for riparian mammals at the Bicester or Oxford Parkway stations.

Hazel dormouse

5.2.15. Hazel dormouse is listed as 'present' in Oxfordshire and 'rare' in Buckinghamshire. The surveys carried up to 2023 out by the EWR Alliance in connection with the Network Rail (East West Rail Bicester to Bedford Improvements) Order identified no recent or historical records of this species within 2km of the Project but assumed the presence of dormouse within scrub and woodland. A precautionary approach of assumed presence was taken in the absence of surveys.

5.3. Fenny Stratford to Kempston

5.3.1. No statutory designated sites intersect with this section of the route and no habitat sites were recorded within 10km. The draft Order Limits are within 30km of Eversden and Wimpole Woods SAC, but outside the SAC 10km impact risk zone (IRZ).

5.3.2. Four non-statutory designated sites intersect with the draft Order Limits, including wet wildlife corridors (Grand Union Canal), road wildlife corridors (V4 Watling Street and A5 (T)) and rail wildlife corridors (Main Line and Woburn – Bletchley). Two sites are located adjacent to the draft Order Limits (Caldecote Lake CWS and Blue Lagoon CWS).

Habitats

5.3.3. Like the Oxford to Bletchley section above, much of the habitat within this route section comprise existing railway, station buildings, and roads. Vegetation is largely confined to edges of infrastructure and urban landscaping.

5.3.4. No AWI sites are located within 100m of the Project.

5.3.5. HPIs identified on the Natural England Priority Habitat Inventory suggest the presence of discrete areas of deciduous woodland, good quality semi-improved grassland and lowland meadow adjacent to the Project within this section.

Aquatic ecology

5.3.6. This section of the Project intersects the River Ouzel, Broughton Brook and Elstow Brook.

5.3.7. Network Rail (2018) reviewed records and surveyed a range of watercourses that were found to support impoverished aquatic invertebrate communities of low conservation importance, restricted macrophyte assemblages and species

poor fish populations. No white clawed crayfish were recorded during surveys in 2018.

Bats

5.3.8. A range of bat species were identified during bat activity field surveys undertaken up to 2018 (Network Rail, 2018). The common pipistrelle, soprano pipistrelle, Nathusius pipistrelle *Pipistrelle nathusii*, brown long-eared bat, noctule, Leisler's bat *Nyctalus leisleri*, serotine *Eptesicus serotinus*, Daubenton's bat and barbastelle bat were confirmed along the Bletchley to Bedford line, in addition to Myotis species. While most of these species are common, Leisler's bat, serotine bat, and Nathusius' pipistrelle are nationally and locally rare and barbastelle bat is nationally very rare.

5.3.9. Eversden and Wimpole Woods SAC/SSSI is situated within 30km. The Annex II bat species barbastelle is a qualifying species of this habitat site. A total of six bat species have been recorded at this site, the other species being the pygmy pipstrelle *Pipistrellus pygmaeus* and common pipistrelle, brown long-eared, Natterer's bat and noctule.

5.3.10. Bats of a variety of species are likely to be roosting in trees and structures within and surrounding the Project. The semi-natural habitats present in this section of the Project could support small to moderate numbers of common and rarer bat species.

Breeding and wintering birds

5.3.11. Caldecote Lake CWS is located adjacent to this section of the Project and is designated for its wintering birds. The habitats present are also likely to support a diverse breeding bird assemblage.

5.3.12. Sites supporting wetland habitats such as Marston Vale Millennium Country Park and Stewartby Lake are likely to be important bird habitat within this area.

5.3.13. Built-up areas are not likely to be important habitat although black redstart *Phoenicurus ochruros* has been recorded adjacent to the boundary of the Project.

5.3.14. Sites supporting rare breeding birds, including turtle dove classified as endangered in Great Britain (Stanbury et al., 2021), may be located within or close to land within the boundaries of the Project.

Riparian mammals

5.3.15. Records of otter were identified at Caldecote Lake and on the River Ouzel near Fenny Stratford station. Additional records indicate that there are records of otter on Elstow Brook, Kempston, Marston Vale Millennium Country Park, Begwary Brook, Bromham Lake CWS, Priory Country Park, River Great Ouse CWS, Rivers Izel and Hiz CWS and Bromham Water Meadows CWS.

5.3.16. The most recent records of water vole in this section of the Project were from the late 1990s at Blue Lagoon LNR.

Hazel dormouse

5.3.17. Data collected up to 2023 by the EWR Alliance for the consented Network Rail (East West Rail Bicester to Bedford Improvements) Order identified no recent or historical records of this species within 2km but presence within scrub and woodland is assumed in the absence of survey data.

5.4. Bedford

Designated sites

5.4.1. No statutory designated sites intersect with the Project, although the route section lies within 30km of Eversden and Wimpole Woods SAC; outside the 10km IRZ.

5.4.2. There were no statutory designated sites with birds as a qualifying feature within 10km of the Project.

5.4.3. The route section crosses the River Great Ouse CWS at three locations. Areas of priority habitats are associated with the river and its valley. In addition to being a CWS, the Great Ouse has hydrological connectivity to other CWS designated within this route section. Within Bedford, the western area of St. John's Station CWS lies within the draft Order Limits.

Habitats

5.4.4. A Phase 1 Habitat Survey was completed in 2018 to inform the Network Rail (East West Rail Bicester to Bedford Improvements) Order. Terrestrial habitats recorded within the existing rail corridor were typically rough grassland with a mosaic of scattered and continuous scrub and woodland along the boundary of the railway. Adjacent habitats typically comprise arable and pasture fields separated by hedgerows.

5.4.5. No AWI sites are present within 100m of the Project.

5.4.6. HPIs identified on the Natural England Priority Habitat Inventory, suggest the presence of discrete areas of coastal and floodplain grazing marsh and deciduous woodland adjacent to the draft Order Limits.

Aquatic ecology

5.4.7. The Project crosses the River Great Ouse within this section. Network Rail (2018) reviewed records and surveyed a range of watercourses for macrophytes, aquatic invertebrates and fish. The watercourses are likely to be integral to the maintenance of the integrity of LWS acting as a wildlife corridor connecting to a wider network of watercourses and standing waterbodies. However, individually the watercourses were found to support impoverished aquatic invertebrate communities of low conservation importance, restricted macrophyte assemblages and species poor fish populations. No white clawed crayfish were recorded during surveys in 2018.

Bats

5.4.8. A range of bat species were identified during bat activity field surveys undertaken up to 2018 (Network Rail, 2018). The common pipistrelle, soprano pipistrelle, Nathusius pipistrelle, brown long-eared bat, noctule, Leisler's bat, serotine, Daubenton's bat and barbastelle bat were confirmed along the Bletchley to Bedford line, in addition to Myotis species. While most of these species are common, Leisler's bat, Serotine bat, and Nathusius' pipistrelle are nationally and locally rare and barbastelle bat is a nationally very rare and a reason for designation for the SAC.

5.4.9. A variety of bat species are likely to be roosting in trees and structures within and surrounding the Project. The semi-natural habitats present in this route section could also support small to moderate numbers of common and rarer bat species.

Breeding and wintering birds

5.4.10. Sites supporting riparian, aquatic and wetland habitats such as The River Great Ouse CWS and the Bromham Water Meadows CWS are likely to support an assemblage of breeding and wintering birds.

5.4.11. Built-up areas are unlikely to be important habitats, although black redstart was recorded in 2021 at a potential nest site adjacent to the draft Order Limits.

5.4.12. Sites supporting rare breeding birds, including turtle dove may be located within or close to land within the draft Order Limits.

Riparian mammals

5.4.13. Records of otter on Elstow Brook, Kempston, Marston Vale Millennium Country Park, Begwary Brook, Bromham Lake CWS, Priory Country Park, River Great Ouse CWS, Rivers Izel and Hiz CWS and Bromham Water Meadows CWS were identified. These broadly coincide with CWS and those habitats that support a watercourse or wetland, although some relate to records of roadkill near to the A421.

5.4.14. No records of water vole available to date are relevant to this section of the Project. However, watercourses crossed by the Project and the adjacent waterbodies are suitable to support riparian mammals.

5.5. Clapham Green to Colesden

Designated sites

5.5.1. No statutory designated sites intersect with the Project or a 2km buffer area. No habitat sites were recorded within 10km of the Project, although the Eversden and Wimpole Woods SAC is present within the ZoI.

5.5.2. There were no statutory designated sites with birds as a qualifying feature within 5km or bats as a qualifying feature within 10km of the Project within this section.

5.5.3. Although no non-statutory designated sites intersect the Project, two non-statutory designated sites are located within the ZoI, including Great and Little Woods, Ravensden CWS and Clapham park Wood CWS.

Habitats

5.5.4. Habitats within the scoping area broadly comprise arable with other habitats including improved grassland, urban/hardstanding/existing railway, woodland, plantation, tree lines, scrub, hedgerows, and watercourses including ditch networks associated with semi-natural grasslands.

5.5.5. One area of HPI habitat (AWI deciduous woodland) was identified from the Natural England Priority Habitat Inventory within 100m of the Project.

Aquatic ecology

5.5.6. The Project crosses the River Great Ouse in the southern extent of this section.

5.5.7. Network Rail (2018) reviewed records and surveyed a range of watercourses for macrophytes, aquatic invertebrates and fish. The watercourses are likely to be integral to the maintenance of the integrity of local wildlife sites and provide value as a wildlife corridor connecting to a wider network of watercourses and standing waterbodies. However, individually the watercourses were found to support impoverished aquatic invertebrate communities of low conservation value, restricted macrophyte assemblages and species poor fish populations.

Bats

5.5.8. The route section lies within 30km of Eversden and Wimpole Woods SAC, but outside the SAC 10km IRZ. The consented A428 Black Cat to Caxton Gibbet Improvements scheme (Highways England) identified barbastelle bat using Boys Wood and St Johns Wood, which are intersected by the new A428 and the Project. To maintain connectivity between the two woodlands the mitigation plans for the A428 include an underpass for barbastelle bat.

5.5.9. Bats of a variety of species are likely to be roosting in trees and structures within and surrounding the Project. The semi-natural habitats present in this section of the Project could support small to moderate numbers of common and rarer bat species.

Breeding and wintering birds

5.5.10. This section of the Project does not include statutory or non-statutory designated sites notified for ornithology. It comprises primarily agricultural habitat with tree lines that will support common and widespread assemblages of breeding and wintering birds but may not support communities of notable birds to the same extent as other sections of the Project.

5.5.11. Built-up areas are not likely to be important habitat although black redstart was recorded in 2021 at a potential nest site adjacent to the Project.

5.5.12. Sites supporting rare breeding birds, including turtle dove, may be located within or close to land within the boundaries of the Project.

Riparian mammals

5.5.13. There are no additional records or watercourses within this section of the Project. This section of the Project crosses the Great River Ouse in the most southern extent and records of otter within this watercourse are present.

5.5.14. No records of water vole available to date are relevant to this section of the Project. However, watercourses crossed by the Project and the adjacent waterbodies are suitable to support riparian mammals, potentially including breeding individuals.

5.6. Roxton to east of St Neots

Designated sites

5.6.1. No statutory designated sites intersect with the study area for this section and no habitat sites were recorded within 10km of the Project. The route section lies within 30km of Eversden and Wimpole Woods SAC, but outside the SAC 10km IRZ.

5.6.2. There are no statutory designated sites on with birds as a qualifying feature within 5km or bats as a qualifying feature within 10km of the Project.

5.6.3. The Project crosses a single non-statutory designated site, River Great Ouse CWS, within this route section.

Habitats

5.6.4. Similar to the Clapham Green to Colesden route section, habitats within the study area broadly comprise arable with other habitats including improved grassland, urban/hardstanding/existing railway, woodland, plantation, tree lines, scrub, hedgerows, and watercourses including ditch networks associated with semi-natural grasslands.

5.6.5. Two areas of HPI habitat (deciduous woodland) were identified from the Natural England Priority Habitat Inventory including Boys Wood and an unnamed area of woodland bounding Hens Brook.

5.6.6. No AWI sites have been identified.

5.6.7. This route section intersects with A428 landscape proposals, including creation of areas of woodland and wildflower grassland and areas identified for future consideration under WFD mitigation/enhancement proposals.

Aquatic ecology

5.6.8. Network Rail (2018) reviewed records and surveyed a range of watercourses for macrophytes, aquatic invertebrates and fish. The watercourses are likely to be integral to the maintenance of the integrity of LWS as a wildlife corridor connecting to a wider network of watercourses and standing waterbodies. However, individually the watercourses were found to support impoverished aquatic invertebrate communities of low conservation importance, restricted macrophyte assemblages and species poor fish populations. No white clawed crayfish were recorded during surveys in 2018.

5.6.9. The Project intersects the River Great Ouse and Abbotsley and Hen Brooks. The species supported by the watercourses in this section are unlikely to have more than a local level of importance. However, the records of aquatic interest in the River Great Ouse suggests a relatively elevated level of importance with records of European eel *Anguilla anguilla,* spined loach, bullhead *Cottus gobio* and barbel *Barbus barbus*.

Bats

5.6.10. Eversden and Wimpole Woods SAC/SSSI is situated within 30km of this section of the Project. Additionally, the Project is situated within proximity to Boys Wood and Sir Johns Wood where field surveys have identified barbastelle bat, a qualifying species of the Eversden and Wimpole Woods SAC.

Breeding and wintering birds

5.6.11. Habitats present around the River Great Ouse including riparian, open water and marginal aquatic vegetation are likely to support wintering and breeding birds. These habitats are likely to occur at Wyboston Lakes (forming part of the Wyboston Pits CWS) and Little Barford CWS.

5.6.12. Built-up areas are unlikely to be important habitat although black redstart was recorded in 2021 at a potential nest site adjacent to the draft Order Limits.

5.6.13. Sites supporting rare breeding birds, including turtle dove may be located within or close to land within the boundaries of the Project.

Riparian mammals

5.6.14. Records of otter were identified on the River Great Ouse CWS. The records broadly coincide with CWS and those habitats that support a watercourse or wetland. Some, however, also relate to records of roadkill near to the A421.

5.6.15. One record of water vole available to date is relevant to this section of the Project, however watercourses crossed by the Project and the adjacent waterbodies are suitable to support riparian mammals, potentially, including breeding individuals.

5.7. Croxton to Toft

Designated sites

5.7.1. No statutory designated sites intersect with the Project, although two habitat sites (Eversden and Wimpole Woods SAC and Portholme SAC) are located within 10km. This route section of the Project lies within the 10km SSSI IRZ associated with the SAC.

5.7.2. There are no statutory designated sites with birds as a qualifying feature within 5km and one (Eversden and Wimpole Woods SSSI) with bats as a qualifying feature within 10km of the Project within this section.

5.7.3. There are no non-statutory designated sites which intersected with the Project. One non-statutory designated site (Frogs Hall Drift CWS) was recorded within the ZoI.

Habitats

5.7.4. Similar to the Clapham Green to Colesden route section, habitats within the study area for this route section broadly comprise arable with other habitats including improved grassland, urban/hardstanding/existing railway, woodland, plantation, tree lines, scrub, hedgerows, and watercourses including ditch networks associated with semi-natural grasslands.

5.7.5. Frogs Hall Drift CWS is designated for the grassland habitat it supports including populations of Nationally Scarce vascular plant species. Two HPI (deciduous woodland and traditional orchard) are located within 100m of the Project.

5.7.6. No AWI sites have been identified within 100m of the Project.

Aquatic ecology

5.7.7. There are no main watercourses intersecting the Project within this section.

Bats

5.7.8. Eversden and Wimpole Woods SAC/SSSI is situated within 30km of this section of the Project. The route section lies within the 10km Eversden and Wimpole Woods SAC barbastelle bat core sustenance zone (CSZ), as outlined in Greater Cambridge Biodiversity supplementary planning document (SPD) (2022). Radio tracking surveys have identified barbastelle bat roosts within woodlands to the north and south of the Project. Results from the surveys suggest that it is likely that populations of barbastelle bat associated with these areas of woodland are interlinked with the SAC.

5.7.9. Bats of a variety of species are likely to be roosting in trees and structures within and surrounding the Project. The semi-natural habitats present in this section of the Project could support small to moderate numbers of common and rarer bat species.

Breeding and wintering birds

5.7.10. Built-up areas are not likely to be important habitat although breeding birds will be present, although black redstart was recorded during the breeding season in 2021 at a potential nest site adjacent to boundary of the Project.

5.7.11. Sites supporting rare breeding birds, including turtle dove, may be located within or close to land within the boundaries of the Project.

Riparian mammals

5.7.12. There are no main watercourses intersecting the Project within this section. A network of drainage ditches has been identified as potentially suitable habitat for riparian species.

5.8. Comberton to Shelford

Designated sites

5.8.1. There are no statutory designated sites that intersect with the Project or a 2km buffer area within this section. One habitat site (Eversden and Wimpole Woods SAC) was recorded within 10km, and the western area of this route section lies within the 10km SSSI IRZ for the SAC.

5.8.2. There are two statutory designated sites under national legislation with birds as a qualifying feature within 5km (Dernford Fen SSSI and Fowlmere Watercress Beds SSSI) and one (Eversden and Wimpole Woods SSSI) with bats as a qualifying feature within 10km of the Project within this section.

5.8.3. There are no non-statutory designated sites that intersected with the Project. However, Hoffer Brook Pollard Willows (north) CWS was located immediately adjacent to the Project. Haslingfield Pit CWS and Lord's Bridge Observatory CWS were located within the ZoI.

5.8.4. Similar to the Clapham Green to Colesden route section, habitats within the study area for this route section broadly comprise arable, with other habitats including improved grassland, urban/hardstanding/existing railway, woodland, plantation, tree lines, scrub, hedgerows, and watercourses including ditch networks associated with semi-natural grasslands.

5.8.5. Two HPI habitat (deciduous woodland and coastal and floodplain grazing marsh) were identified from the Natural England Priority Habitat Inventory within 100m of the Project. No AWI sites have been identified within 100m of the Project.

Aquatic ecology

5.8.6. The Project in this section crosses several aquatic linear features: Environment Agency main rivers designated under the Water Environment Regulations (2017), associated tributaries and streams, unnamed tributaries and linear

drainage features. Watercourses crossed by the Project include Bourn Brook (chalk stream), the River Rhee and the River Cam.

5.8.7. Environment Agency records for the Ouse, Stone Brook, Hen Brook, Bourne Brook, Hoffer Brook and River Cam reveal a limited diversity of aquatic invertebrate and fish species. No notable species were identified in most records, with interest focussed on Hoffers Brook. Here recorded fish were limited to bullhead, common minnow *Phoxinus phoxinus*, stone loach *Barbatula barbatula*, brown trout Salmo trutta, and 3-spined stickleback Gasterosteux aculeatus. Incidental plant data from Environment Agency datasets indicate the presence of macrophytes typical of lowland river and stream habitats.

Bats

5.8.8. The western part of this route section lies within the 10km Eversden and Wimpole Woods SAC barbastelle bat CSZ, as outlined in Greater Cambridge Biodiversity SPD (2022). Radio tracking surveys have identified barbastelle bat roosts within woodlands to the north and south of the Project. Results from the surveys suggest that it is likely that populations associated with these areas of woodland are interlinked with the SAC. Eversden and Wimpole Woods SAC/SSSI is situated within 30km of this section of the Project.

5.8.9. Bats of a variety of species are likely to be roosting in trees and structures within and surrounding the Project. The semi-natural habitats present in this section could support small to moderate numbers of common and rarer bat species.

Breeding and wintering birds

5.8.10. Dernford Fen SSSI and Fowlmere Watercress Beds SSSI are notified for their importance to bird species. Fowlmere Watercress Beds includes ‘watercress beds’, reedbed, open water and scattered scrub, which provide foraging habitat for ducks and migratory waders on passage. The scattered scrub present provides breeding habitat for a range of warbler species. Dernford Fen SSSI is also notified for the breeding birds it supports, specifically warbler species.

5.8.11. Hoffer Brook Pollard Willows (north) CWS is located adjacent to the Project and is likely to support suitable habitat for a range of breeding and wintering birds.

5.8.12. Built-up areas are not likely to be important habitat, although black redstart was recorded during the breeding season in 2021 at a potential nest site adjacent to boundary of the Project.

5.8.13. Sites supporting rare breeding birds, including turtle dove which is classified as endangered in Great Britain (Stanbury et al., 2021), may be located within or close to land within the boundaries of the Project.

5.8.14. Sites supporting ancient woodland such as the West Cambridgeshire Hundreds are likely to support a notable assemblage of woodland birds.

Riparian mammals

No records of otter or water vole identified to date are relevant to this section of the Project, however watercourses crossed by the Project and the adjacent waterbodies are suitable to support riparian mammals, potentially including breeding individuals.

5.9. Cambridge

Designated sites

5.9.1. No statutory designated sites intersect with the Project or a 2km buffer area, although one habitat site (Eversden and Wimpole Woods SAC) was recorded within 10km of the Project.

5.9.2. There were four statutory designated sites with birds as a qualifying feature within 5km (Little Paxton Pits SSSI, Wilbraham Fens SSSI, Fulbourn Fen SSSI and Dernford Fen SSSI) and one (Eversden and Wimpole Woods SSSI) with bats as a qualifying feature within 10km of the Project within this section.

5.9.3. The Project crosses Hobson's Conduit along the route of existing railway. Hobson's Conduit (also referred to as Hobson's Brook) flows from Nine Wells LNR, under the railway to the south of Addenbrookes Road and joins Hobson's 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.

5.9.4. The Project intersects with two CWSs within this route section along the route of existing railway, Triangle North of Long Road CWS and Coldham's Common CWS. Three CiWS lie adjacent to Project comprising CU Officer Training Corps Pits, Norman Cement Pits and The Spinney and Hayster Open Space. The Cambridge Botanic Gardens CWS is also located within the ZoI.

Habitats

5.9.5. This section of the Project includes central and the outskirts of Cambridge including predominately the built environment (urban/hardstanding/existing railway) in addition to habitats that broadly comprise managed grassland and greenspaces with recreational functions.

5.9.6. Triangle North of Long Road CWS is intersected by the Project. The site qualifies because of the presence of a nationally scarce vascular plant species. Coldham's Common is associated with neutral grassland indicator species, semi-improved grassland, woodland, and scrub. Three CiWS lie adjacent to Project comprising CU Officer Training Corps Pits, Norman Cement Pits and The Spinney and Hayster Open Space and include areas of HPI, including Lowland Fen and Deciduous Woodland.

5.9.7. There are no AWI sites within 100m of the Project.

5.9.8. Outside the boundary of designated sites, one HPI habitat (deciduous woodland) was identified from the Natural England Priority Habitat Inventory. Small areas of deciduous woodland were recorded adjacent to the A1134. The

Project intersects with landscape planting proposed for Cambridge South. Proposals include the creation of waterbodies and woodland.

Aquatic ecology

5.9.9. Nine Wells LNR is 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 an artificial groundwater recharge scheme) have led to interest in reintroduction. Hobson's Brook is a chalk stream.

5.9.10. The Project crosses the chalk stream, Cherry Hinton Brook, along the route of existing railway. From the Cherry Hinton Brook crossing, the Project runs adjacent to three old chalk pits. These are non-statutory designated sites for nature conservation and include Norman Cement Pits CiWS and CU Officer Training Corps CiWS.

Bats

5.9.11. The following bat species have been recorded roosting within 1km of the Project: common and soprano pipistrelle species, brown long-eared bat, Natterer's bat, serotine bat and Daubenton's bat. The Annex II bat species, barbastelle, associated with Eversden and Wimpole Woods SAC and SSSI is known to utilise habitats located along this section of the Project, including woodlands located north and south of the Project.

5.9.12. Eversden and Wimpole Woods SAC/SSSI is situated within 30km of this section of the Project.

Bats of a variety of species are likely to be roosting in trees and structures within and surrounding the Project. The semi-natural habitats present in this section of the Project could support small to moderate numbers of common and rarer bat species.

Breeding and wintering birds

5.9.13. Four statutory designated sites with birds as a qualifying feature are located within the ZoI. Little Paxton Pits SSSI supports wintering gadwall *Anas strepera* regularly in excess of 1% of the British wintering population. The breeding bird assemblage is also considered significant, particularly ringed plover *Charadrius hiaticula*, snipe G*allinago gallinago,* tufted duck *Aythya fuligula*, kingfisher and nightingale, in addition to a small heronry. Wilbraham Fens SSSI supports drainage ditches and Fulbourn Fen SSSI supports fen and secondary woodland habitat noted as important for various bird species.

5.9.14. This section of the Project includes central and the outskirts of Cambridge including predominately the built environment or semi-natural green space, which also provides recreational or leisure space. Notable assemblages of breeding and wintering birds are considered unlikely within this section. However, black redstart has historically been recorded in Cambridge including the area around Cambridge Station and may therefore be present.

5.9.15. Sites supporting rare breeding birds, including turtle dove may be located within or close to the draft Order Limits.

Riparian mammals

5.9.16. Hobson's Brook and Cherry Hinton Brook are known to support populations of water vole.

5.10. Future baseline

5.10.1. The EIA Regulations require consideration of the likely evolution of the baseline conditions over time, without the implementation of the Project, with reasonable effort based on the availability of environmental information and scientific knowledge.

5.10.2. Climate change is the single most prevalent factor when attempting to predict the future baseline of an ecosystem or species community. Climate change is affecting ecology via multiple pathways. Impacts on species are considered to include changes in distribution and abundance, the timing of seasonal events and habitat use and, as a consequence, there are likely to be changes in the composition of plant and animal communities. Habitats and ecosystems are also likely to change in character.

5.10.3. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

5.10.4. Land management is likely to have a significant influence on biodiversity over much of the study area within the timescale of construction of the Project, which is when most effects from the Project would occur. Within agricultural areas it is expected that, in general, arable field margins, hedgerows, woodlands and trees are likely to be retained by landowners, although these may be subject to routine management activities. As such, unpredictable changes in the biodiversity value or spatial extent of semi-natural habitats are unlikely to occur. It is not clear at this time exactly what these changes would be and hence their effect on the baseline cannot be predicted.

5.10.5. Future planned developments will be considered for the purposes of cumulative assessment. There is the potential that these developments may influence the baseline conditions prior to the construction of the Project.

5.10.6. It is anticipated that construction works for the Project will be undertaken from 2028. Due to the mobile nature of several species which may be impacted by the Project, pre-construction surveys will be required prior to the commencement of construction works.

6. Potential impacts and effects

6.1.1. To identify likely significant effects on ecological features it is necessary to understand the activities associated with the construction (e.g. vegetation clearance) and operation of the Project, to identify the relevant ZoI of those activities, the likely effects that may occur in the environment as a result, and the ecological features that may be subject to effect.

6.1.2. Table 7 outlines the generic activities (sources of impact) that may have an effect on ecological features during the construction and operation of the Project and are therefore being scoped into the assessment at this stage. The evolution of the design (including how it may be implemented), and the collection of further field survey data, will enable this list of effects to be developed in greater level of detail as part of the EIA and reported in the ES.

Table 7 – Effects scoped into the assessment.

Activity	Effect	Ecological feature(s) to be considered
Change of land use including ground clearance for construction sites, enabling works, rail track construction, roads development.	Degradation and/or loss of habitat. Reduction in the availability of habitat. Killing or injury of fauna. Loss of ecological connectivity through severance of habitats resulting in fragmentation. Introduction or spread of invasive species.	Terrestrial and freshwater habitat including HPIs; Birds; Otter; Water vole; Badger; Bat (various species); Dormouse (Oxford to Bedford); and Terrestrial invertebrates.
Use of lighting for construction (including for security purposes or to illuminate working areas) and operation.	Disturbance and displacement of species susceptible to light disturbance potentially leading to a reduction in survival and productivity rates.	Breeding and wintering birds; Otter; Bats (various species); Badger; and Dormouse (Oxford to Bedford).
Construction/alteration of drainage.	Alteration to hydrology including surface water connections, leading to changes to vegetation communities and the species these support.	Terrestrial and freshwater habitats (including groundwater dependent terrestrial ecosystem); and Flood plain grasslands.

Activity	Effect	Ecological feature(s) to be considered
Realignment/diversion/ modification of river/stream channels; loss or modification ponds, drains, ditches and ephemeral channels.	Freshwater habitat degradation and/or loss through shading or direct removal and/or reduction of geomorphological and flow diversity. Loss of ecological connectivity through severance of habitats. A change in flow quantity and seasonal flow patterns particularly high flood events, may alter fish mitigation patterns. Increased flow may also result in increased mortality of semiaquatic species.	Freshwater habitat; Fish; Otter; Water vole; Bat; and Birds.
Changes to water abstraction, discharge, storage during construction activities.	Potential decrease in water quality parameters at discharge/abstraction point resulting in changes to freshwater vegetation communities and the fauna these support. Creation of flood storage areas offers opportunities for the creation of new wetland habitat areas.	Freshwater habitats; Macrophytes; Macroinvertebrates; and Fish.
Pollutants from hard standings due to surface water flows during rainfall events during operation. Use of chemicals and liberation of pollutants and fine material through excavation, demolition or stockpiling or surface water flows during rainfall events.	The introduction of toxic pollutants or sediments into the environment. Changes, loss, or damage to terrestrial or freshwater environments and the fauna they support.	Terrestrial and freshwater habitats; and Associated flora and fauna.
Creation of airborne particles (e.g. dust) during construction activities and vehicle movements.	Loss or damage of sensitive flora through smothering. Deposition of dust resulting in enrichment of sensitive HPIs, including statutory designated sites, leading to alteration of flora. Direct effects on invertebrates through ingestion or direct deposition on sedentary species.	Terrestrial and freshwater habitats (including Ancient Woodland); and Terrestrial and freshwater invertebrates.

Activity	Effect	Ecological feature(s) to be considered
Deposition of nitrogen and sulphur from engine exhaust from operational diesel trains and vehicular traffic accessing/egressing the train stations.	Enrichment and/or acidification of sensitive terrestrial HPIs, leading to alteration of vegetation communities through changes in baseline conditions and the species which they support. In water may result in the build-up of algal blooms and subsequent changes in vegetation community.	Terrestrial and freshwater habitats; and Associated flora and fauna.
Production of aural and visual stimuli and vibration from: construction activities such as vehicular movements, piling or site personnel in the environment; train passes during operation; and/or, vehicles and/or presence of work force for maintenance works of the operational railway	Behavioural avoidance of species from areas with high level of noise and/or vibration. Sensitive species may actively avoid, leading to a reduction in the distribution of these species within suitable habitats and/or potentially leading to a reduction in survival and productivity rates.	Breeding and wintering birds; Otter; Bats (various species); Dormouse (Oxford to Bedford) and Badger.
Increase in vehicle movements using public highways and changes in movement patterns and timings during construction activities.	Deposition of nitrogen or sulphur from vehicle emissions resulting alteration of vegetation communities through changes in baseline conditions and the species which they support. Potential killing or injury of fauna through road traffic collisions.	Terrestrial and freshwater habitats; Otter; Badger; Bats; and Birds.
Collision with moving trains during operation.	Death or injury of individuals.	Birds (especially barn owl); Bats (various); Otter; and Badger.
Provision of biodiversity habitats through the establishment and management of green infrastructure.	Positive increase in biodiversity value through creation and management of suitable habitats.	Terrestrial and freshwater habitats; and Associated flora and fauna.

6.1.3. Changing climate conditions into the future, together with the impacts of the project on ecological features, may exacerbate (or occasionally ameliorate) the significance of the Project effects. For example, increased summer temperatures and drought risk may affect waterbodies (standing and running) suitable for certain species. These climatic changes, combined with the effects of the project upon reduced habitat range may cause potentially significant effects.

6.1.4. The influence of climate change in exacerbating or ameliorating the significance of project effects will be incorporated within the evaluation stage.

7. Assumed mitigation

7.1. Mitigation principles

7.1.1. The Mitigation Hierarchy will be applied to ensure the designs first seek to avoid significant harm, to mitigate where it is unavoidable, and, as a last resort, to compensate for residual effects that remain after avoidance and mitigation measures are implemented. The avoidance of significant harm is being considered through the design process, as are potential mitigation measures. These measures include determining the extent and distribution of suitable habitats required within the Project and in the wider surrounds to account for the likely effects on legally protected and other notable species, the types of habitats that they may require and how these can be incorporated within developing green infrastructure designs. As more information becomes available from the ongoing field survey programme and as the design and construction phasing plans develop mitigation plans will evolve.

7.1.2. The Project proposals will have embedded within them various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

7.1.3. The draft Order Limits will be defined to include land that could be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

7.1.4. It is assumed that mitigation measures are designed which take climate change into account, for example through the mitigation design and timing. Any such effects on mitigation will be identified and recorded within the ES.

7.2. Design principles

7.2.1. Several measures are being incorporated into the design of the Project to reduce effects on ecological features. Measures are also being developed with the aim of achieving net gain of biodiversity across the Project. Measures could include the following:

- Avoidance of important ecological features through the design-development process wherever possible;
- Development of an appropriate ecological design (in conjunction with wider landscaping, BNG and drainage measures); and
- Habitat re-creation.

7.2.2. In addition, several potential biodiversity enhancement measures are being developed which will form part of the design. Land within the boundary would include areas identified to deliver biodiversity mitigation, compensation, and enhancement measures.

7.3. Code of construction practice

7.3.1. Construction work can be one of the chief causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

7.3.2. The environmental assessment of biodiversity impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

7.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on biodiversity may include the following generic categories:

- Timing of construction works and working hours;
- Construction site layout and good 'housekeeping';
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Pollution prevention measures;
- Investigation and reporting;
- Unexpected discoveries;
- On-site and off-site protection;
- Site drainage and watercourse and groundwater protection;
- Pre-emptive environmental surveys to guide on-site activities;
- Protection and reinstatement of land and soils;
- Ground investigation and remediation;
- Tree protection;
- Site waste management plans, including segregation and storage of waste;
- Site specific measures; and
- Monitoring requirements.

7.3.4. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

7.4. Evaluating significance

7.4.1. The approach to the assessment of biodiversity will follow the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2018) produced by the CIEEM.

7.4.2. The methodology used to assess the likely impacts on ecological features is the same for both the construction and operation phases of the Project and will take the following approach:

- Determine the importance of ecological features affected, through desk study and/or field survey;
- Identify impacts potentially affecting important ecological features;
- Characterise the impacts by describing their extent, magnitude, duration, reversibility, timing, and frequency;
- Identify significant effects of impacts;
- Incorporate measures to avoid and reduce (mitigate) these impacts;
- Assess the significance of any residual effects after mitigation;
- Identify cumulative impacts;
- Identify appropriate compensation measures to off-set significant residual effects (if any); and
- Identify opportunities for ecological enhancement.

7.4.3. The importance of ecological features will be assigned a value according to one of the following geographical frames of reference: international; national; regional; county; and local (parish). This will be determined based on a variety of reasons, for example:

- The quality or extent of designated sites or habitats;
- Habitat/species rarity; and
- The extent to which they are threatened throughout their range; and/or their rate of decline.

7.4.4. In accordance with CIEEM (2018), a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general.

7.4.5. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the biodiversity chapter of the ES.

7.5. Habitats Regulations Assessment

7.5.1. The Project will be subject to an HRA to determine whether the project may affect the interest features and objectives of protected nature conservation sites at a European and International level (referred to as Habitats Sites).

7.5.2. HRA refers to the several distinct stages of assessment which must be undertaken in this case by the Secretary of State for Transport and in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations').

7.5.3. The HRA is an iterative, staged process that is described in the Planning Inspectorate's Advice Note Ten HRA relevant to Nationally Significant Infrastructure Projects as:

- **Stage 1 – Screening**: to check if the proposal is likely to have a significant effect on the site's conservation objectives, alone or in combination with other plans or projects);
- **Stage 2 – Appropriate assessment/Consideration of effects on site integrity:** to assess the implications of the proposal for the qualifying features of the Habitats Site or sites, in view of the site's conservation objectives, and identify ways to avoid or minimise any effects; and
- **Stage 3 – Derogation:** to consider if proposals that would have an adverse effect on the integrity of a European site (referred to as Habitat Sites) qualify for an exemption. The derogation stage involves (in order):
  - the consideration of alternative solutions
  - consideration of IROPI
  - securing compensatory measures which would maintain the coherence of the UK National Site Network.

7.5.4. EWR Co is proposing to use the framework of DEFRA's guidance Evidence Plans for Nationally Significant Infrastructure Projects and the Planning Inspectorate's Advice note 11 to deliver technical consultation with specialist bodies about HRA. An Evidence Plan is a formal mechanism to agree upfront with statutory nature conservation bodies (SNCBs) what information the applicant needs to supply to the Planning Inspectorate as part of a DCO application. The Evidence Plan process will determine the type of information necessary to inform a robust assessment and the approaches used to consider the evidence gathered. The Evidence Plan is a dynamic document which develops as the consultation with the SNCB progresses. Agreement and decisions will be recorded in an Agreement Log as a part of the Evidence Plan.

7.5.5. Habitats Sites relevant to this HRA have been identified in accordance with the study area criteria noted in Section 5. These will be considered systematically through the stages of HRA. It is anticipated that a small number of Habitats Sites will progress to Stage 2 Appropriate Assessment based on the potential broad LSE noted in Table 8.

Table 8 – Broad LSE to be considered in the HRA process.

LSE	Comment
Habitat loss	Degradation of habitat during the construction phase through e.g. release of pollutants / deposition of dust.
Habitat fragmentation	Disturbance to qualifying features resulting from habitat fragmentation arising from loss or degradation.

LSE	Comment
Disturbance	Noise, vibration and lighting from construction activities. Noise, vibration and lighting from the operational phase.
Hydrological changes	Changes to surface water levels and flows e.g. changes to surface drainage, or soil compaction leading to reduced infiltration and flooding in construction and operation phases.
	Changes to groundwater levels and flows, e.g. due to construction vehicles (soil compaction for example), any dewatering required for excavations or inadequate soil restoration. Also possible in the operational phase with new impermeable features below ground impeding flow.
Change in water quality	Pollution of surface and groundwater including changes in water chemistry, nutrient changes, and turbidity e.g. from run-off from stripped areas and construction of bridge/viaduct abutments next to watercourses.
Change in air quality	Air emissions associated with vehicular traffic and plant during construction and change in passenger car journeys to stations during operation.
	Release of dust during construction, e.g. following demolition, tracking of machinery and storage of materials.
	Air emissions associated with new and increased operational rail rolling stock.

8. Proposed scope

8.1.1. Ecological features being scoped out at this stage are those deemed to be absent or of local or negligible importance only. These ecological features are being scoped out as any effects upon them would not be 'significant' in EIA terms.

8.1.2. Great crested newt has been scoped out from the assessment due to agreement in principle with Natural England for the Project's inclusion within Natural England's district level licensing (DLL) scheme. Because the maintenance of favourable conservation status is guaranteed through the DLL, an impact assessment is not required.

Table 9 – Ecological features scoped in and out.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
HPI	✓	✓	✓	✓	✓	✓	✓	✓
Ancient Woodland	✓	×	×	✓	×	✓	×	×
Hedgerow	✓	✓	✓	✓	✓	✓	✓	✓
Bats	✓	✓	✓	✓	✓	✓	✓	✓
Badger	✓	✓	✓	✓	✓	✓	✓	✓
Otter	✓	✓	✓	✓	✓	✓	✓	✓
Water vole	✓	✓	✓	✓	✓	✓	✓	✓
Breeding Birds	✓	✓	✓	✓	✓	✓	✓	✓
Wintering Birds	✓	✓	✓	✓	✓	✓	✓	✓
Hazel Dormouse	✓	✓	×	×	×	×	×	×
Macrophytes	✓	✓	✓	✓	✓	✓	✓	✓
Macroinvertebrates	✓	✓	✓	✓	✓	✓	✓	✓
Fish	✓	✓	✓	✓	✓	✓	✓	✓
Terrestrial Invertebrates	✓	✓	✓	✓	✓	✓	✓	✓

9. Assumptions and risks

9.1. Assumptions

9.1.1. Habitat and species data referenced in the scoping exercise have been collected from surveys undertaken in 2021-2022. Although not all areas of land within the Project have been surveyed to date, the survey coverage is considered to be comprehensive for the purposes of scoping.

9.2. Risks

9.2.1. Both the habitat and species surveys are ongoing. Further information on ecological features may emerge through ongoing assessment and consultation, requiring consideration and evaluation in the biodiversity assessment. Further surveys are ongoing to update the baseline conditions.

9.2.2. There is a risk that surveys will not be able to be conducted across all land scoped in within the study area. A precautionary approach to the assessment will be developed and discussed with Natural England during the pre-assessment stage for the Project. Given the precautionary approach, it is not anticipated that the survey will increase the importance of receptors or the level of impact or significance of residual effects.

9.3. Opportunities

9.3.1. Technical consultations with stakeholders will continue throughout the pre-application process. Proactive engagement with stakeholders will:

- Identify the baseline information required to inform an EcIA and an HRA for the Project;
- Agree suitable methods for the collection of the baseline information as the design develops during the pre-application stage;
- Identify the likely significant effects associated with the construction and operational phases of the Project and determine the most appropriate way to assess the scale and extent of identified effects;
- Identify local nature conservation priorities; and
- Enable the Project design (including mitigation and green infrastructure) to be informed by local knowledge and local targets.

EWR-MWJV Technical Partner

Routewide – Environment - EIA Scoping Method Statement – Carbon

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an Environmental Statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS) 1 sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This carbon Method Statement sets out the proposed scope of the assessment of impacts on carbon and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. This document sets out the proposed scope and methodology for the assessment of impacts on climate from direct and indirect emissions of greenhouse gases (GHG) from the Project.

[1] Department for Transport (2024) *National Networks National Policy Statement*. Accessed at: National Networks - National Policy Statement (publishing.service.gov.uk) (Accessed April 2024).

1.1.7. A list of relevant legislation and policies, both local and national, along with a description of the methodology that will be used to assess the GHG impacts of the Project is provided within this document. The baseline conditions are set out followed by a summary of the potential impacts and the design and mitigation methods.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
ARN	Affected road network
BEIS	Department for Business, Energy & Industrial Strategy
BoQ	Bill of quantities
CMP	Carbon management plan
CoCP	Code of construction practice
CO2e	Carbon dioxide equivalent
CS	Connection stage
DWL	Design working life
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
GHG	Greenhouse gases
IEMA	Institute of Environmental Management Assessment
NNNPS	National networks national policy statement
PAS	Publicly Available Specification
RICS	Royal Institution of Chartered Surveyors
UK	United Kingdom

3. Relevant standards and guidance

3.1. Legislation

3.1.1. The following legislation is relevant to the Project:

- United Kingdom (UK) Climate Change Act 2008[2].

3.2. National policy, strategies, and guidance

3.2.1. The following national policies, strategies and guidance are relevant to the Project:

- UK Net Zero Strategy (2021)[3];
- National Planning Policy Framework (2021)[4];
- National Networks National Policy Statement (NNNPS) (2024) [1];
- Network Rail Traction Decarbonisation Network Strategy (2021)[5];
- Department for Transport, Decarbonising Transport – A Better, Greener Britain (2021)[6];
- Rail Environment Policy Statement (2021)[7];
- Network Rail Environmental Sustainability Strategy 2020 – 2050 (2020)[8];
- Publicly Available Specification (PAS) 2080: 2023 – Carbon management in buildings and infrastructure[9]; and
- Institute of Environmental Management Assessment (IEMA) Environmental Impact Assessment (EIA) Guidance on Assessing GHG Emissions (2022)[10].

3.3. Local policy

[2] HM Government (2008) *Climate Change Act*. Available at: Climate Change Act 2008 (legislation.gov.uk) (Accessed October 2023).
[3] HM Government (2021) *Net Zero Strategy: Build Back Greener*. Available at: Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk) (Accessed October 2023).
[4] Ministry of Housing, Communities and Local Government (2021) *National Planning Policy Framework*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf (Accessed October 2023).
[5] Network Rail (2021) *Traction Decarbonisation Network Strategy.* Available at: Traction Decarbonisation Network Strategy – Executive Summary (networkrail.co.uk) (Last accessed October 2023)
[6] Department for Transport (2021) *Decarbonising Transport – A Better, Greener Britain.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf (Accessed October 2023).
[7] Department for Transport (2021) *Rail Environment Policy Statement*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002166/rail-environment-policy-statement.pdf (Accessed October 2023).
[8] Network Rail (2020) *Environment Sustainability Strategy*. Available at: https://www.networkrail.co.uk/wp-content/uploads/2020/09/NR-Environmental-Strategy-FINAL-web.pdf (Accessed October 2023).
[9] British Standards Institution (2023) *PAS 2080 – Carbon Management in Infrastructure.* Available at: Revised PAS 2080:2023 | BSI (bsigroup.com) (Accessed October 2023).
[10] IEMA (2022) *Assessing Greenhouse Gas Emissions and Evaluating their Significance*. Accessed at: IEMA - Launch of the Updated EIA Guidance on Assessing GHG Emissions - February 2022 (Accessed October 2023).

3.3.1. The following local policies are relevant to the Project:

- Oxfordshire County Council Climate Action Framework (2020)[11]
- Oxfordshire County Council Carbon Management Plan 2022-2050 (2023)[12]
- Milton Keynes Council's Sustainability Strategy 2019-2050[13];
- Buckinghamshire Climate Change and Air Quality Strategy (2021)[14];
- Central Bedfordshire Climate Change Strategy (2020)[15];
- Bedford Borough Council Sustainable Development and Environmental Efficiency Strategy (2019)[16]; and
- Cambridge County Council Net Zero Cambridgeshire 2045 (2022)[17].

[11] Oxfordshire County Council (2020),*Climate Action Framework Available at* https://www.oxfordshire.gov.uk/sites/default/files/file/about-council/OCC_Climate_Action_Framework2020.pdf (last accessed December 2024)
[12] Oxfordshire County Council (2023), *Carbon Management Plan 2022-2050* Available at https://www.oxfordshire.gov.uk/sites/default/files/file/about-council/OCC_Climate_Action_Framework2020.pdf (Last accessed December 2024
[13] Milton Keynes City Council (2019) *Milton Keynes Council's Sustainability Strategy 2019-1050*. Available at: https://www.milton-keynes.gov.uk/sites/default/files/2022-01/sustainability%20strategy%20v3%281%29.pdf (Accessed October 2023).
[14] Buckinghamshire Council (2021) *Climate Change and Air Quality Strategy*. Accessed at: Climate Change and Air Quality Strategy | Buckinghamshire Council (Accessed October 2023).
[15] Central Bedfordshire Council (2020) *Climate Change Strategy*. Accessed at: Microsoft Word - 100504 CBC Climate Change Strategy v1.0 (centralbedfordshire.gov.uk) (Accessed October 2023).
[16] Bedford Borough Council (2019) *Sustainable Development and Environmental Efficiency Strategy*. Accessed at: download (bedford.gov.uk) (Accessed October 2023).
[17] Cambridge City Council (2022) *Net Zero Cambridgeshire 2045*. Accessed at: Climate Change Strategy - Cambridge City Council (Accessed October 2023).

4. Establishing the baseline

4.1. Overview

4.1.1. The baseline for the Project is defined as the GHG that would be emitted within the draft Order Limits if the Project was not in place, in line with IEMA guidance[18].

4.1.2. The baseline will be based on the current and projected carbon emissions over the assessment period of the existing traffic affected road network (ARN), rail services and land use.

4.1.3. Connection Stage 1 (CS1) is the East West Rail service that will operate from Oxford to Bletchley/Milton Keynes. Planning consent for this was granted via a Transport and Works Act Order (TWAO) and new tracks have now been built to enable passenger services to start running from 2025. Connection Stage 2 (CS2) will enable East West Rail services to extend from Oxford to Bedford, and consent has been granted through the same TWAO and permitted development. CS2 train services are expected to run from Oxford to Bedford from 2030. These works and the CS1 and CS2 services will be included as part of the EIA baseline operational carbon footprint so will not be assessed as part of the DCO application whole life carbon assessment.

4.1.4. To deliver the full proposed East West Rail service for Connection Stage 3 (CS3) a new railway between Bedford and Cambridge is required, together with additional upgrades between Oxford and Bedford. The following elements will form part of the carbon assessment:

- Construction of the works forming the Project which are required to deliver CS3 services, including the construction of the new railway and any works on existing lines; and,
- Emissions from the operation of the Project including the train services enabled by the uplift in services above CS1 and CS2 and associated traffic on the road network.

4.2. Documentary records

4.2.1. The following sources of information have been used to provide a qualitative assessment of the baseline:

- Information on the proposed Project including preliminary design information; and

[18] "The whole life carbon baseline for the Project differs from the baseline that is discussed within the EIA. The whole life carbon baseline considers the carbon impact of the built asset without planned measures aiming to reduce emissions, in line with PAS 2080. The EIA baseline considers the emissions within the Project draft Order Limits without the Project."

- Information on the current and projected GHG emissions in the UK, and in the local area.

4.3. Surveys

4.3.1. No surveys are required to be undertaken.

4.4. Modelling

4.4.1. No modelling has been undertaken at this stage.

4.5. Study area

4.5.1. The effects on climate relate to the potential impacts of the Project on the climate through an increase in GHG emissions. It captures all six GHG defined by the Kyoto Protocol but for the purpose of this report, they will be grouped into a single emission value and will be referred to as 'carbon emissions', reported in terms of carbon dioxide equivalent (CO_2e).

4.5.2. The assessment of the effects of GHG emissions does not have a defined study area per se as the receptor (climate in this instance) for GHG emissions is not spatially defined. Instead, the study area will incorporate the following:

- Construction impacts – the embodied carbon within the materials, construction plant emissions, emissions from the transport of materials to site, transport of waste to site, treatment of waste, and emissions from land use change; and
- Operational impacts - the emissions from repair and maintenance, energy use through operation, users of the road network, and emissions from land use change/sequestration.

4.6. Consultation

4.6.1. Consultation will be ongoing to inform the assessment of carbon emissions as the DCO application progresses. A non-statutory consultation commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. The scope of the baseline will include existing operational emissions including user emissions, road user emissions, maintenance emissions for existing infrastructure and emissions from land use change and sequestration. GHG emissions will be compared to the baseline to assess the net contribution of the Project to climate change (in $ktCO_2e$) from construction and operation over the 60 year appraisal period.

5.1.2. It is not yet possible to include the Project specific operational baseline carbon emissions as this relies on traffic modelling and other inputs which are not available at this stage. The baseline scenario will be reported in the EIA. The following sections include qualitative information describing the existing and future baseline conditions. CS1/CS2 is a committed development and so trains will be running through this route from the baseline year and operational emissions arising from this will be considered as part of baseline.

5.2. Existing baseline

5.2.1. The total emissions in 2022 generated from each of the counties that the route crosses, are as follows[19]:

- 4,064 ktCO2e in Oxfordshire (of which 1,572 ktCO2e were from transport);
- 2,284 ktCO2e in Buckinghamshire (of which 1,273 ktCO2e were from transport);
- 2,991 ktCO2e in Bedfordshire (of which 1,000 ktCO2e were from transport); and
- 6,449 ktCO2e in Cambridgeshire (of which 1,758 ktCO2e were from transport).

5.2.2. Emissions from the construction sector are not listed as an area of emissions by the Project's local authorities. However, across the UK, manufacturing and construction accounts for 12% of carbon emissions.

5.2.3. The Oxford to Bletchley section of the route, which is to be upgraded, covers the journey between the River Thames crossing south of Oxford stations, and Saxon Street, south of Bletchley station, as shown in Figure 35 in the EIA Scoping - Figures. The Project will add a service of 4 trains per hour and an

[19] Department for Energy Security and Net Zero (2023) *UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2022*. Accessed at: UK local authority and regional greenhouse gas emissions statistics, 2005 to 2022 - GOV.UK(Accessed November 2024).

hourly freight service. The existing services operating in this section under CS1 will be included within the baseline.

5.2.4. On the line between Marston Vale to Kempston, there is also an established rail route primarily used by London North-western Railway and freight services. The existing freight services and the CS2 passenger services in this section will be included in the baseline.

5.2.5. Emissions from existing rail services operating on the national rail network in the area between Bedford and Cambridge will be included in the baseline.

5.2.6. There are existing road user emissions associated with vehicles driving in the ARN which will be considered within the baseline and will be assessed using traffic modelling outputs.

5.2.7. In relation to current land use, 88% of land required permanently is considered agricultural land.

5.2.8. The following information is based on national and local data since carbon emissions are not limited to geographical boundaries once emitted.

5.2.9. In 2022, total UK GHG emissions were estimated at 417.1 MtCO2e, demonstrating a 2.2% reduction on 2021 levels. In 2022 there was an increase in CO2e emissions in the transport sector by 4% from 2021 levels[20].

[20] Department for Energy Security & Net Zero (2022) *2022 UK Provisional Greenhouse Gas Emissions national statistics*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147771/2022_UK_greenhouse_gas_emissions_provisional_figures_statistical_summary.pdf (Accessed October 2023).

5.3. Future baseline

5.3.1. Like the existing baseline, it is not yet possible to include the Project specific future operational baseline carbon emissions as this relies on traffic modelling and other inputs which are not available at this stage. The future baseline scenario will be reported in the EIA. The following information is based on available national data since carbon emissions are not limited to geographical boundaries once emitted.

5.3.2. The projections from the Department for Business, Energy & Industrial Strategy[21] (BEIS) (referred to as the BEIS projections) show a decline in total UK carbon emissions to 2040, with carbon emissions projected to fall by 24% from 2019 levels. In 2019, 96.5% of transport's final energy consumption was from oil-based fossil fuels but by 2040 this is projected to fall to 89% due to an increase in electric vehicles and increasing biofuels use[22].

5.3.3. The UK carbon budgets, shown in Table 2, indicate the level of emissions required to meet net zero in the UK by 2050 as legislated by the Climate Change Act[2]. However, projections show shortfalls for the Fourth Carbon Budget and Fifth Carbon Budget of 188 $MtCO_2e$ and 253 $MtCO_2e$ respectively.

5.3.4. Carbon budgets for the manufacturing and construction sector, the transport sector and the UK as a whole have been determined as part of the Climate Change Committee Sixth Carbon Budget[23]. These are shown in

[21] BEIS existed until 2023 when it was split to form the Department for Business and Trade (DBT), the Department for Energy Security and Net Zero (DESNZ) and the Department for Science, Innovation and Technology (DSIT).
[22] Department for Business Energy and Industry Strategy (2020) *Digest of UK Energy Statistics 2020*. Available at: DUKES_2020_Press_Notice_.pdf (publishing.service.gov.uk) (Accessed October 2023).
[23] Climate Change Committee (2021) *Sixth Carbon Budget – Dataset (Version 2 – December 2021)* [online]. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/ (Accessed August 2023).

5.3.5. Table 3 and Table 4 respectively.

Table 2 – Total carbon budgets aligning with current net zero trajectory targets.

Carbon budget	Carbon budget level	Reduction below 1990 levels
Fourth carbon budget (2023 – 2027)	1,959 $MtCO_2e$	51% by 2025
Fifth carbon budget (2028 – 2032)	1,725 $MtCO_2e$	57% by 2030
Sixth carbon budget (2033 – 2037)	965 $MtCO_2e$	78% by 2035

Table 3 – Manufacturing and construction balanced net zero trajectory targets.

Carbon budget	Carbon budget level ($MtCO_2e$)
Fourth carbon budget (2023-2027)	139
Fifth carbon budget (2028-2032)	95
Sixth carbon budget (2033-2037)	62

Table 4 – Transport sector balanced net zero trajectory targets.

Carbon budget	Carbon budget level ($MtCO_2e$)
Fourth carbon budget (2023-2027)	462
Fifth carbon budget (2028-2032)	311
Sixth carbon budget (2033-2037)	163

5.3.6. The physical impacts of climate change may impact the project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, such events, and extreme cold snaps remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), both in summer and winter, high winds, and storms.

5.3.7. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

6. Sources of impact

6.1.1. The Project would result in GHG emissions during construction as well as changes to emissions during operation.

6.1.2. The sources of potential GHG emissions during construction include:

- Embodied GHG emissions from the construction materials used, including raw material supply, transport and manufacture;
- GHG emissions associated with construction processes, including transport of materials, workers and machinery to/from the works site and construction/installation processes;
- GHG emissions associated with the transport of waste from the site and the treatment of waste; and
- GHG emissions associated with land use change, for example those mobilised from vegetation or soil loss during construction.

6.1.3. The sources of potential GHG emissions during operation include:

- GHG emissions from the use of fuel and/or electricity to operate the trains, and any ancillary infrastructure including lighting, signalling and the energy required to operate stations;
- GHG emissions from changes in traffic flow (road users);
- Replacement and maintenance activities including emissions from embodied carbon (i.e. materials), construction plant, transport of materials, and the treatment/disposal of waste;
- End of life decommissioning for components that require replacement during the assessment period; and
- GHG emissions associated with ongoing land use change/sequestration.

7. Potential impacts and effects

7.1. Potential operational effects

7.1.1. The GHG emissions released during the operation of the Project, as outlined in section 5.3.6, may result in an impact on the climate. The potential emissions being assessed include land use change including sequestration, the impact of changes to traffic flows on the ARN, the Project operation including operation of trains, ancillary infrastructure and stations, and replacement maintenance including materials and their transport. These are permanent effects that will occur throughout the Project's lifespan.

7.2. Potential construction effects

7.2.1. The GHG emissions released during the construction, as outlined in Section 5.3.6, mean that the Project will have an impact on the climate. The potential emissions being assessed include embodied emissions from the construction materials, construction plant emissions, transport of material and workers to site, transport of waste from site, and treatment of waste. These are also permanent effects as although the period of emissions may be limited to the construction stage, the effect on the climate of the GHG released is permanent.

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project proposals will therefore have embedded within them various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The draft Order Limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.2. Design principles

8.2.1. A carbon management plan (CMP) will be developed for the Project, aligned to the PAS 2080 requirements, which will outline the approach to carbon management, include targets for carbon reduction, outline the carbon baseline assessment and the methodology for carbon assessments, and include monitoring and reporting requirements. The approach to carbon reduction in the CMP will be aligned to the carbon reduction hierarchy (as defined within PAS 2080 (2023)[9]), with a particular focus on the carbon hotspots identified through the baseline carbon assessment. The key considerations in the carbon reduction hierarchy are as follows:

- **Avoid**: Evaluate the basic need for an asset and explore alternative approaches to achieve outcomes set by the asset owner / manager;
- **Switch**: Evaluate the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required; and
- **Improve**: Consider the use of low carbon solutions (including technologies, materials, and products) and techniques that reduce resource consumption

during the construction and operational phases to reduce resource consumption during the construction, operation, and user utilisation stages of the asset.

8.2.2. A key activity to reduce emissions is through the option selection process, where the potential carbon emissions of different options will be considered, and carbon will be included as a key criterion during decision making. Detailed information on materials and quantities of materials will be available to accurately quantify the emissions of each option. However, it will be possible to give an indication of the relative carbon intensity of the options through qualitative means or through undertaking a basic estimation using the information available.

8.2.3. Carbon workshops will be undertaken at each design and construction phase to identify carbon reduction opportunities and discuss implementation. All opportunities would be logged in a register to ensure that these are tracked through to completion.

8.2.4. Whole life carbon assessments will be undertaken periodically throughout design and construction, to assess the progress of targets against the baseline.

8.3. Code of construction practice

8.3.1. Construction work can be one of the chief causes of environmental impact. A draft Code of Construction Practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

8.3.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic environment assets. The environmental assessment of carbon impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a Project of this nature.

8.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on carbon may include the following generic categories:

- Site specific measures;
- Construction traffic routes;
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Pollution prevention measures;

- Emergency preparedness and access;
- Demolition;
- Carbon management;
- Selection and management of materials;
- Protection and reinstatement of land and soils;
- Site waste management plans, including segregation and storage of waste;
- Workplace travel plans; and
- Monitoring requirements.

8.3.4. Contractors will need to take measures to reduce their impact on the Project's total carbon emissions, such as:

- Procurement of low carbon materials;
- Reduce construction waste so far as reasonably practicable;
- Efficient transport of materials and equipment;
- Using machinery and equipment that use electricity rather than fossil fuels;
- Responsible disposal of demolition materials;
- Reduce excavation where possible;
- Maximise the on-site use of cut material from excavation;
- Maximising energy efficiency through proper maintenance of equipment, selection of fuel efficient machinery and appropriate levels of thermal insulation in relevant areas of site accommodation; and
- Produce a carbon management plan to report their emissions and their approach to reducing them.

8.3.5. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

9. Assessment methodology

9.1.1. A whole life carbon assessment will be undertaken to estimate the carbon impact of the Project. This will follow 'good practice' design measures as defined by PAS 2080[9], including the use of low carbon materials already used as standard across the industry.

9.1.2. A carbon assessment tool will be used to undertake all calculations. The advantages and features of each tool available will be considered and ranked to ensure the most effective can be selected. The methodology for calculating carbon for each life cycle stage is outlined in Table 5.

9.1.3. The construction period is assumed to commence in 2028. The operational carbon assessment will be based on a 60 year operational period which begins in the opening year of 2034.

Table 5 – Life cycle stage calculation methods.

Life cycle stage	Data inputs	Assessment methodology
A1-3 embodied carbon	• Bill of quantities (BoQ) including material types and quantities for all design components; and • Emission factors for each material.	The BoQ and associated emission factors will be used to calculate total embodied carbon for each design item.
A4 transport	• Transport type and distance of materials from manufacturer to construction site; and • Emission factor for transport type.	Following the Royal Institution of Chartered Surveyors (RICS) guidance[24], using an assumed transport distance dependent on the supplier being local national or international.
A5 construction and waste	• Estimated fuel use for plant and equipment. • Emission factors for fuels; • Waste quantity for each material based on Waste and Resources Action Programme guidance; • Emission factors for waste treatment; and • Transport distance of waste from site.	Estimate of fuel use for plant and equipment and emission factors for fuel to calculate construction emissions. Where this information is not available, benchmark figures from RICS guidance will be used to estimate the emissions. Waste emissions will be assessed based on quantity of waste and waste treatment option.
B2-3 maintenance and repair	• Maintenance period for each design component.	Using the maintenance period of the item to determine how often an item requires maintenance and what emissions are associated with maintenance and repair.

[24] Royal Institution of Chartered Surveyors (RICS) (2023) *Whole life carbon assessment for the built environment*, *RICS professional statement*. Available at: Whole Life Carbon Assessment for the Built Environment (rics.org) (last accessed October 2023)

Life cycle stage	Data inputs	Assessment methodology
B4 replacement	• Design working life (DWL) of each component and material; and • A1-A5 emissions for each design component.	Using the DWL of components/materials to identify which items will be replaced during the assessment period.
B6 operational energy use	• Estimate of energy consumption; and • Grid-average emission factors from Green Book guidance[25].	Using the energy consumption of the trains and ancillary infrastructure with the hours of operation to calculate the total energy used in a year and corresponding carbon impact.
B8 user's utilisation	• Traffic modelling outputs.	Assessment of the 60 year transport impact on modal shift in terms of CO_2e emissions using the Emissions Factor Toolkit v11.
C1-C4 end of life	• Quantity of waste material (for items replaced during assessment period); and • Emission factors for waste treatment.	Waste emissions assessed based on quantity of waste and waste treatment option.
D beyond life cycle boundary	• Habitat types and area; and • Sequestration rates for habitats.	The Woodland Carbon Code and Natural England research for the soil carbon change unless an alternative site specific methodology is determined.

[25] UK Government (2023) *The Green Book and Business Case Guidance, and The Green Book International Guidance*. Available at: The Green Book and accompanying guidance and documents - GOV.UK (www.gov.uk) (Accessed October 2023).

10. Evaluating significance

10.1.1. The assessment of significance of effects on climate will be evaluated in line with the latest IEMA Guidance, using professional judgement with reference to relevant benchmarks including the UK government's carbon budgets (Table 2), manufacturing and construction budgets (

10.1.2. Table 3) and the transport sector budgets (Table 4). When evaluating significance, the impact of the Project will consider all new GHG emissions as contributing to a negative environmental impact.

10.1.3. As outlined in the IEMA Guidance, the significance of effects is determined based on whether the Project contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.

10.1.4. The IEMA guidance provides examples of how to distinguish levels of significance as follows:

- Major adverse: the Project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
- Moderate adverse: the Project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
- Minor adverse: the Project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
- Negligible: the Project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
- Beneficial: the Project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact. All beneficial effects are considered to be significant.

11. Proposed scope

11.1.1. Table 6 summarises the GHG emissions sources that would be scoped in the carbon assessment for the Project.

11.1.2. End of life decommissioning for the Project is proposed to be scoped out as the Project will not be decommissioned within the assessment period.

Table 6 – Scoping table.

Assessment item	Scoped in
Embodied GHG emissions from the construction materials used for the Project, including raw material supply, transport, and manufacture.	✓
Transportation of materials from the manufacturer to the site of the Project.	✓
GHG emissions associated with construction and installation processes for the Project, including transport of waste from the site and waste treatment.	✓
GHG emissions associated with land use change associated with the Project, for example those mobilised from vegetation or soil loss during construction.	✓
GHG emissions from the use of fuel and/or electricity to operate the trains, and any ancillary infrastructure including lighting, signalling.	✓
GHG emissions from changes in traffic flow (road users).	✓
Replacement and maintenance activities including emissions from embodied carbon (i.e. materials), construction plant, transport of materials, and the treatment/disposal of waste.	✓
GHG emissions associated with ongoing land use change/sequestration.	✓
End of life decommissioning for items that require replacement during the assessment period.	✓

12. Assumptions and risks

12.1. Assumptions

12.1.1. The whole life carbon assessment will include all life cycle stages, aligned with PAS 2080 as outlined in Table 5.

12.1.2. The assessment of embodied carbon will be based primarily on early stage design information. Assumptions for specific design components will be required in some instances to assess the associated carbon impacts if there are data gaps.

12.1.3. Travel distances for the transport of materials (lifecycle stage A4) will use RICS guidance as it is not anticipated that the supplier locations will be available at this early stage of the Project.

12.1.4. The operational assessment of trains and ancillary infrastructure will be based on early stage design information. Energy grid emission rates will be based on projections for the Green Book Guidance25 unless a green tariff is selected.

12.1.5. The assessment of land use change will be based on the level of information available on the proposed planting and any removal of habitat during construction.

12.1.6. A list of key assumptions and sources of information for the assessment will be outlined in further detail within the EIA.

12.2. Risks

12.2.1. Data availability poses a risk to the reliability of the carbon assessment. Where data is not available for parts of the assessment, assumptions will need to be made which may result in an overestimation or underestimation of the total carbon.

12.2.2. The estimated material quantities will be derived from the BoQ provided by the design team for the Project. As the detailed design of the Project is yet to be completed, the final material quantities may differ from the estimated material quantities used in this assessment.

12.3. Opportunities

12.3.1. The primary opportunity of this assessment is the reduction of the GHG emissions of the Project, through application of the carbon reduction hierarchy (described in section 8.2).

12.3.2. As per PAS 2080 (2023), it is vital to integrate the approach to carbon reduction with climate resilience and nature based solutions to ensure it remains best practice throughout the future of the Project.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping Method Statement – Climate Resilience

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. In order to plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this method statement including the full description of the proposals that make up the project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of physical impacts of climate change upon the Project assets, henceforth referred to as the climate change risk assessment (CCRA) and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The ES will include an assessment of the impacts to environmental receptors including the impacts of future climate change. The baseline climate information contained in this method statement is used across both the CCRA and the EIA.

[1] *National Networks National Policy Statement* (2024) *GOV.UK.* Available at: National Networks - National Policy Statement (publishing.service.gov.uk) (Accessed: 11 November 2024).

1.1.7. Climate resilience considers assessment of physical impacts of climate change upon the Project assets.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
ARP	Adaptation reporting power
AR6	Sixth assessment report (of the IPCC)
CCRA	Climate change risk assessment
CoCP	Code of construction practice
CRI	Climate risk indicators
DCO	Development consent order
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co.	East West Rail company
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LRF	Local Resilience Forum
NNNPS	National Networks National Policy Statement
RCP	Representative concentration pathways
UKCP18	UK climate projections 2018
WRCCA	Weather resilience and climate change adaptation

3. Relevant standards and guidance

3.1. Overview

3.1.1. This section summarises the relevant legislation, standards and guidance with regard to the climate change risk assessment. National and local planning policy relevant to climate resilience can be found in the EIA Scoping Report.

3.2. Legislation

3.2.1. Legislation relevant to the Climate Resilience aspect includes The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) and the UK Climate Change Act 2008[2].

3.3. Standards and guidance

3.3.1. The following standards and guidance have informed the production of this Method Statement and the development of the methodology for the CCRA which include:

- ISO (International Organization for Standardization) 14090 Adaptation to climate change – Principles, requirements and guidelines[3]
- ISO14091 Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment[4];
- IPCC (Intergovernmental Panel on Climate Change), 2022, Assessment Report 6 (AR6 Climate Change 2022: Working Group II: Impacts, Adaptation and Vulnerability, Chapter 1)[5];
- The Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation 2020[6];
- IEMA, 2022, Climate Change Adaptation Practitioner Guidance[7];
- UK Government, 2023, Third National Adaptation Plan (NAP3)[8];
- Network Rail, 2021, Network Rail Asset Management Weather Resilience and Climate Change Adaptation Plan[9];
- Network Rail, 2021, Network Rail Third Adaptation Report (ARP3)[10];

[2] UK Parliament (2008) Climate Change Act 2008 (Online). Available from: https://www.legislation.gov.uk/ukpga/2008/27/contents (Accessed: October 2023).
[3] ISO 14090:2019 - Adaptation to climate change — Principles, requirements and guidelines. Available for purchase from: https://www.iso.org/standard/68507.html
[4] ISO 14091:2021 - Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment. For purchase from: https://www.iso.org/standard/68508.html
[5]Working Group II Technical Support Unit (2022) IPCC Sixth Assessment Report, Climate Change 2022: Impacts, Adaptation and Vulnerability (Online). Available from: https://www.ipcc.ch/report/ar6/wg2/. (Accessed: October 2023).
[6] Pooley, M., Montgomery, J., Le Gouais, P., Welburn, K., Wright, J., Blyth, N. and Howard, R., 2020, Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation, IEMA
[7] England, K. and Murtagh, E., 2022, IEMA Climate Change Adaptation Practitioner Guidance
[8] Department for Environment, Food & Rural Affairs (2023) Third National Adaptation Programme (NAP3) (Online). Available from: https://www.gov.uk/government/publications/third-national-adaptation-programme-nap3 (Accessed: October 2023)
[9] Network Rail 2021) Network Rail Asset Management Weather Resilience and Climate Change Adaptation Plan (Online). Available from: https://www.networkrail.co.uk/wp-content/uploads/2021/11/Asset-management-WRCCA-plan.pdf (Accessed: October 2023).
[10] Network Rail (2021) Third Adaption Report (Online) Available from: https://www.networkrail.co.uk/wp-content/uploads/2022/01/Network-Rail-Third-Adaptation-Report-December-2021.pdf (Accessed: October 2023).

- Network Rail, 2021, Weather Resilience and Climate Change Adaptation: Climate Projections guidance note NR/GN/ESD23[11];
- Network Rail, 2021, Weather Resilience and Climate Change Adaptation: Impact Assessment guidance note NR/GN/ESD11[12];
- Network Rail, 2022, Weather Resilience and Climate Change Adaptation (WRCCA): Adaptation Pathways Approach guidance note NR/GN/ESD41[13];
- Network Rail Earthworks: cutting slopes and embankments[14];
- Network Rail Asset Management Network Rail Weather Resilience and Climate Change Adaptation (WRCCA) plan[15]; including region-specific WRCCA Plan such as the Anglia Region[16] and London North East and East Midlands region[17];
- Environment Agency guidance on Flood Risk Assessment: climate change allowances[18];
- Tomorrow's Railway and Climate Change Adaptation (T1009)[19].

[11] Network rail (2021) NR/GN/ESD23: Weather Resilience & Climate Change Projections Guidance Note (Online). Available from: https://safety.networkrail.co.uk/wp-content/uploads/2023/01/Climate-Change-Projections-Guidance-Note.pdf (Accessed: October 2023).
[12] Network rail (2021) NR/GN/ESD11: Weather Resilience & Climate Change Impact Assessment Guidance Note (Online) . Available from: https://safety.networkrail.co.uk/wp-content/uploads/2023/01/Weather-Resilience-and-Climate-Change-Impact-Assessment-Guidance-Note.pdf (Accessed: October 2023).
[13] Network rail (2022) NR/GN/ESD41: Weather Resilience & Climate Change Adaptation Pathways Approach Guidance Note (Online). Available from: https://safety.networkrail.co.uk/wp-content/uploads/2024/10/NR-GN-ESD41-Adaptation-Pathways-Methodology-Guidance-Note-Issue-2.pdf (Accessed: October 2023).
[14] Network rail (2018) Earthworks Technical Strategy (Online) Available from: https://www.networkrail.co.uk/wp-content/uploads/2018/07/Earthworks-Technical-Strategy.pdf (Accessed: October 2023).
[15] Network Rail (2021) Climate change adaptation plans Available from: https://www.networkrail.co.uk/sustainability/climate-change/climate-change-adaptation (Accessed: October 2023).
[16] Network Rail (2020) Route Weather Resilience and Climate Change Adaptation Plans – Anglia 2019-2024 (Online).Available from: https://www.networkrail.co.uk/wp-content/uploads/2020/10/Anglia-route-WRCCA-Plan-CP6.pdf (Accessed: January 2024).
[17] Network Rail (2020) Route Weather Resilience and Climate Change Adaptation Plans – London North East and East Midlands 2019-2024 (Online). Available from: https://www.networkrail.co.uk/wp-content/uploads/2020/10/LNE-and-EM-Route-WRCCA-Plan-CP6.pdf (Accessed: January 2024).
[18] Environment Agency (2022) Guidance: Flood risk assessments climate change allowances (Online). Available from: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances (Accessed: January 2024).
[19] RSSB (2013) Tomorrow's Railway and Climate Change Adaptation (T1009) (Online) Available from: https://www.rssb.co.uk/research-catalogue/CatalogueItem/T1009 (Accessed: October 2023).

4. Establishing the baseline

4.1. Documentary records

4.1.1. Establishing the current and future baseline for the Project CCRA will draw from a number of data sources.

4.1.2. The latest (2023) State of the UK Climate Report[20] provided by the Met Office will be used to draw UK-wide context to how climate change may affect the UK.

4.1.3. The current baseline describes an overview of the climate conditions for the study area using climate variable data from the weather stations representative of the East West Rail route, such as temperature, precipitation and wind. This is provided by the Met Office and gives understanding of how recent climate trends have impacted the study area. Weather station data has been collected from NIAB (Cambridgeshire)[21], Bedford[22] and Oxford[23].

4.1.4. The UK climate projections (UKCP18)[24] have been used to infer future changes in a range of climate variables. The climate risk indicators (CRI)[25], developed by Nigel Arnell et al., as part of the UK Climate Resilience Programme has been used to inform this assessment. The CRI utilises the UKCP18 projections and provides data for a range of climate related indicators. The CRI data for three geographical areas representing the study area has been used, referred to 'Local Resilience Forum' (LRF) areas.

4.2. Surveys

4.2.1. No site surveys are required to be undertaken for the CCRA.

4.3. Modelling

4.3.1. No modelling is currently anticipated as part of the CCRA, however the assessment will draw from the outcomes of hydrological and hydraulic modelling that will inform the EIA as part of the assessments for flood risk and water resources, as well as the Project engineering drainage design.

4.4. Study area

4.4.1. The spatial study area for the CCRA is the draft Order limits, as shown in Figure 1 in EIA Scoping - Figures. The future climate baseline study area is

[20] Met Office. (2024). State of the UK Climate. Available online at: https://www.metoffice.gov.uk/research/climate/maps-and-data/about/state-of-climate . (Accessed: November 20243).
[21] Met Office (2023) UK Climate Averages: Cambridge, NIAB (Online). Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u1214qgj0. (Accessed: October 2023).
[22] Met Office (2023) UK Climate Averages: Bedford (Online). Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcr9j7q0s (Accessed: October 2023).
[23] Met Office (2023) UK Climate Averages: Oxford (Online). Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcpn7mp10 (Accessed: October 2023).
[24] UKCP18 Climate Projections. Available from: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index
[25] The UK Climate Resilience Programe (2023), Climate Risk Indicators. Available from: https://uk-cri.org/. Accessed November 2024

shown in Figure 161 of EIA Scoping – Figures. This has informed the selection of current and future climate baseline data from the sources described in section 4.1.

4.4.2. As such, the climate projection data extracted from the CRI database utilises three geographical areas, referred to LRFs extending across the route: Thames Valley; Bedfordshire; and Cambridgeshire. These areas are shown in Figure 161 in EIA Scoping - Figures. The climate projection data covers the geographical areas containing the study area however they extend beyond the study area. They also provide coverage for the entire East West Rail route of which only a subset is within the draft Order Limits of the Project.

4.4.3. At the time of writing, the construction of the Project is due to commence in 2028, with peak construction in 2032, and the intended opening year in 2034. The design life of the Project is 100 years. The temporal study area has been chosen to be representative of the design life of the Project, including the construction phase and early operation (climate epoch 2021 – 2050) and the operation and maintenance phase of the Project (climate epoch 2051 – 2080 and climate epoch 2071 – 2100). It is noted that the Project design life runs beyond the available climate projection data (2100).

4.5. Consultation

4.5.1. Consultation will be ongoing to inform the assessment of Climate Resilience as the DCO application progresses. A non-statutory consultation commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. According to the latest State of the UK Climate Report [20], the UK's climate is changing, with recent decades experienced as warmer, wetter, and sunnier than the 20th century. The Report highlights that the UK has warmed at a broadly consistent (but slightly higher) rate than the observed change in global mean temperature. The key findings from the latest 2023 report are:

- The observations show that in the UK extremes of temperature are changing much faster than the average temperature;
- 2023 was the second warmest year on record for the UK (since 1884), with only 2022 warmer. 2023 was 0.83°C above the 1991-2020 average. 2023 had the warmest June on record and experienced a heatwave in September which were all made more likely by climate change.
- Six years in the most recent decade (2014–2023) have been within the top-ten warmest in the UK series from 1884, with all 10 warmest years occurring in the 21st century.
- In 2022 (from the 2022 State of the Climate Report), 40°C was recorded in the UK for the first time during a heatwave which exceeded previous records by a large margin. The UK's record warm year of 2022 and unprecedented July heatwave were both made more likely by climate change[26]. 2022 was the warmest year in the UK since records began in 1884, 0.9°C above the 1991–2020 average[27]. It was the first year to record a UK annual mean temperature above 10°C.;
- Cooling degree days[28] are dominated by annual variability, however, the most recent decade (2014–2023) has had 30 cooling degree days per year for England compared with 22 for 1991–2020;
- 2023 was the seventh wettest year on record for the UK in the series from 1836, with 113% of the 1991–2020 average. March, July, October and December 2023 were all top-ten wettest months in the UK monthly rainfall series from 1836;
- UK winters for the most recent decade (2014–2023) have been 9% wetter than 1991–2020 and 24% wetter than 1961–1990, with smaller increases in summer and autumn and none in spring
- In recent years, widespread and substantial snow events have occurred in 2021, 2018, 2013, 2010 and 2009, but their number and severity have generally declined since the 1960s;
- The UK annual mean wind speed from 1969 to 2023 shows a downward trend, consistent with that observed globally;

[26] UK Met Office (2023). State of the UK Climate 2022. Available at: https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167. Accessed November 2024.
[27] Subsequent to the publication of the 2022 report, 2023 was recorded as the second warmest year on record in the UK.
[28] Sum of number of days by which the mean temperature is more than 22°C and thereby occupants of buildings require cooling.

- The most recent decade (2014–2023) has had for the UK on average 4% more hours of bright sunshine per year than the 1991–2020 average and 9% more than1961–1990.
- Sea levels around the UK are rising, with 2023 the highest year on record since 1916. The rate of sea level rise is increasing, with highest estimates of 4.6 ± 0.9 mm/year (1993–2023; and
- There were 16 extreme storm-surge events in 2023, of which 13 were associated with named storms.

5.1.2. In general, climate change in the UK is projected to lead to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice events. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency and intensity of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.2. Climate resilience assets

5.2.1. Assets for consideration within the CCRA consist of the following:

- Constructed assets, including buildings, infrastructure, and environmental assets, both temporary and permanent, throughout the lifecycle of the Project; and
- Human health i.e., health and safety of construction workers, maintenance staff, users of the Project.

5.2.2. The potential assets under consideration for the CCRA will be collated based on the Project design and will be presented with the preliminary environmental information to support statutory consultation and in the subsequent ES. The asset design life for each asset will also be ascertained as this informs the climate resilience assessment and consideration of adaptive capacity of the assets, such as maintenance and replacement schedules.

5.3. Future baseline

5.3.1. The future baseline reported in this section provides an overview of the projected changes in climate trends, which are used to inform the CCRA and wider environmental impact assessments (assessing the impact of the Project on the environment receptors taking into account future climate). The environmental aspect assessments will assess whether the future climate change baseline presented here will exacerbate or ameliorate the environmental impacts identified as part of the assessment of the Project and will be reported in the ES aspect chapters. The CCRA will assess how the future climate change baseline will affect the Project assets.

5.3.2. To understand the future climate, it is important to review the current climate trends. The current observed climate conditions for temperature, precipitation and windspeed, described using weather station data[21,22,23] averaged across

1991 - 2020, are outlined in Table 2. Current climate weather station locations are shown in Figure 162 in EIA Scoping - Figures.

Table 2 – Present-day average climate 1991 – 2020.

Climate variable	Value		
	Oxford	Bedford	Cambridge
Annual maximum temperature (°C)	15.0	14.4	14.9
Annual minimum temperature (°C)	7.1	6.4	6.7
Minimum temperature (DJF) (°C)	2.3	1.5	1.8
Maximum temperature (JJA) (°C)	23.1	22.4	23.1
Annual rainfall (mm per year)	682	609	559
Winter rainfall (DJF) (mm)	172	148	134
Summer rainfall (JJA) (mm)	164	160	153
Average windspeed (knots)	8.3	8.9	Not available

5.3.3. Table 3 presents the projected change in the climate variables averaged across the study area, utilising the Climate Risk Indicator tool[25], which is based on the Met Office's UK climate change projections 2018 ("UKCP18")[24]. Table 3 includes data for the period 1981 – 2010 as this is the baseline period used the climate projections by UKCP18. It also includes data for the period 1991-2020, described above as the present-day current baseline. The climate projections change values presented (for e.g. 2030s, 2060s, 2080s time period) are the departure from the reference period 1981-2010. Three time periods have been chosen to show changes in climate variables across the lifecycle of the Project, for example:

- 2021-2050 would cover impacts during construction activities, and short-lived assets;
- 2051-2080 would cover medium-life assets and environmental works; and
- 2071-2100 is the furthest future available for climate projections data. As such this should be used for long-life assets, or assets intended to exist beyond 2100.

5.3.4. UKCP18 provides probabilistic data on projected climate variables for the UK until the end of the 21st century for different emissions scenarios, known as representative concentration pathways (RCP).

5.3.5. RCP6.0 is considered a medium emissions pathway, with stabilisation of global greenhouse gas emissions in response to climate change mitigation measures. RCP8.5 is considered a high emissions pathway and represents a potential future that is slow to transfer to low-carbon energy provision. RCP8.5 is considered a possible, but conservative, emission scenario suitable for evaluating the Climate Change Resilience of projects with a long lifetime.

5.3.6. Furthermore, probabilistic data assigns a probability of climate change outcomes, for example 50% probability level is known as the 50th percentile where the outcome is just as likely to happen as not. The 10th percentile means that 10% of the possible outcomes fall below this level, and the 90th percentile means that 10% of the outcomes fall above this level. As such, for the purposes

of determining the future climate baseline at this stage, the 50th percentile has been used for RCP6.0 and RCP8.5, as shown in Table 3, with the more extreme percentile shown in brackets. However, to support the Climate Change Risk Assessment, the 10th and 90th percentile values for both RCPs will be used for sensitivity analysis. This is also in line with Network Rail WRCCA guidance and industry best practice, as listed in Section 4. In addition, for climate projections regarding precipitation, given the probabilistic distribution of the data, it is important to consider the 10th percentile values to assess risk of drought (as 10th percentile gives the lowest precipitation projection). Considering only the 50th or only the 50th and 90th in these cases can give a skewed perception of projected changes to rainfall. Accordingly, in Table 3 presents the 50th and 10th percentile values for projected changes in summer precipitation.

5.3.7. Climate variables for temperature and precipitation were extracted and presented in Table 3. This provides an overview of key climate trends. For the purposes of the CCRA, other climate variable data is available for use and identified in this section. This will be integrated into the CCRA with the preliminary environmental information and the ES

5.3.8. Section 4.4 describes the spatial study area from which the climate projections are obtained. Table 3 presents the average data from across the three LRFs. Regional variations of note will be identified and developed through the CCRA, and climate data will be used for hotspot areas where applicable. ‘Hotspots’ are areas where a particular asset may be more sensitive than other assets within that asset group, for example due to age, or condition, or location such as on a floodplain.

Table 3 – Future climate change projections.

Climate Variable	Unit	Model Reference Baseline (1981-2010)	Current Present Day Baseline (1991-2020)	Climate Projections RCP6.0 50th *(90th)*			Climate Projections RCP8.5 50th *(90th)*		
				2030 (2021–2050)	2060 (2051-2080)	2080 (2071–2100)	2030 (2021–2050)	2060 (2051-2080)	2080 (2071–2100)
Average summer temperature (JJA)	°C	14.3 °C	14.8 °C	+1.0 *(+1.8)*	+2.3 *(+3.8)*	+3.5 *(+5.7)*	+1.5 *(+2.3)*	+3.3 *(+5.2)*	+5 *(+7.7)*
Average winter temperature (DJF)	°C	6.4 °C	6.8 °C	+0.8 *(+1.5)*	+1.5 *(+2.5)*	+2.2 *(+3.6)*	+1.0 *(+1.9)*	+2.1 *(+3.4)*	+3.0 *(+4.9)*
Max summer temperature (JJA)	°C	22.5 °C	22.9 °C	+1.1 *(+1.8)*	+2.3 *(+3.8)*	+3.5 *(+5.7)*	+1.7 *(+2.8)*	+3.8 *(+6.3)*	+5.6 *(+9.1)*
Min winter temperature (DJF)	°C	1.3 °C	1.9 °C	+0.8 *(+1.6)*	+1.5 *(+2.5)*	+2.2 *(+3.6)*	+0.9 *(+1.9)*	+2.1 *(+3.6)*	+3.0 *(+5.2)*
Change in seasonal precipitation (winter, DJF)	% change	142 mm	151 mm	+4.6% *(+11.8%)*	+10.2% *(+21.5%)*	+14.2% *(+28%)*	+5.8% *(+13.9%)*	+13.3% *(+27.5%)*	+18.6% *(+36.3%)*
Climate Variable	**Unit**	**Model Reference (1981-2010)**	**Current Baseline (1991-2020)**	**Climate Projections RCP6.0 50th *(10th)***			**Climate Projections RCP8.5 50th *(10th)***		
				2030 (2021–2050)	**2060 (2051-2080)**	**2080 (2071–2100)**	**2030 (2021–2050)**	**2060 (2051-2080)**	**2080 (2071–2100)**
Change in seasonal precipitation (summer, JJA)	% change	153 mm	159 mm	-8.4% *(-22.4%)*	-19.9% *(-38.4%)*	-25.8% *(-46.5%)*	-10.0% *(-24.9%)*	-24.4% *(-44.2%)*	-31.6% *(-52.7%)*

Temperature

5.3.9. The climate change projection data in Table 3 aligns with the trend of increasing temperatures, both averages and maximums and across the seasons, but more notably in the summer. There is an increasing trend in temperatures across the lifetime of the Project.

5.3.10. Winter temperatures are projected to increase, moving minimum temperatures into a range already experienced, and decreasing the number of low temperature events, although cold snaps could still occur. This trend is also likely to reduce the amount of precipitation that falls as snow.

5.3.11. For the CCRA, further climate risk indicators for high temperatures will be used including for example:

- Wildfire danger as defined by the Met Office, measured in days per year of both Very High and Exceptional risk;
- Heatwave events as defined by the Met Office, measured as events per year and duration of event (in days)
- Heat stress days defined as days with Wet Bulb Globe Temperature (WBGT) above 25°C and
- Number of days per year exceeding rail-critical temperature thresholds. Thresholds identified by CRI as being relevant to rail include 21°C, 24°C, 26°C and 30°C.

Precipitation

5.3.12. There is a clear trend in the climate change projection data towards drier summers and wetter winters across the lifetime of the Project under both the medium emissions RCP6.0 and high emissions RCP8.5 scenarios, using the 50th percentile value. Natural variations, including extreme precipitation events such as storms and resultant flooding, will continue to punctuate these trends across the year.

5.3.13. For the CCRA, further climate risk indicators for precipitation trends will be utilised such as soil moisture content and drought using precipitation and evaporation indices, available through CRI.

5.3.14. Further data would also be drawn from the Water Resources and Flood Risk Chapters and accompanying Flood Risk Assessment and associated modelling.

Sea level rise

5.3.15. Due to the Project's inland location and distance to the coast or tidally affected water bodies, the Project is not expected to be at risk of future sea level rise.

Wind

5.3.16. UKCP18 guidance shows a wide spread of future changes in mean surface wind speed, however, there is large uncertainty in projected changes in air

circulation over the UK, and natural climate variability contributes much of this uncertainty[29]. The global projections over the UK show an increase in near surface wind speeds over the UK for the second half of the 21st century for the winter season, when more significant wind impacts are experienced[30].

5.3.17. Studies relating to future projections of storms suggest that climate-driven storm changes are less distinct in the northern than southern hemisphere[31],[32]. However, such is the wide range of inter-model variation, that there is low confidence in the direction of future changes in the frequency, duration or intensity of storms affecting the UK.

Fog

5.3.18. The trends projected for fog are complex and of a low confidence within climate projections. The general projected climate change trend is that there will be a decrease in the frequency of fog events, but evidence is limited within model simulations.

Humidity

5.3.19. Relative humidity is a function of air temperature and water vapour content of the air. There is little discernible trend in changes to relative humidity within climate projection data [33].

Lightning

5.3.20. Lightning is expected to increase with future climate change, likely due to the increase in intensity of storm events. There is seasonal variability anticipated with this trend, for example a decrease in lightning is projected in the autumn months[34].

Summary

5.3.21. The climate change trends identified in this section have informed the scoping exercise as part of this Method Statement within section 9.

[29] Brown, S., Boorman, P., McDonald, R., and Murphy. J. (2012). *Interpretation for use of surface wind speed projections from the 11-member Met Office Regional Climate Model ensemble. Post-launch technical documentation for UKCP09.* Met Office Hadley Centre, Exeter, UK. Crown copyright. Available at: http://cedadocs.ceda.ac.uk/1343/1/tech_note_on_surface_wind_speed_from_11_member_RCM.pdf (Accessed: 31 October 2023).
[30] Met Office (2018d). UKCP18 Factsheet: Wind (online). Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-wind_march21.pdf (Accessed: 31 October 2023).
[31] Slingo, J., Belcher, S., Scaife, A., McCarthy, M., Saulter, A., McBeath, K., Jenkins, A., Huntingford, C., Marsh, T., Hannaford, J. and Parry, S. (2014) The recent storms and floods in the UK, Met Office, Exeter, 29pp. Available at: https://nora.nerc.ac.uk/id/eprint/505192/1/N505192CR.pdf (Accessed: 31 October 2023).
[32] Bengtsson, Lennart & Hodges, Kevin & Roeckner, Erich. (2006). Storm Tracks and Climate Change. Journal of Climate. 19. 10.1175/JCLI3815.1. Available at: https://journals.ametsoc.org/view/journals/clim/19/15/jcli3815.1.xml (Accessed: 31 October 2023).
[33] Gohar, L, et al. (2018). UKCP18 Derived Projections of Future Climate over the UK (Online). Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Derived-Projections-of-Future-Climate-over-the-UK.pdf (Accessed: 31 October 2023).
[34] Met Office (2021) Local Update Report (Online). Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/ukcp18_local_update_report_2021.pdf (Accessed 13 November 2023).

6. Potential impact to Project assets

6.1. Overview

6.1.1. The Project includes works to existing stations, new stations, new railway, works to existing railway and works to road crossings. All assets of the Project would be relevant to the CCRA as each asset would have a level of sensitivity and adaptive capacity when exposed to a change in a particular climate hazard. However, to ensure a proportionate approach, these assets have been categorised into asset groups as outlined in this section. The assets have been grouped based on similar characteristics. As the design progresses, 'hotspots' will be identified where a particular asset may be more sensitive than other assets within that asset group for example due to age or condition, or due to siting in a flood plain where the hazard likelihood is deemed higher. By identifying these specific assets, they will then be assessed separately to the rest of that asset group.

6.1.2. Asset groups are defined as follows:

- Drainage and flood conveyance infrastructure;
- Utilities (high voltage and low voltage energy, pipelines and telecommunications, GSM-R and SISS);
- Electrification and Plant systems;
- Traction Power;
- Overhead Catenary Systems;
- Mechanical, Electrical and Public Health (MEP);
- Signalling;
- Highways and access;
- Geotechnical – cuttings, embankments and false cuttings;
- Ancillary civils (Boundary protection, lighting, signage);
- Bridges, viaducts, tunnels and other structures;
- Rolling stock – passenger and non-passenger;
- Track;
- Level crossings;
- Stations, depots and buildings; and
- Staff and passengers.

6.1.3. The above asset groups may be subject to minor changes through the course of the assessment, to align with the Engineering Teams' high level asset groupings. In particular, the assessment of the utilities asset group may be broken down further, as required, due to the variety of sub-assets present within this group. This will ensure the assessment is made to the appropriate level of detail.

6.1.4. The projected increases in extreme weather events in the short, medium to long term as well as long-term changes to climate conditions have the potential to influence a range of climate impacts for the Project.

6.1.5. Based on the current level of design and environmental information, some of the climate hazards that are considered to have the potential to impact assets of the Project are set out in Table 4. This is not an exhaustive list of potential hazards, impacts and consequence, which will be presented in the CCRA. The impacts identified here relate to the operational phase of the Project. Construction phase impacts will not be scoped into the climate change risk assessment, as outlined in section 9.

6.1.6. Other Project risks include those due to vulnerabilities within third parties, upon which the Project is dependent. These interdependency risks include loss of utility services such as water and power to the Project, disruption of supply lines, lack of staff access via public road networks due to extreme weather events.

Table 4 – Potential impacts to Project asset groups.

Climate hazard	**Description of potential climate change impact**	**Description of risks (consequences)**	
		Risks to assets/services	**Risks to health and safety of infrastructure users**
Temperature: **Increase in mean temperature across all seasons, increase in mean daily maximum temperature**	Increase growth rate of vegetation	Increase risk of drainage infrastructure blockages. Increased maintenance requirements.	Increased requirement for track-side vegetation maintenance, increasing risks to employees or contractors.
Temperature: **Increased frequency of extreme heat days and heatwaves**	Exceedance of design standards and operational thresholds of heating, ventilation, and air conditioning systems	Overheating of electrical equipment reducing the efficiency and performance of equipment and potential failure or fire risk.	Working conditions in buildings become unfeasible.
	Expansion of the track resulting in buckling	Failure of rail expansion joints requiring replacement and additional or unplanned maintenance. Delays to rail services.	Derailment of rolling stock (passenger or freight) and resulting injury and fatality risk.
	Increase in conditions that create risks of heat related morbidity		Minor or major health and safety events for staff/passengers whilst waiting on platforms or whilst conducting maintenance works outdoors

Climate hazard	Description of potential climate change impact	Description of risks (consequences)	
		Risks to assets/services	**Risks to health and safety of infrastructure users**
Precipitation: **Increase in mean winter rainfall** **Increased frequency of heavy rainfall events**	Increased frequency and severity of extreme flood events exceeding drainage and flood design	Direct flood damage to buildings, structures and infrastructure. Overwhelmed drainage. Washout of ballast, Delays to rail services and requiring increased or unplanned maintenance. Earthwork failures, from periods of intense rainfall, particularly scour of embankments. Delays and disruption to rail services and passengers.	Earthwork failures (landslides) may result in derailment rolling stock (passenger or freight) and result in injury and fatality risk. Blocked access/egress from buildings (including stations, maintenance depots) parking areas and access roads, due to flooding. Increased health and safety risks to maintenance workers (including emergency/on-call workers).
Precipitation: **Decrease in mean summer rainfall** **Increased frequency of dry spells and droughts**	Greater fluctuations in soil moisture content leading to shrink-swell processes in areas with susceptible soils.	Damage to track geometry and structural integrity of embankments and other assets with below ground structures, resulting in increased or unplanned repair and maintenance.	Increased health and safety risks to maintenance workers.
Wind: **Increased frequency of windstorm events in the second half of the 21st Century**	Increase likelihood of vegetation, leaves and other wind-borne debris on road and track.	Requirement for additional road and track maintenance activities. Delays to rail services.	Increased health and safety risks to maintenance workers (including emergency/on-call workers).
	Overhead lines blown out of alignment; damaged, either directly or indirectly from debris.	Disruption to rail services and increased or unplanned repair and maintenance requirements. Delays to rail services.	Increased health and safety risks to maintenance workers (including emergency/on-call workers).

Climate hazard	Description of potential climate change impact	Description of risks (consequences)	
		Risks to assets/services	**Risks to health and safety of infrastructure users**
	Direct damage to fencing, walls and noise barriers.	Additional repair and maintenance requirements. Delays to rail services.	Risk of trespassers accessing the track from previously secured area. Increased health and safety risks to maintenance workers (including emergency/on-call workers).
Lightning: **Increased frequency of lightning events in the second half of the 21st Century**	More frequent lightning events would lead to an increased likelihood of lightning strikes.	Direct damage to electrical equipment, power system failure, caused by a direct strike or a surge.	Increased health and safety risks to maintenance workers (including emergency/on-call workers).
Note: this table provides an indication of potential climate impacts. As the CCRA is developed, other potential climate hazards and impacts will be considered, and further detail on climate change trends will be included.			

7. Assumed resilience measures

7.1. Principles of climate resilience

7.1.1. Developing resilience to the physical risks of climate change is a central tenet of a successful CCRA. If resilience measures are effective, future climates and weather events may not pose a large threat to the Project assets or operations and the remaining level of risk can be managed. Climate resilience can be achieved in a variety of ways: from moving a project's alignment out of flood zones; modifying design elements such as wind loading or thermal design limits; providing flexibility and capacity within project design for future upgrades and additions such as increased ventilation and flood protection; or changing the timing or characteristics of certain activities and operations.

7.1.2. The CCRA team will inform the design through successive stages and using a prescribed process about potential risks of climate change to the Project. The team will work with designers to support the adoption of measures that avoid, reduce or otherwise mitigate climate risks to the Project. The Project proposals will therefore have embedded within them various resilience measures; and the risks to the Project will be assessed on the basis that this resilience is an integral part of the Project.

7.1.3. For the assessment of climate risks to the Project, embedded resilience may be obtained by the following measures:

- The Project design will adhere to principles of climate resilience through its design, construction and operation. The overarching approach has been applied in which the designers will assess the potential impact of climate change on the activities and assets and identify and include climate resilience and adaptation measures within the Project design;
- The Project design for each asset group will include reference to designing for future climate where relevant;
- The buildings and depots that fall within the criteria for the building research establishment environmental assessment methodology (BREEAM) assessment as part of the sustainability strategy for the Project will adhere to the relevant climate change resilience criteria;
- The Project engineering drainage design will be designed to incorporate the relevant climate change allowances;
- The BNG assessment will embed climate change within the assessment, including consideration for how to build resilience within BNG. Potential benefits to the resilience of engineered assets as a result of BNG design, such as nature-based solutions for flood risk or cooling, will be identified and assessed; and
- The operational Project will also be subject to Network Rail's Asset Management procedures. Adaptive capacity will be built into the operation and maintenance and the Project where appropriate.

7.2. Code of construction practice

7.2.1. Construction work can be one of the chief causes of environmental impact. Construction works are also at risk of extreme weather and climatic events such as flooding, high winds and extreme temperatures. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles that future contractors will be required to abide by in undertaking their work. The proposed construction phase is to 2034 (as outlined in 4.4.3) and is therefore within present-day climate conditions, which negates the need for a climate change risk assessment. Nevertheless, construction compounds and activities will need to manage present-day climate variability and uncertainty. There is still potential for extreme events to occur during construction, such as those experienced in recent years (e.g., the 2022 heatwave, which saw maximum temperatures of 40°C for the first time on record).

7.2.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce the risk that extreme weather events have adverse impacts on construction works such as construction materials storage and curing times, overheating of equipment and safe working conditions. It will also secure best-practice that can support longer-term resilience of the Project throughout its design life for example, through effective top-soil management, planting in reinstated or re-worked areas which can increase resilience to flood and erosion hazards. The CCRA will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a Project of this nature.

7.2.3. The measures to be addressed within the CoCP that pertain to mitigation of climate risks to construction works may include the following generic categories:

- Timing of construction works and working hours;
- Construction site layout and good ‘housekeeping’;
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Site access;
- Fire prevention;
- Site safety and security;
- Pollution prevention measures;
- Emergency preparedness and access;
- On-site and off-site protection;
- Site drainage and watercourse and groundwater protection;
- Extreme weather events;
- Selection and management of materials;
- Procedures for ground settlement;

- Ground investigation and remediation;
- Workplace travel plans;
- Site specific measures; and
- Monitoring requirements.

7.2.4. A register of environmental actions and commitments will also be developed alongside the ES and the CoCP.

8. Climate change risk assessment methodology

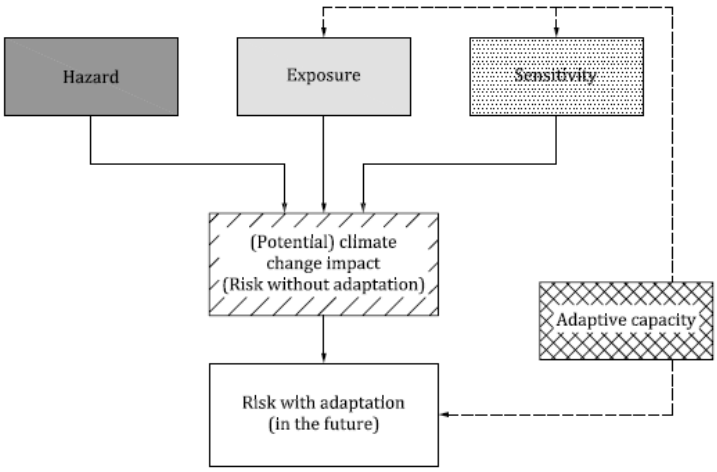
8.1.1. This section outlines the methodology used to assess those matters scoped into the CCRA, as outlined in section 9 and are within the study area outlined in section 4.4.

8.1.2. The methodology for conducting the CCRA will be based upon British standard BS EN ISO 14091:202135, the UK implementation of EN ISO 14091:2021 utilises the definition of climate risk as provided by the IPCC AR6[36]. This definition is provided in Appendix B Glossary of Key Terms but is summarised as 'the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on asset(s).

8.1.3. ISO 14091:2021 presents the components risk as shown in Figure 1, where risks are defined based on the following components:

- Presence and likelihood of physical climate hazards;
- The exposure of in-scope assets to those hazards; and
- The vulnerability of the asset to the impacts that arise from climate hazards (as determined by the sensitivity of an asset to the hazard as well as its adaptive capacity);

Figure 1 – Schematic of climate risk (ISO 14091, Fig A.1).



8.1.4. The methodology is also compatible with the Network Rail Adaptation Reporting Power 3rd report (ARP3,2021), regarding definitions of consequence and likelihood, and the risk matrix used to determine the level of risk. The Network Rail definition of 'likelihood' is further broken down into two categories (as per

[35] available at: ISO 14091:2021 - Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment
[36] Available at: Sixth Assessment Report — IPCC

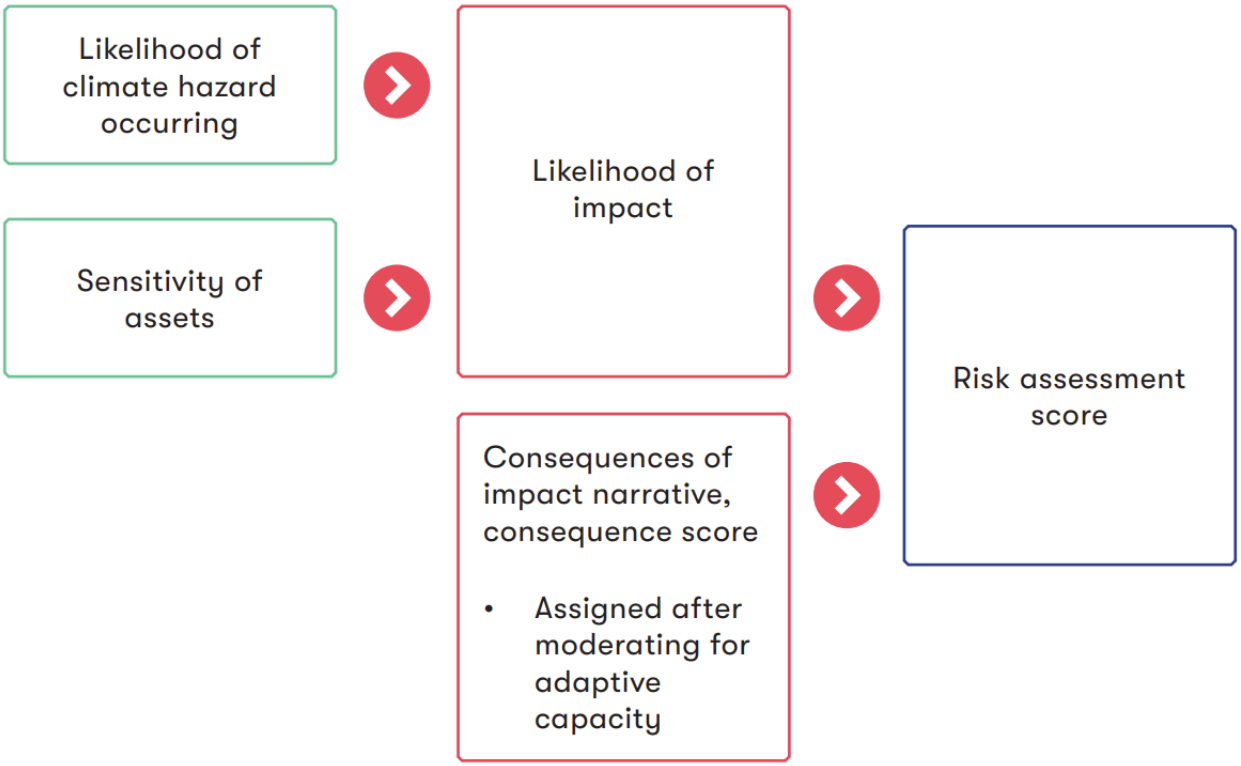
the ISO 14091:2021 methodology), whereby likelihood of an impact is a combination of the likelihood of a hazard occurring under a future climate scenario, and the sensitivity of the asset(s) which may experience it.

8.1.5. The future climate baseline will be used to determine the list of climate hazards which are the source of physical risk to Project assets. The hazards list will also detail the direction of change and a qualitative description of the potential extent of change in the hazard due to climate change, as well as a qualitative description of the level of confidence in the projections. The risk assessment will only consider the extent of change to climate hazards for the 2080s (2071-2100) time horizon. The 2080s is selected as it is considered to cover the majority of the operational lifetime of the Project. The level of risk to Project assets beyond 2100 is not assessed as there are no climate projections available as at the time of writing. To address weather and climate risks over the full Project lifetime, the CCRA process should be periodically repeated over the lifetime of the Project by the operator, using the latest available climate projections data and taking into account the latest technologies available and management best practice, including corporate climate adaptation strategies.

8.1.6. Using the list of future climate hazards, potential impacts (including but not limited to those identified within section 5.3) will be assessed using the RCP6.0 90th percentile. Where appropriate, sensitivity testing will be conducted under RCP8.5 90th percentile. This is in line with Network Rail ARP3 approach. Long-life and difficult-to-replace assets will be sensitivity tested to minimise major upgrades and refurbishments that may become necessary over their lifetime, as will assets that are found to be at high or extremely high levels of risk following the risk assessment process.

8.1.7. Figure 2 illustrates the methodology that will be used in the CCRA.

Figure 2 – Schematic of climate change risk assessment methodology.



8.1.8. Impacts will be assessed as a combination of the likelihood of the hazards occurring, project assets' sensitivity to each hazard, adaptive capacity, and the consequences that arise as a result of the impacts.

8.1.9. The '**likelihood of climate hazard**' refers to the likelihood of the Project to experience a climate hazard over the course of the operational lifetime (end of life taken as 2130, however climate projections only extend to 2100, limiting the assessment). This does not take into account that the lifetime of certain asset groups may be significantly shorter than the intended operational lifetime. Hazard likelihood is taken across the full geographical route that the Project encompasses. As noted within section 5.3, the future climate baseline is considered to be consistent across the route. Any deviations from this will be identified during the CCRA and captured as a separate entry into the risk assessment whereby a different level of hazard likelihood will be assigned for assets that fall within that 'hotspot'. For example, assets that fall within a higher flood zone will be assessed separately to assets that sit outside of a flood zone due to the difference in probability of a flood occurring. Other potential hotspots include areas subject to higher winds or heat.

8.1.10. '**Sensitivity of asset**' refers to the potential extent to which asset groups may suffer an impact in relation to climate change hazards over the course of the Project's lifetime. The Sensitivity scoring assumes that future climate has been

taken into account within the design of any new or upgraded assets, which will therefore include a level of embedded resilience.

8.1.11. The sensitivity of assets will vary across the route. East West Rail is being promoted and brought into use in three connection stages. Connection Stage 1 enables services to run between Oxford and Milton Keynes. Work on this has started and will be complete by 2025 when services will commence. Work is ongoing to bring forward Connection Stage 2 which will enable the first direct services between Oxford and Bedford. Connection Stage 3 would complete East West Rail and enable passenger services to operate between Oxford and Cambridge via Bletchley and Bedford. Proposed works associated with Connection Stage 3 are the subject of the DCO and of this Method Statement.

8.1.12. Assessing and achieving resilience across the entire route and all three connection stages is outside the scope of this assessment, which is focused only on those interventions that lie within the scope of the proposed works for the Project. The climate resilience of connection stages 1 and 2 will be the responsibility of Network Rail. However, the Project will not hinder any such upgrades to other parts of the route or impede their maintenance and monitoring, in accordance with the detailed requirements of the Network Code.[37]

8.1.13. There may be differences in sensitivity of individual assets within each asset group, for example due to age, design or condition. Where different sensitivities are identified, these 'hot spot' sensitive assets will be segregated from the rest of the asset group and added as a separate entry into the risk assessment allowing for a different level of risk and adaptation actions to be awarded as appropriate. Where more resilient assets (e.g., newly designed assets) interface with or are otherwise dependent upon the effective operation of less resilient (e.g., older) assets (for example different sensitivities along consecutive parts of the track), these intra-project dependencies will be taken into consideration within the risk assessment.

8.1.14. Full definitions of criteria for the likelihood of climate hazards and sensitivity of assets, together with adaptive capacity and consequence criteria definitions, are provided in Table 7.

8.1.15. Likelihood of climate hazard and sensitivity of asset will then be combined to provide a likelihood of impact rating in line with the impact matrix provided in Table 5.

[37] Available at: https://www.networkrail.co.uk/industry-and-commercial/information-for-operators/network-code/

Table 5 – Likelihood of impact: scoring matrix.

		Likelihood of climate hazard				
		Very low (1)	Low (2)	Medium (3)	High (4)	Very high (5)
Sensitivity of asset(s)	Very high (5)	Possible 5	Possible 10	Likely 15	Almost certain 20	Almost certain 25
	High (4)	Unlikely 4	Possible 8	Likely 12	Likely 16	Almost certain 20
	Medium (3)	Unlikely 3	Possible 6	Possible 9	Likely 12	Likely 15
	Low (2)	Highly unlikely 2	Unlikely 4	Possible 6	Possible 8	Possible 10
	Very low (1)	Highly unlikely 1	Highly unlikely 2	Unlikely 3	Unlikely 4	Possible 5

8.1.16. For each impact, the adaptive capacity of the affected assets will then be qualitatively assessed. Adaptive capacity refers to the ability of assets to be modified to withstand climate change over the Project lifetime. Adaptive capacity may include opportunities for repairs, replacements and upgrades, introduction of new technologies as well as operational and maintenance best practices.

8.1.17. Adaptive capacity can reduce the level of risk by moderating some of the consequences of the impact. 'Consequence' refers to the 'so-what' of each impact and can be related to any one (or more) areas of: safety and/or environment, financial or operational performance. Full criteria for the adaptive capacity and consequence are provided in Table 7.

8.1.18. The overall risk will be determined through the combination of the likelihood of impact rating, and the consequence (after moderating for adaptive capacity) using the risk matrix in Table 6, which is consistent with the risk matrix used in the Network Rail ARP3 report.

Table 6 – Risk assessment scoring matrix.

		Consequence[38]				
		Minimal (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Likelihood of impact	Almost certain (20-25)	Moderate	Major	Major	Severe	Severe
	Likely (10-15)	Moderate	Moderate	Major	Major	Severe
	Possible (5-9)	Minor	Moderate	Moderate	Major	Major
	Unlikely (3-4)	Minor	Moderate	Moderate	Moderate	Major
	Highly unlikely (1-2)	Minor	Minor	Minor	Moderate	Moderate

8.1.19. Sensitivity testing against RCP8.5 (90th percentile) will be carried out for all risks with a rating of severe or major, and for all long-life assets or assets that are deemed to be difficult to repair or replace should risks materialise. Additional adaptation actions and information regarding how these will be secured will be provided. Long-lived or difficult to replace assets which are found to have an acceptable risk level under RCP6.0 scenario but not under the RCP8.5 scenario will be highlighted, with additional adaptation measures recommended in the future, as the climate continues to evolve, and additional measures may become necessary (if RCP8.5 emerges as a more likely scenario than RCP6.0 during the design life). This supports an adaptive management approach, providing adaptation pathways under different future climate scenarios. In this way, the assessment will take a proportionate response to building resilience into the Project, taking steps to embed resilience during the design stage and identifying the appropriate amount of additional adaptation required throughout the operation phase, including future upgrades or renewals that may be necessary at an appropriate time in the future.

8.1.20. Refer to Appendix C for an example of a risk assessment template that will be developed and utilised for conducting the CCRA.

8.1.21. Interdependencies, such as reliance on third parties for utility supplies, will be identified and described within the CCRA. However, they will not be assessed following this process and will not require adaptation measures to be secured as part of the Project, because they fall outside of the remit of EWR Co to

[38] Consequence rating is assigned after moderating for adaptive capacity.

address. Interdependencies will be identified and described with the assistance of relevant industry tools and research such as the UK Climate Change Committee Technical Report of the Third UK Climate Change Risk Assessment[39], and the latest (third) round of the Adaptation Reporting Power (ARP) reports under the Climate Change Act 2008, and the fourth round ARP reports, if published in time to consider (expected submission to Defra is December 2024) .

8.1.22. Adaptive capacity may include future opportunities to enhance resilience for example through operational phase maintenance measures. Where such measures are applicable to the wider route (i.e., to non-Project assets as well as Project assets) this will be identified, and any measures noted will be compatible with existing plans and processes such as Network Rail's asset management. The combination of Project design resilience and compatibility with Network Rail asset management to secure future adaptation will support an overall acceptable level of resilience for the Project.

8.1.23. Table 7 describes the criteria for scoring Likelihood of climate hazard, Sensitivity of asset to the Hazard, Adaptive Capacity and Consequence.

Table 7 – Assessment criteria.

Score		Criteria
Likelihood of climate hazard		
5	Very high	Climate hazard (severe enough to induce impacts) occurs multiple times during design life of the asset group e.g., annually.
4	High	Climate hazards capable of inducing impacts occur several times typical design life of the asset group e.g., once every five years.
3	Medium	The event occurs limited times during the typical design life of the asset group, e.g. once every 25 years.
2	Low	The effect is unlikely and may occur once or twice during the typical design life of the asset group e.g. once in 60 years.
1	Very low	The event is remote and unlikely to occur may occur once during the typical design life of the asset group e.g., once in 100 years.
Sensitivity of asset		
5	Very high	Asset has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climate hazards. Hazard would result insignificant damage or total loss of original function/form, very high likelihood of asset failure.
4	High	Asset has some small ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climate hazards. Impact leads to much damage and loss of original function/form. Likelihood of asset failure.

[39] Available at: Technical Report - UK Climate Risk

Score		Criteria
3	Medium	Asset has some ability to withstand/not be altered by the projected changes to the existing/prevailing climatic conditions. Asset unlikely to fail and is able to retain some of its original function/form with minor damage.
2	Low	Asset has the ability to withstand/not be altered much by the projected changes to the existing/prevailing climatic factors. Asset retains much of its original function and form and very unlikely to fail, sustaining little to no damage.
1	Very low	Asset has the ability to withstand/not be altered by the projected changes to the existing/prevailing climatic factors. Asset retains most of its measurable original function and form and is extremely unlikely to fail or sustain damage.
Adaptive capacity		
High		High level of opportunity to introduce/build technological resilience throughout project lifetime, such as through asset repairs, replacements and upgrades. Alternative options available to deliver services even in the case that assets are altered due to climate impacts for example through redundancies, back-ups or alternative procedures. Adaptive capacity counteracts asset sensitivity to a large degree, thereby reducing the consequences of climate impacts either through reducing the amount of change to asset function or form.
Medium		Some opportunity to introduce/build technological resilience throughout project lifetime, such as through asset repairs, replacements and upgrades. Alternative options available which support some level of service delivery even in the case that assets are altered due to climate impacts for example through redundancies, back-ups or alternative procedures. Adaptive capacity partially counteracts asset sensitivity, thereby reducing the consequences of climate impacts either through reducing the amount of change to asset function or form.
Low		Little to no opportunity to introduce/build technological resilience throughout project lifetime, such as through asset replacements and upgrades. No alternative options available to deliver critical services even in the case that assets are altered due to climate impacts. Little to no reduction in the consequences of climate impacts when they occur.
Consequence		
5	Catastrophic	**Safety/Environment:** Catastrophic Safety event with the potential of over 10 fatalities, with catastrophic long term environmental damage **Performance:** Prolonged and unplanned severe disruption to key routes resulting in adverse media attention and protests/lobbying resulting in a review of Network licence condition **Finance:** Costs to resolve issue in excess of £250m per annum
4	Major	**Safety/Environment:** Catastrophic Safety event with the potential of between two and 10 fatalities, with major environmental impact resulting in Regulatory

Score		Criteria
		fines and current control measures are not suitable **Performance:** Unplanned disruption for over a week on multiple routes **Finance:** Costs to resolve issue - £75m to £250m per annum
3	Moderate	**Safety/Environment:** Significant safety event with the potential of between five major injuries and two fatalities, with significant environmental impact that results in Regulatory intervention and it exceeds existing control measures **Performance:** Unplanned disruption (for up to a week) on any one route or multiple routes **Finance:** Costs to resolve issue - £25m - £75m per annum
2	Minor	**Safety/Environment:** Significant Safety event with the potential of a single major injury to five major injuries with adverse environmental impact within a control period that can be mitigated using existing control measures **Performance:** Unplanned disruption for up to a day on any one Route **Finance:** Costs to resolve issue - £2m to £25m per annum
1	Minimal	**Safety/Environment:** Minor Safety event with the potential to cause up to 20 minor injuries or a single major injury and with environmental incidents that can be addressed using existing control measures **Performance:** Planned disruption for up to a day on any one Route **Finance:** Costs to resolve issue - up to £2m per annum

9. Proposed scope

9.1. Overview

9.1.1. The purpose of this Method Statement is to define what is scoped into the climate change assessment in the EIA. As a result, it also sets out what is proposed to be scoped out of the EIA and not considered further for climate change. This is summarised in Appendix A.

9.2. Construction

9.2.1. Impacts of climate change upon the temporary construction compounds and works are considered unlikely. The construction phase will occur in the short-term (Construction year 1 is 2028, peak construction 2032 and with intended opening year is 2034), whereas future climate change impacts are expected to manifest over longer time periods. As such it is proposed that the construction phase is scoped out of further assessment of vulnerability to climate change and not included within the CCRA.

9.2.2. Notwithstanding this, relevant present-day climate conditions still result in a range of different weather impacts, including extreme weather events (e.g., heatwaves, cold snaps, heavy rainfall, high winds) which may have adverse impacts to the proposed Project construction activities. These impacts will be identified, and measures for management of these will be included within the CoCP, which will be developed as part of the DCO application. The CoCP will detail the environmental controls, environmental protection measures and safety procedures to be adopted during construction which will include measures intended to provide resilience to extreme weather events.

9.3. Operation

9.3.1. Based on the current level of design and environmental information, all asset groups for the operational phase of the Project will be scoped in, for all geographical zones. Refer to Table 8.

Table 8 – Scoping of asset groups during operation.

Asset group	Scoping in/out
Drainage and flood conveyance infrastructure	✓
Utilities (high voltage and low voltage energy, pipelines and telecommunications, GSM-R and SISS)	✓
Electrification and Plant systems,	✓
Traction Power	✓
Overhead Catenary Systems (OCS)	✓

Asset group	Scoping in/out
Mechanical, Electrical and Public Health (MEP)	✓
Signalling	✓
Highways and access	✓
Geotechnical - cuttings, embankments and false cuttings	✓
Ancillary civils (Boundary protection, lighting, signage)	✓
Bridges, viaducts, tunnels and other structures	✓
Rolling stock - passenger and non-passenger	✓
Track	✓
Level crossings	✓
Stations, depots and buildings	✓
Staff and passengers	✓

9.3.2. For each relevant asset, impact will be assessed for climate hazards including those identified within the future climate baseline and any others that are identified when the climate baseline is constructed. Table 9 identifies the climate hazards that are to be scoped into further assessment. Refer to Appendix A for further details on those hazards that are scoped out.

Table 9 – Scoping of climate hazards.

	Climate hazard	Scoping in/out
Operation	**Temperature:** Increase in mean temperature across all seasons and mean daily maximum temperature.	✓
	Temperature: Increased frequency of extreme heat days and heatwaves	✓
	Temperature: Decreasing in the number of low temperature events (cold snaps)	×
	Precipitation: Increase in mean winter rainfall Increased frequency of heavy rainfall events	✓
	Precipitation:	✓

	Climate hazard	Scoping in/out
	Decrease in mean summer rainfall Increased frequency of dry spells	
	Wind: Increased frequency of windstorm events in the second half of the 21st Century	✓
	Wind: Small increases in average wind speed, with large spread and high uncertainty.	×
	Fog: The general projected climate change trend is that there will be a decrease in the frequency of fog events	×
	Relative humidity: There is little discernible trends in changes to relative humidity within climate projection data	×
	Lightning: Increased frequency of lightning events in the second half of the 21st Century	✓
	Interdependencies: Various impacts on third-party assets or services (e.g., utilities, highways) that the Project is dependent on or interfaces with.	✓[40]

** Interdependencies are partially scoped in – refer to section 8 for further details.*

[40] As described within 8.1.21, interdependencies will be scoped-in however will not be subject to the CCRA methodology as outlined within this methods statement because these risks are outside of the remit of the Project. It is nevertheless important for East West Rail Co. to have awareness and understanding of their interdependencies risks in order to support adaptation planning into the future.

10. Assumptions and risks

10.1. Assumptions

10.1.1. Assumptions that have been made, and any limitations that have been identified in undertaking this scoping exercise, are set out in this section.

10.1.2. The baseline data has been constructed using data for LRF 43 (Thames valley); LRF 2 (Bedfordshire); and LRF 3 (Cambridgeshire) within which the study area is located.

10.1.3. The assessment has assumed a trend of increased global carbon emissions, in the atmosphere in the coming decades, in line with RCPs used in UKCP18. This will lead to increased global temperatures, with associated increased global temperatures. In turn this is a general assumption used in the climate models which are the basis of the climate trends used to inform the assessment. It is recognised that other outcomes are possible.

10.1.4. The baseline for climate resilience considers both the present-day climate and how the climate may change in the future as a result of climate change, expressed as the outputs of climate modelling, referred to as projections and obtained from a third-party source (Climate Risk Indicator[25]).

10.1.5. Climate projections are not predictions or forecasts but scenarios of future climate under a range of hypothetical emissions scenarios and assumptions. The results, therefore, from the experiments performed by climate models cannot be treated as exact or factual, rather they are scenarios. They represent internally consistent representations of how the climate may evolve in response to a range of potential forcing scenarios and their reliability varies between climate variables. Scenarios exclude outlying "surprise" or "disaster" scenarios in the literature and any scenario necessarily includes subjective elements and is open to various interpretations. Generally global projections are more certain than regional, and temperature projections more certain than those for precipitation and other variables. Further, the degree of uncertainty associated with all climate change projections increases for projections further into the future.

10.1.6. Reliability of the environmental modelling used to investigate the localised impact of climate change depends not only on the accuracy of the climate projections adopted but also on the existence of good quality calibration data and of detailed information to characterise the physical properties of the area. Even when this information exists, a model can never fully replicate the complexity in the natural environment and there will always be uncertainty about its performance when applied to different climate conditions to those used during calibration.

10.1.7. The UK annual mean wind speed from 1969 to 2022 shows a downward trend, consistent with that observed globally. However, this series must be interpreted with some caution. Changes in instrument type, station network size, station exposure, and choice of metric used mean that interpreting trends in storminess from UK wind speed data is not straightforward due to the limitations of available data.

10.1.8. Any environmental modelling exercise is an approximation of the real natural processes and has its own uncertainty related to the choice of model and its configuration, its spatial and temporal resolution, and the information used for its calibration. Accepted procedures are followed in providing this modelling work, but results need to be interpreted in light of the related overall uncertainty.

10.1.9. All climate scenarios are plausible. It is thus not possible to provide a definitive scenario for climate change and therefore ranges will be identified highlighting where there is confidence and where there is uncertainty.

10.1.10. The assessment will assume that mitigation measures included in the design, construction and maintenance phase are sufficient to address the effects of the Project to current climatic conditions. The assessment focuses on the resilience of the Project to future climate change effects, taking account of design standards, construction and operational approaches.

10.1.11. Climate projections used in the assessments only extend to 2100. Thus, projections do not cover the full lifetime of the Project. Climate change assessment should be undertaken and updated across the lifetime of the Project, utilising the latest climate change projections data as it becomes available.

10.1.12. Operational lifetime of the Project is assumed to be 100 years, with end-of-life being in the 2130s.

10.2. Risks

10.2.1. It is expected that most risks due to climate change can be mitigated through standards implemented during the design process, or how assets are to be maintained, replaced or upgraded over the design life of the Project. There is a risk that, as the climate continues to evolve, some design standards become outdated and business as usual maintenance or renewal cycles become insufficient to manage growing climate risks. This could be particularly true for assets where a degree of climate risk has been locked-in, for example due to route choices or geographical constraints that have limited the ability to embed resilience within the Project design or which impede maintenance access. However, it is the purpose of the EIA to assess and identify these risks and provide recommendations for best-practice adaptation measures.

10.2.2. The assessment would exclude consideration of cumulative risks in relation to future climate change, as the EIA process and consideration of (relatively) short term cumulative projects does not generally suit the temporal scale of the climate change assessments. Instead, the Climate Change Risk Assessment would consider the route of the proposal with strategic local and regional plans that span a number of decades and identify any risk relating to cumulative long term land use changes that may lead to climate change risks such as the creation of heat islands or contribution to wider risks of future flooding. In doing this the assessment will overlap with other technical aspects that may be looking at similar long term strategic plans.

10.2.3. The CCRA is focusing on the Project assets and activities, including new infrastructure and upgrades to existing infrastructure along the route. However, the Project is a subset of the wider East West Rail route and therefore Project resilience is interdependent with the resilience of the entire route. There are other areas along the wider route that may be more vulnerable to climate hazards than the Project (for example due to higher sensitivity of aging assets, or geographical location in areas of higher hazards). Therefore, whilst climate resilience will be designed into the Project, and this resilience can support resilience of the wider route, there is a risk that the full East West Rail route will retain climate vulnerabilities. The CCRA will identify risks to the Project due to high-level wider route vulnerabilities.

10.3. Opportunities

10.3.1. The Project has the opportunity to align itself with Network Rail's vision for a railway that is safer and more resilient to the effects of weather and climate change now and in the future as outlined in ARP3. This would include short-medium-term operational and seasonal resilience that delivers a safer and seasonally agnostic railway by putting passengers and freight users first; and long-term weather and climate change resilience that provides a reliable railway service.

APPENDIX A - Aspects and matters proposed to be scoped out

Climate change impacts associated with the construction are scoped out of the assessment. This is due to the proposed construction programme running to 2034, which falls within the present-day climate epoch and as such is not anticipated to be subject to a change in average climate values or the likelihood of extreme weather events. The present-day risk of extreme weather and the need to account for natural climate variability will be captured through the CoCP.

Climate change impacts that are considered not likely to result in significant risk and the reason why they have been scoped out of the climate change resilience assessment during operation are:

- **Low temperatures** – although cold weather events (e.g. snow and ice) are still expected to occur, the general projected climate change trend is that there will be a decrease in the frequency of cold weather events (Table 3 and paragraph 5.3.10). Therefore, mitigation embedded into the design and operation of rail infrastructure to manage the existing impact of cold weather events, will be applicable for the future[17]. Potential effects will therefore be scoped out at this stage;
- **Wind (mean)** – there are no discernible changes in mean wind speed (**paragraph 5.3.16**) beyond the realm of current wind impacts, therefore it is not considered to result in increased risks or additional mitigation. Therefore, mean wind speed has been scoped out;
- **Fog** – the general projected climate change trend is that there will be a decrease in the frequency of fog events in the second half of the 21st Century. Potential effects will be scoped out at this stage due to few fog events occurring in the future and the rail infrastructure becoming less vulnerable to fog events (e.g. rolling stock and reliance on line of sight)[16]. The majority of fog delays are related to inability to read semaphore signals; installation of new modern signalling systems provides resilience to this weather impact[17]; and
- **Humidity** – the potential climate change impacts associated with a change in humidity on rail infrastructure is considered be low due to the lack of discernible trend in relative humidity[33]. This will not result in climate risks where additional mitigation measures would be required beyond current practices. As such, humidity will be scoped out at this stage.

APPENDIX B - Glossary of key terms

Term	Definition	Source (if applicable)
Climate impact	**ISO** An effect on natural and human systems. Note 1 to entry: In the context of climate change, the term "impact" is used primarily to refer to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of climate change or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes. The impacts of climate change on geophysical systems, including floods, droughts and sea level rise, are a subset of impacts called "physical impacts".	ISO 14901:2021
Impact chain	Analytical approach that enables understanding of how given hazards generate direct and indirect impacts which propagate through a system at risk.	ISO 14901:2021
Risk	Effect of uncertainty. Note 1 to entry: An effect is a deviation from the expected. It can be positive, negative or both. An effect can arise as a result of a response, or failure to respond, to an opportunity or to a threat related to objectives. Note 2 to entry: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of an event, its consequence, or likelihood. **IPCC AR6** The potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Risk results from the interaction of vulnerability (of the affected system), its exposure over time (to the hazard), as well as the (climate-related) hazard and the likelihood of its occurrence.	ISO 14091:2021 IPCC AR6[41]
Exposure	**ISO** Presence of people, livelihoods, species or ecosystems, environmental functions, services, resources, infrastructure, or economic, social or cultural assets in places and settings that could be affected.	ISO 14091:2021
Hazard	Potential source of harm.	ISO 14091:2021

[41] Available at: Sixth Assessment Report — IPCC

Term	Definition	Source (if applicable)
	Note 1 to entry: The potential for harm can be in terms of loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. Note 2 to entry: In this document, the term usually refers to climate-related physical events or trends or their physical impacts. Note 3 to entry: Hazard comprises slow-onset developments (e.g. rising temperatures over the long term) as well as rapidly developing climatic extremes (e.g. a heatwave) or increased variability.	
Vulnerability	Propensity or predisposition to be adversely affected Note 1 to entry: Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.	ISO 14091:2021
Sensitivity	Degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. Note 1 to entry: The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea level rise).	ISO 14091:2021
Adaptive capacity	Ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences	ISO 14091:2021

APPENDIX C - Example risk template

Climate hazard	Climate indicators (from baseline)	Affected element(s)	Description of impact	Likelihood of climate hazard	Description of embedded design measures	Sensitivity of asset(s)[42]	Impact Likelihood Rating (RCP6.0 90th)	Adaptive capacity[43] (future opportunities to enhance resilience)	Consequence	Consequence rating[44]	Overall Risk rating (RCP6.0 90th)	Sensitivity testing Risk rating (RCP8.5 90th)	Linked CCRA3 Risks
Windstorm events	*Description of general trend of increased frequency of high wind events*	*OHL*	*OHL blown out of alignment, damaged either directly or from debris*	*4 (High)*	*Appropriate Design Standards for maximum wind speed,* *Wind loading calculations to include appropriate allowances for climate change,* *Deeper foundation designs*	*2 (Low)*	*8 (Possible)*	*High –* *Replaced and upgraded every c.20 years* *Inspection and proactive maintenance regimes*	*Performance – service delays*	*2 (Minor)*	*Moderate*	*NA*	*I12 Risks to transport from high and low temperatures, high winds, lightning*
Extreme high temperature	*Maximum temperatures (JJA)* *Heatwaves – no. events per year* *No. very hot days (>35°C)*	*Track*	*Expansion of rail leading to bends and buckling*	*4 (High)*	*Stress-free temperature settings including climate change allowances,*	*3 (Medium)*	*12 (Likely)*	*Moderate –* *Rail Painting, Periodic re-stressing, (remote) temperature monitoring, stress-free temperature monitoring,* *Changes to future service timetables*	*Performance – speed restrictions & cancellations* *Safety – risk of derailment*	*3 (Minor)*	*Moderate*	*NA*	*I12 Risks to transport from high and low temperatures, high winds, lightning*

[42] Taking into account embedded design information.
[43] Taking into account asset group lifetimes with opportunities for repairs, upgrades, introduction of new technologies as well as operational and maintenance best practices.
[44] Consequence rating after taking into account the adaptive capacity of relevant assets or processes.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping Method Statement - Communities

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. In order to plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on communities and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The communities assessment will consider potential impacts on people, including residential property, community facilities, public open space and connections between communities.

[1] *National policy statement for national networks* (2024) *GOV.UK*. Available at: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf (Accessed: 28 October 2024).

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
CoCP	Code of construction practice
DCO	Development consent order
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
NNNPS	National Networks National Policy Statement
NSIP	Nationally significant infrastructure project
PRoW	Public rights of way

3. Relevant standards and guidance

3.1. Context

3.1.1. There is currently no UK legislation or guidance that specifies the detailed content required to prepare community assessments, or that provides defined standards or thresholds for assessing the significance of community effects. The 2017 Infrastructure Planning EIA Regulations[2] identify population as a factor to be considered within the assessment process but do not provide definitive guidance on the approach, process or methodology to follow. On this basis, the methodology has been based on accepted industry practice, and a review of community assessments for other relevant projects including other rail or significant infrastructure schemes.

[2] *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017* (2017). *GOV.UK*. Available at: https://www.legislation.gov.uk/uksi/2017/572/contents/made (Accessed: 15 April 2024).

4. Establishing the baseline

4.1. Overview

4.1.1. The baseline relevant to Communities considers the local authorities which are intersected by the draft Order Limits.

4.2. Documentary records

4.2.1. The baseline draws on publicly available information on the population, provided by the office for national statistics (ONS). Information on residential property and community facilities is based on the AddressBase dataset.

4.3. Surveys and stakeholder engagement

4.3.1. No community surveys have been undertaken to date. Community surveys will primarily be focused on selected areas of formal and informal public open space.

4.3.2. Stakeholder engagement with local authorities and affected community receptors will inform the identification and assessment of significant effects.

4.4. Study area

4.4.1. The study area is informed by the geographic extent of the likely impacts of the Project (see section 6: sources of impact). The study area is focused on those locations where the land use of receptors is likely to change, and areas affected by disturbance because of construction activities associated with the Project or the operation of East West Rail. Therefore, an area of 500m around the draft Order Limits has been used to consider impacts. In addition, some temporary and permanent components of the Project may result in changes in accessibility between community receptors. This may result in impacts that occur beyond 500m. These instances will be identified separately (informed by baseline analysis, stakeholder engagement and professional judgement) and the study area will be expanded where required in specific areas to assess impacts.

4.5. Consultation

4.5.1. Consultation will be ongoing to inform the assessment of Communities as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. Baseline information for the community assessment is set out in the Social Baseline. The Social Baseline covers the study area and also provides context, principally focusing on information at a local authority level.

5.2. Community elements

5.2.1. The Social Baseline describes key features of the study area related to residential receptors (people living in affected communities) and community receptors (the community facilities, the people who own, operate and use these facilities).

5.2.2. Key aspects of the Social Baseline relevant to community are:

- Population;
- Settlements; and
- Community facilities.

5.2.3. Residential receptors include:

- Residential dwellings, including gardens, garages, outbuildings and associated parking;
- Permanent dwellings, including mobile homes (in an established location) and canal boats; and
- Private, rented and shared ownership dwellings, student accommodation, retirement housing.

5.2.4. Community receptors include:

- Education, health and social care, community venues, places of worship (including burial grounds), sports and recreational facilities, emergency services infrastructure, publicly accessible open space and recreational routes (i.e. promoted routes like national trails – for clarity, this does not include all public rights of way (PRoW), as the impact on these routes is considered in the Traffic and Transport method statement;
- Receptors include the people who own, operate and use these facilities. This includes local residents, organisations and community groups, pupils, patients and congregations. Operators may be the owners, community organisations, or staff; and
- Local communities as a whole.

5.3. Future baseline

5.3.1. Future demographic baseline is set out in the Social Baseline.

5.3.2. New development can introduce new receptors into a location who may experience positive or negative effects of the Project. The new developments that are assumed to be in place when the Project is being constructed or operated are known as ‘committed development’. A list of committed developments will be produced, and the potential impacts will be assessed.

5.3.3. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the Project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the Project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.3.4. While these climate changes may have some minor influence on resources and receptors, it is not considered that these scenarios will lead to changes to the likely significant effects identified in the community assessment.

5.3.5. Refer to the section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

6. Sources of impact

6.1.1. The Project includes works to existing stations (including potential closures), new stations, new railway, works to existing railway, works affecting level crossings and works to local highways and utilities.

6.1.2. These activities may result in the requirement for land (including demolitions), change in land use, affect accessibility (including community severance) and have the potential to introduce disturbance to existing communities and future communities (where land is identified for new development).

6.1.3. Further details on the Project are included in the EIA Scoping Report.

7. Potential impacts and effects

7.1. Impacts

7.1.1. For the purpose of this report 'receptors' are the features of the environment (e.g. people, schools and hospitals) that might experience a change as a result of the Project. 'Impacts' have been defined as the changes that would result from an action linked to the construction, operation, or maintenance of the Project, and 'effects' are defined as the consequences of the impacts.

7.1.2. The communities assessment seeks to consider the impact of the Project associated with:

- Land requirements: the temporary or permanent requirement for land;
- Accessibility: the ability to access residential or community receptors; and
- Amenity: the combination of two or more environmental impacts (air quality, noise, visual and traffic) at a single location which can result in a change in how a receptor is enjoyed/used (e.g. deterring people from using an area of open space).

7.1.3. Based on the likely activities, the potential impacts and effects on communities have been identified.

7.2. Potential permanent and operational effects

7.2.1. The potential effects identified in Table 2 include effects during construction which are permanent and effects during operation which will continue for the life of the Project.

Table 2 – Potential permanent and operational effects.

Receptors	Potential impact and effects	Impact stage	Duration
Residential receptors	Land requirement (including demolition or change or use away from) residential property resulting in loss of the housing stock available to local communities.	Construction	Permanent
Community receptors	Land requirement (including demolition) or change of use away from) community uses resulting in loss of community receptor or change in its ability to function.	Construction	Permanent
Residential receptors and Community receptors	Land requirement, presence of new infrastructure, removal of existing infrastructure (e.g. level crossings) resulting in reduced or improved accessibility to access other residential property and/or community receptors.	Construction	Permanent
Residential receptors	Disturbance to residential receptors resulting from a combination of significant effects on air quality, noise and vibration and visual impacts, leading to potential effects on the amenity of the residential receptor.	Operation	Permanent

Receptors	Potential impact and effects	Impact stage	Duration
Community receptors	Disturbance to community receptors resulting from a combination of significant effects on air quality, noise and vibration and visual impacts, leading to potential effects on the amenity of those using the community receptor.	Operation	Permanent
Residential receptors and Community receptors	Change in connectivity resulting from the operation of new railway services.	Operation	Permanent

7.2.2. The influence of climate change is not anticipated to exacerbate or ameliorate the potential effects to the extent that significant effects will occur.

7.3. Potential temporary construction effects

7.3.1. The effects identified in the Table 3 include effects which are temporary during the construction phase only and which will be reversed or stopped at the end of the construction phase.

7.3.2. The assessment will consider the duration of effects (in temporal terms), recognising that some temporary effects could last months or even years.

Table 3 – Potential temporary construction effects.

Receptors	Potential effect	Impact stage	Duration
Residential receptors	Land requirement (or change of use away from) residential property resulting in property being temporarily unavailable for habitation.	Construction	Temporary
Community receptors	Land requirement (or change of use) resulting in a change in the ability of the community receptor to function.	Construction	Temporary
Residential receptors	Disturbance to residential communities resulting from a combination of significant effects on air quality, noise and vibration, visual and traffic impacts, leading to potential effects on the amenity of residents.	Construction	Temporary
Community receptors	Disturbance to community receptors resulting from a combination of significant effects on air quality, noise and vibration, visual and traffic impacts, leading to potential effects on the amenity of those using the community receptor.	Construction	Temporary
Residential and community receptors	Change in accessibility resulting from construction activities, affecting the ability of residents to access other residential property and/or community receptors	Construction	Temporary

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on cultural and heritage assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce or otherwise mitigate potentially likely significant effects. The Project will therefore have embedded within them various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The draft Order Limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. No specific mitigation measures are anticipated in relation to climate change for this aspect. The influence of climate change is not anticipated to impede the effectiveness of mitigation.

8.2. Design principles

8.2.1. The approach to the design of the Project aims to include the following measures:

- The avoidance of the demolition of residential properties in all cases unless it can be demonstrated that this cannot reasonably be achieved;
- The avoidance of loss of open space where reasonably practicable and consideration given to re-provision of an equivalent or greater area where required;
- The alternative provision for buried human remains in line with The Burial Act 1857 and The Disused Burial Grounds Act 1981 (as amended), where burial grounds, human remains, and associated monuments cannot be avoided; and
- To design holistically with the wider loop in mind, rather than as an individual PRoW, where a realignment of a public footpath, bridleway or road is part of

promoted routes for recreational walking, for example National Trails or locally promoted loops.

8.3. Code of construction practice

8.3.1. Construction work can be one of the chief causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to abide by in undertaking their work.

8.3.2. The draft CoCP will be a fundamental part of the Project and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and cultural assets. The environmental assessment of community impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a scheme of this nature.

8.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on communities may include the following generic categories:

- Community relations;
- Timing of construction works and working hours;
- Construction traffic routes;
- On-site working practice and amelioration;
- Hoarding, fencing, screening and lighting;
- Demolition;
- Workplace travel plans
- Site specific measures; and
- Monitoring requirements.

8.3.4. Best practicable means (BPM) will be employed throughout construction, taking into account the risks, costs and best practice.

8.3.5. A register of environmental actions and commitments (REAC) will also be developed alongside the ES and CoCP.

9. Evaluating significance

9.1. Assessing effects

9.1.1. Following the identification of potential impacts, the effects of the Project will be evaluated by applying magnitude and sensitivity criteria to identify the likely significant effects of the Project.

9.1.2. To assess the magnitude of the effect, each effect will be assessed in terms of the following indicators:

- Spatial scope – whether impacts are likely to be felt within the study area, or more widely;
- Extent – how many community resources and receptors are likely to experience impacts;
- Duration – whether the impacts would be short or long-term; and

9.1.3. Reversibility – whether the impact is permanent or temporary. Table 4 provides a guide as to the description of effects that typify each rating of impact magnitude. The assessment will provide justification for assigning a rating to an impact, recognising that the different range of potential impacts and the large range of community facilities/receptors.

Table 4 – Impact magnitude criteria.

Impact magnitude	Description of effect
High	• A large proportion of the community study area is impacted; • Affects many (e.g. over 5,000) receptors; • The impact is permanent or long-term (e.g. more than two years); and • Requires considerable intervention to return to the Social Baseline.
Medium	• A moderate proportion of the community study area is impacted; • Affects a moderate (e.g. over 1,000) number of receptors; • The duration over which the impact is experienced is medium-term (e.g. between one and two years); and • May require some intervention to return to the Social Baseline.
Low	• A small proportion of the community study area is impacted; • Affects a small (e.g. over 500) number of receptors; • The duration over which the impact is experienced is short-term (e.g. between six and twelve months); and • Social Baseline returns without intervention or with only limited intervention.
Negligible	• A very small proportion of the community study area is impacted; • Impact is very short-term (e.g. less than six months); • Affects very few (e.g. less than 500) receptors; and • Social Baseline remains largely consistent.

9.1.4. An example of a high magnitude impact would be a demolition of a community facility that is used by lots of people.

9.1.5. Table 5 provides a guide as to the description of effects that typify each rating of receptor sensitivity. The assessment will provide justification for assigning a rating to an impact, recognising that the different range of potential impacts and the large range of community facilities/receptors.

Table 5 – Receptor sensitivity criteria.

Receptor sensitivity	Description of effect
High	• An already vulnerable receptor with very little capacity and means to absorb changes; • No alternative resources, access arrangements or opportunities are available within an easily accessible distance; and • A highly or frequently accessed resource or permanently occupied residential dwellings.
Medium	• A receptor with limited capacity and means to absorb changes; • A limited range of alternative resources, access arrangements or opportunities are available within and easily accessible distance; and • A moderately, or semi-frequently accessed resource.
Low	• A receptor with sufficient capacity and means to absorb changes; • A wide range of alternative resources, access arrangements or opportunities are available within an easily accessible distance; and • An infrequently accessed resource.

9.1.6. An example of a high sensitivity receptor would be permanent residents of a care home.

9.1.7. Based on the combination of ratings for impact magnitude and receptor sensitivity, the categorisation of effect will be applied according to Table 6.

Table 6 – Effect categorisation.

Receptor sensitivity	Impact magnitude: Negligible	Low	Medium	High
Low	Minor	Minor	Minor	Moderate
Medium	Minor	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

9.2. Assigning significance

9.2.1. Effects rated as Major are considered to be 'Significant'. Effects rated as Moderate are considered to be 'Significant' in the majority of cases, on a precautionary basis. However, there may be instances where a 'Moderate' rated effect aligns more closely with some of the determining criteria in the lower rated categories for magnitude and sensitivity, or where part of the effect will be mitigated. In these instances, justification as to why the effect is considered 'Not Significant' will be provided.

9.3. Cumulative effects

9.3.1. Where two or more significant community effects combine in the same location, affecting the same receptors, there may be intra-project cumulative effects. In the event that these occur, these will be highlighted. It is not anticipated that another layer of assessment will be applied.

9.3.2. In addition, where significant community effects from the Project may combine (location, timing) with likely significant effects occurring as a result of other schemes, these will be identified as inter-project cumulative effects.

10. Proposed scope

10.1.1. The potential impacts and effects of the Project on communities are set out in Section 7 of this document. These are the items that are considered to be scoped in and are described in Table 7.

Table 7 - Items to be scoped in

Item to be scoped in	Duration	Impact stage
Land requirement (including demolition or change or use away from) residential property resulting in loss of the housing stock available to local communities.	Permanent	Construction
Land requirement (including demolition) or change of use away from) community uses resulting in loss of community receptor or change in its ability to function.	Permanent	Construction
Land requirement, presence of new infrastructure, removal of existing infrastructure (e.g. level crossings) resulting in reduced or improved accessibility to access other residential property and/or community receptors.	Permanent	Construction
Disturbance to residential receptors resulting from a combination of significant effects on air quality, noise and vibration and visual impacts, leading to potential effects on the amenity of the residential receptor.	Permanent	Operation
Disturbance to community receptors resulting from a combination of significant effects on air quality, noise and vibration and visual impacts, leading to potential effects on the amenity of those using the community receptor.	Permanent	Operation
Change in connectivity resulting from the operation of new railway services.	Permanent	Operation
Land requirement (or change of use away from) residential property resulting in property being temporarily unavailable for habitation.	Temporary	Construction
Land requirement (or change of use) resulting in a change in the ability of the community receptor to function.	Temporary	Construction
Disturbance to residential communities resulting from a combination of significant effects on air quality, noise and vibration, visual and traffic impacts, leading to potential effects on the amenity of residents.	Temporary	Construction
Disturbance to community receptors resulting from a combination of significant effects on air quality, noise and vibration, visual and traffic impacts, leading to potential effects on the amenity of those using the community receptor.	Temporary	Construction

Item to be scoped in	Duration	Impact stage
Change in accessibility resulting from construction activities, affecting the ability of residents to access other residential property and/or community receptors	Temporary	Construction

10.1.2. Different sections of the route are likely to experience different impacts, as the type of work required across the different sections varies.

10.1.3. Given the nature of the potential significant effects relevant to communities, it is assumed that all of the potential significant effects are relevant to all of the route sections. Therefore, no sections of the route are scoped out.

10.1.4. Other items that are intended to be scoped out of the assessment are set out in Table 8.

Table 8 – Items proposed to be scoped out

Item proposed to be scoped out	Justification
Temporary land requirement affecting non-habitable residential property, e.g. gardens, garages, parking spaces	The assessment will consider the permanent requirement for land from individual residential property. The assessment will consider the temporary requirement for land affecting multiple (more than 5) properties at the same location. Where temporary requirement for land (garden, garage, outbuilding, parking space, driveway) only affects small numbers of residential property (i.e. 5 and below) and does not affect the ability of the property to be habitable, this is unlikely to result in a significant effect at a community level and is therefore recommended to be outside of the scope of the EIA. It is understood that these are important issues for the individual owner or occupier and appropriate mitigation will be provided where identified as required.
Changes in demand for public services Public services and infrastructure provision for construction workers and permanent workforce. Impacts on emergency services.	It is assumed that most additional jobs during construction and operational phases will be filled by people living within commuting distance of the Project. There is unlikely to be a significant increase in demand for accommodation and public services due to temporary workers or a permanent workforce. The construction and operation activities are not expected to result in an increase in demand for emergency services. The impacts of the Project on journey times of vehicles is considered within the traffic and transport Method Statement. Therefore, it is recommended that these aspects are not subject to assessment.
Accessibility as it relates to those with needs covered by the Equalities Act 2010	The assessment of effects on communities considers the general population group plus any specific population groups that use affected community facilities (e.g. younger people using a school). The assessment does not consider the needs of all routes (footpaths, roads, cycleways) between places, rather than the physical adjustments made in order to accommodate the Protected Characteristics Groups covered by the Equalities Act 2010. The effects of

Item proposed to be scoped out	Justification
	the Project on these groups are considered in the Equalities Impact Assessment (EqIA). The use of the term 'accessibility' in the EqIA assessment refers to the physical needs of population groups.
Creation of future demand for housing/and employment sites (including over-site development)	The assessment considers effects on existing residential properties and those identified as 'committed development'. The assessment does not consider the Project's role in enabling or bringing forward future development of residential properties or community facilities.
Safety and security	It is assumed that site security arrangements for the Project will be in line with the requirements set out relevant legislation and appropriate levels of security (personnel/CCTV) will be provided. Furthermore, appropriate levels of security (personnel/CCTV) will be implemented during the operational phase. Therefore, there are unlikely to be significant effects in relation to safety and security and these will not be considered further.

11. Assumptions

11.1. Assumptions

11.1.1. The community assessment will consider the impact of direct effects (land requirement) on individual properties. The receptor for this assessment is the local housing stock. For indirect impacts (such as changes in access or amenity), the assessment considers the effects on groups of residential properties (5 or more) that represent a community.

11.1.2. Impacts on businesses will be assessed in the socio-economics assessment. In some rural areas, some businesses such as café's, pubs, restaurants can provide an additional function as a service to the local community, and therefore will be included as community receptors where this dual function is identified.

11.1.3. Agricultural land holdings and farms are not considered to be community receptors. The exception is where farms provide a community function, for example, hosts educational visits from local schools.

11.1.4. Hotels are considered as commercial facilities, rather than community facilities. In some cases, hotels may provide services that are accessible to the public or to an external organisation (e.g. hosting swimming lessons). In these cases, the community function will be assessed.

11.1.5. The assessment of effects on community amenity is triggered where residual significant effects are identified by two or more related aspects. These related aspects are air quality, noise and vibration, visual effects and traffic and transport (specifically an increase in HGV movements).

11.1.6. The assessment of the Project on PRoW is covered in the traffic and transport Method Statement. Some PRoW form part of established 'promoted routes' – those walking, cycling or equestrian routes that serve as a recreational asset in their own right. The assessment of effects on communities focuses on the assessment of promoted routes, not PRoW.

11.1.7. The assessment of a change in connectivity will consider changes in travel time and number of services between selected communities and selected centres for education and employment.

11.2. Opportunities

11.2.1. Where any open space is lost due to the Project and replacement land has been identified as required, the replacement land should, where reasonably practicable, be to an equivalent or greater amount that which is lost.

11.2.2. Locations for re-provided open space should be chosen that are accessible to a range of people, including those with limited mobility.

11.2.3. Promoted route: Where a realignment of a public footpath, bridleway or road is part of promoted routes for recreational walking, for example National Trails or locally promoted loops, where reasonably practicable this will be designed holistically with the wider loop in mind, rather than as an individual PRoW.

EWR-MWJV Technical Partner

Routewide - Environmental - EIA Scoping Method Statement - Flood Risk

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) are proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which would introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring Environmental Impact Assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an Environmental Statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of Nationally Significant Infrastructure Projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made. The DCO application for the Project will therefore be determined in accordance with the NNNPS.

1.1.4. In order to plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this flood risk Method Statement, including more detailed descriptions of the proposals that make up the Project.

1.1.5. This flood risk Method Statement sets out the proposed scope of the assessment of impacts on Flood Risk and should be read in conjunction with the Method Statements prepared for other aspects.

[1] *National policy statement for national networks* (2014) *GOV.UK*. Available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks (Accessed: 15 April 2024).

1.1.6. The flood risk assessment will consider the potential effects as a result of the Project during both construction and operation activities in the context of characteristics of the Project. Flood Risk considers flooding from fluvial (main rivers and ordinary watercourses), surface water, groundwater, reservoirs and other artificial sources.

2. Abbreviations & descriptions

Table 1 - Abbreviations and descriptions.

Abbreviation	Definition
AEP	Annual exceedance probability
BGS	British Geological Survey
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
EWR Co	East West Rail Company
FRA	Flood risk assessment
IDB	Internal Drainage Board
LLFA	Lead local flood authority
SFRA	Strategic flood risk assessment

3. Relevant standards and guidance

3.1. Legislation

3.1.1. The following legislation will be used to inform the assessment of flood risk for the Project:

- Flood and Water Management Act 2010;
- Flood Risk Regulations 2009;
- The Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2018;
- Land Drainage Act 1991;
- Reservoirs Act 1975;
- Floods Directive (2007/60/EC);
- Water Resources Act 1991;
- Environment Act 1995;
- Water Act (2003); and
- Flood Risk (England and Wales) Regulations 2010.

3.2. Policy

3.2.1. The following policy is relevant to the assessment of flood risk for the Project:

- National Policy Statement for National Networks 2014[2];
- Draft National Policy Statement for National Networks 2023[3];
- National Planning Policy Framework (NPPF)[4];
- Vale of Aylesbury Local Plan 2013-2023[5];
- Bedford Borough Council Local Plan 2030[6];
- Cambridge City Council Local Plan 2018[7];
- Central Bedfordshire Council Local Plan 2015 to 2035[8];
- Cherwell District Council Local Plan 2011-2031[9];
- Huntingdonshire Local Plan to 2036[10];
- Milton Keynes Plan 2019[11];
- Oxford City Council Local Plan 2036[12]; and
- South Cambridgeshire Local Plan 2018[13].

[2] National Policy Statement for National Networks 2014
[3] Draft National Policy Statement for National Networks 2023
[4] National Planning Policy Framework (NPPF)
[5] Vale of Aylesbury Local Plan (VALP) 2013 - 2023 Adopted Plan
[6] Bedford Borough Council Local Plan 2030
[7] Cambridge Local Plan 2018
[8] Central Bedfordshire Local Plan 2015 - 2035
[9] Cherwell District Council Local Plan 2011-2031available here: Cherwell District Council Local Plan
[10] Huntingdonshire's Local Plan to 2036
[11] Milton Keynes Plan 2019 is available here: Milton Keynes City Council Plan
[12] Oxford City Council Local Plan 2036
[13] South Cambridgeshire Local Plan 2018 is available here: South Cambridgeshire Local Plan 2018

3.3. Guidance

3.3.1. The following guidance documents will be used to inform the assessment of flood risk for the Project:

- Planning Practice Guidance: Flood Risk and Coastal Change (HM Government, 2022)[14];
- Non-Statutory Technical Standards for Sustainable Drainage Systems (Department for Environment, Food and Rural Affairs (2016)[15];
- Design Manual for Road and Bridges (DMRB) LA113 Road Drainage and the Water Environment (Highways England, 2020)[16];
- Environment Agency River Modelling: Technical Standards and Assessment (Environment Agency and the Department for Environment, Food and Rural Affairs, 2023)[17];
- Level 1 and Level 2 Strategic Flood Risk Assessments and Local Flood Risk Management Strategies for the relevant authorities within the study area;
- Catchment Flood Management Plans relevant to the hydrological catchments crossed by East West Rail; and
- Flood Risk Management Strategies for the relevant authorities within the study area.

[14] Planning Practice Guidance: Flood risk and coastal change
[15] Non-Statutory Technical Standards for Sustainable Drainage Systems Guidance is available here: Non-statutory technical standards for sustainable drainage systems
[16] LA113 Road Drainage and the Water Environment
[17] River Modelling: Technical Standards and Assessment available here: Guidance: River modelling: technical standards and assessment

4. Establishing the baseline

4.1. Documentary records

4.1.1. Information regarding the baseline environment with regard to flood risk to inform the preparation of this Method Statement has been obtained from the following sources:

- Environment Agency Flood Map for Planning (Environment Agency, https://flood-map-for-planning.service.gov.uk);
- Environment Agency Long Term Flood Risk Mapping (Environment Agency, https://www.gov.uk/check-long-term-flood-risk)'; and
- Hydraulic models and reporting provided by the Environment Agency.

4.1.2. New data sources will be added as the assessment progresses, including relevant strategic flood risk assessment (SFRA), catchment flood management plan (CFMP), preliminary flood risk assessment (PFRA), flood risk management strategy (FRMS) and local flood risk management strategy (LFRMS) documents.

4.1.3. Contact has been made with the Environment Agency, lead local flood authorities (LLFAs), Bedfordshire & River Ivel Internal Drainage Board (IDB) and Buckingham & River Ouzel IDB to request additional information pertaining to historic flood events, flood defences, model data (beyond that currently provided), planned flood defence works and any watercourse specific information that the authorities advise should be considered in the assessment of flood risk within the study area. Information has not been received at the time of writing this Method Statement.

4.1.4. Contact will also be made with the relevant sewerage authorities serving the study area to request data pertaining to historic flooding events and planned improvement, mitigation or other works within the study area that would be of relevance to the Project.

4.1.5. Collection of groundwater data to assess baseline data will also be undertaken from various sources including British Geological Survey (BGS).

4.2. Surveys

4.2.1. No surveys have been undertaken to inform the baseline environment at the time of preparing this Method Statement.

4.2.2. Topographic, channel and structural survey data will be obtained to support the hydraulic modelling undertaken to inform the flood risk assessment (FRA) that will be summarised in the ES submitted to support the DCO application.

4.3. Modelling

4.3.1. No modelling has been undertaken to inform the baseline environment at the time of preparing this Method Statement. Modelling will be undertaken to inform the FRA as summarised in Section 9.2 and 9.3 of this document.

4.3.2. Previous modelling was undertaken in 2021 to inform earlier stages of the Project. These models were reviewed to better understand the scope of previous work, identify model complexity, and establish models that are suitable to support future design development of the Project. To date this review has included watercourses crossed by East West Rail between Bedford and Cambridge (i.e. for sections of new track). The models that have been provided and reviewed include:

- River Cam;
- River Rhee;
- Long Brook;
- Bourne Brook;
- Gallow Brook;
- Hen Brook;
- Top Farm;
- Rectory Brook;
- River Great Ouse;
- South Brook; and
- Ravensden Brook.

4.3.3. The Project closely follows the committed route for the A428 highway improvements within the A428 corridor. Several watercourses of relevance to the Project also form part of the modelling works being undertaken to inform the A428 highway improvements scheme. The hydraulic models of these watercourses have been requested but the A428 hydraulic modelling programme is not yet complete and therefore completed models have not been received at the time of preparing this Method Statement. However, high level detail of the models was provided and considered in the initial model review for the Project. The watercourses modelled to inform the A428 highway improvements scheme (and will also be used to inform the development of the Project) include:

- West Brook;
- Gallow Brook;
- Wintringham Brook and tributaries;
- Hen Brook;
- Top Farm;
- Rectory Brook;
- River Great Ouse;
- Rockham Ditch; and

- South Brook.

4.3.4. Model data has been requested from the Environment Agency for the following watercourses:

- River Cam updated urban model;
- Hobson's Brook tributary;
- River Rhee;
- Long Brook;
- Bourn Brook;
- Fen Drayton and tributaries;
- Nill Well;
- West Brook and tributaries;
- Gallow Brook;
- Fox Brook and tributaries;
- Wintringham Brook and tributaries;
- Hen Brook (also known as Abbotsley);
- Top Farm;
- River Great Ouse - upper-mid, mid and middle-lower Great Ouse Tributaries modelling package;
- Rockham Ditch;
- South Brook (also known as Wyboston);
- Ravensden Brook;
- Renhold Brook and tributaries;
- Rectory Brook;
- Ivel/Great Ouse confluence modelling; and
- Bin Brook.

4.3.5. The assessment of flood risk for the Project will consider all available model data to agree the most suitable baseline to inform future assessments.

4.3.6. Model data for sections of existing track (between Oxford and Bedford) has been requested and received from the Environment Agency. The need to review existing hydraulic model data (and develop updated models as required) will depend on the nature of the proposed works within these sections. As the design develops and FRA progresses there may be works in areas of flood risk that are deemed to require quantitative analysis; the need for hydraulic modelling of additional watercourses will be considered and agreed with the Environment Agency and LLFA as appropriate.

4.4. Study area

4.4.1. The study area for the assessment of flood risk is defined by the expected influence of the Project on flood risk to people, property and infrastructure elsewhere and, as such, has no defined extent. Based on professional judgement, it is considered appropriate to apply an initial study area of land

within the draft Order limits plus land within an approximately 1km buffer of the draft Order limits. This will be applied for the assessment of both temporary (construction) and permanent (operational) effects. Should impacts be predicted beyond 1km from the draft Order limits, the study area will be increased accordingly.

4.5. Consultation

4.5.1. Consultation will be ongoing to inform the assessment of Flood Risk as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. This section provides a brief summary of existing flood risk within the study area associated with all sources of flooding:

- Fluvial (main rivers and ordinary watercourses);
- Surface water;
- Groundwater;
- Sewers; and
- Reservoirs and other artificial sources.

5.1.2. No tidal flood risk is predicted.

5.1.3. This section also provides information on how the baseline condition will be further established during the course of the ES and supporting FRA to inform the assessment of flood risk and design of mitigation to support the Project.

5.1.4. Historic flood risk information, including that relating to any existing historic flood risk to the existing track, will be reviewed to inform the ES and supporting FRA.

5.2. Main rivers

5.2.1. The Project and associated study area crosses several main rivers[18] that are under the jurisdiction of the Environment Agency. These are summarised in Table 2, along with the route section in which the watercourse is located. Due to the spatial extent of the Project, eight route sections have been identified:

- Oxford to Bletchley;
- Fenny Stratford to Kempston;
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

5.2.2. The Project interacts with the mapped fluvial Flood Zones of the identified watercourses, where flood risk is defined as follows:

- Flood Zone 1 is described as land with less than a 1 in 1000 annual probability of flooding from fluvial sources;

[18] A Main River is a watercourse shown on the Main River Map, where the Environment Agency carries out maintenance, improvement or construction work on main rivers to manage flood risk.- Designation of 'main rivers': guidance to the Environment Agency - GOV.UK

- Flood Zone 2 is described as land having between a 1 in 100 and 1 in 1000 annual probability of flooding from fluvial sources; and
- Flood Zone 3 is described as land having a 1 in 100 or greater annual probability of flooding from fluvial sources.

Table 2 – Main rivers within the study area.

Main river	Location	Section of the route
Hinksey Stream	Crosses south of Oxford Station	Oxford to Bletchley
Eastwyke Ditch	Crosses south of Oxford Station	Oxford to Bletchley
River Thames	Crosses immediately south and north of Oxford Station	Oxford to Bletchley
Osney Stream	Crosses in close proximity to Oxford Station	Oxford to Bletchley
River Cherwell	Crosses west of Islip	Oxford to Bletchley
Gallos Brook	Crosses east of Islip	Oxford to Bletchley
Tributary of River Ray	Crosses east of Islip	Oxford to Bletchley
New House Farm Stream (name unconfirmed)	Crosses east of Islip	Oxford to Bletchley
Tributary of Gagle Brook	Crosses east of M40	Oxford to Bletchley
Gagle Brook	Crosses east and west of Bicester Station	Oxford to Bletchley
Beaconhill Ditch	North of Marsh Gibbon	Oxford to Bletchley
Little Marsh Ditch	North of Marsh Gibbon	Oxford to Bletchley
Sminnell Farm Ditch (West)	Northwest of Marsh Gibbon	Oxford to Bletchley
Sminnell Farm Ditch (East)	Northwest of Marsh Gibbon	Oxford to Bletchley
Town Brook	Crosses in proximity to Bicester Station	Oxford to Bletchley
Langford Brook	Crosses in proximity to Bicester Station	Oxford to Bletchley
River Ouzel	Crosses east of Fenny Stratford Station	Fenny Stratford to Kempston

Main river	Location	Section of the route
River Great Ouse	Crosses in proximity to Bedford Station, and north of Tempsford	Bedford, Clapham Green to Colesden
Hen Brook	Crosses study area south-east of St Neots	Roxton to east of St Neots
Fox Brook	Crosses study area east of St Neots	Roxton to east of St Neots
Bourn Brook	Crosses east of Cambridge	Comberton to Shelford
River Rhee	Crosses south of Cambridge	Comberton to Shelford
River Cam	Crosses south of Cambridge and within centre of Cambridge	Cambridge

5.3. Ordinary watercourses

5.3.1. The Project crosses a large number of other ordinary watercourses[19] that are under the jurisdiction of the LLFA or IDB. Many of these have an associated Flood Zone 2 or 3 (definition as described earlier). Where the catchment of these features is too small to have generated an associated Flood Zone (typically less than 5km^2) the Environment Agency's Risk of Flooding from Surface Water maps will be used to provide an indication of likely fluvial flood risk.

5.3.2. Data request has been made to the relevant LLFAs and IDBs regarding supplementary information that can be used to inform the baseline assessment of flood risk within the study area, including but not limited to the availability of hydraulic modelling data, historic flood risk information and benefit provided by flood defence infrastructure.

5.3.3. A summary of key ordinary watercourses within the study area is provided in Table 3.

Table 3 – Significant ordinary watercourses within the study area.

Ordinary watercourse	Location	Section of the route
Claydon Brook	Crosses west of Winslow	Oxford to Bletchley

[19] An ordinary watercourse is generally a smaller watercourse where flood risk management work is carried out by the lead local flood authority, district council, or internal drainage board. Designation of 'main rivers': guidance to the Environment Agency - GOV.UK

Ordinary watercourse	Location	Section of the route
Tributary of Claydon Brook	Crosses east of Winslow	Oxford to Bletchley
Broughton Brook	Crosses study area between Aspley Guise Station and Ridgmont Station	Fenny Stratford to Kempston
Caldecotte Brook	Crosses study area between Bow Brickhill and Woburn Sands Stations	Fenny Stratford to Kempston
Elstow Brook	Crossed south of Bedford	Bedford
Renhold Brook	Crosses north of Bedford	Clapham Green to Colesden
Ravensden Brook	Crosses between Bedford and St Neots.	Clapham Green to Colesden
Top Farm Stream	Crosses south-west of St Neots	Clapham Green to Colesden
South Brook	Crosses between Bedford and St Neots.	Clapham Green to Colesden
Rockham Ditch	Crosses south-west of St Neots	Clapham Green to Colesden
Stone Brook	Crosses study area near Tempsford	Roxton to east of St Neots
Wintringham Brook and tributaries	Crosses south-east of St Neots	Roxton to east of St Neots
Gallow Brook	Crosses study area east of St Neots	Roxton to east of St Neots
Long Brook	Crosses east of Cambridge	Comberton to Shelford
Hoffer Brook	Crosses study area south-west of Harston	Cambridge
Hobson's Brook	Crosses north of Great Shelford	Cambridge
Coldham's Brook	Crosses in central Cambridge	Cambridge

5.4. Surface water

5.4.1. There are numerous surface water flow paths crossing the study area of varying size and form. These flow paths do not strictly correspond to particular water features but are generally formed by natural topography and are only active during heavy rainfall events. As most watercourses also follow natural

topography the most significant mapped surface water flood risks are also indicated to be associated with watercourses.

5.5. Groundwater flood risk

5.5.1. The study area crosses numerous designated aquifers which pose a potential risk to groundwater flooding. To the west of Cambourne, these are predominantly superficial, with bedrock generally comprising unproductive clay formations, however between Cambourne and Cambridge these also include Principal chalk and sandstone aquifers. Groundwater flooding is generally most prevalent in chalk aquifers, in which groundwater levels can be highly variable, and in shallow superficial aquifers, so the risk can be expected to be higher in areas underlain by these geologies. Superficial aquifer coverage is sparse in some small areas of the study area, particularly in stretches from Bletchley to Bedford and Bicester to Winslow, however they can generally be considered extensive.

5.5.2. A preliminary review of the BGS susceptibility to groundwater flooding mapping suggests that there is a >75% risk of groundwater flooding along a significant stretch of the study area between St Neots and Cambourne, along with smaller areas distributed in other parts. This review is incomplete, relying on readily accessible information from local authority SFRAs which do not all include relevant maps. A more detailed review of this dataset along the entire study area will be conducted as part of the EIA and presented in the ES.'.

5.6. Sewer flood risk

5.6.1. The study area crosses multiple urban environments with two identified where sewer flood risk is likely to be at its greatest, namely Bedford and Cambridge. Whilst the risk of sewer flooding to the Project is deemed low, a more detailed assessment of the SFRAs, and engagement with the sewer undertakers will be undertaken with a review of all key sewer mains crossings along the route of the Project.

5.7. Reservoirs and other artificial sources

5.7.1. The Oxford Canal is located in close proximity to Oxford Station and the Grand Union Canal is located east of Fenny Stratford Station. Although there is no mapped flood risk impact zone associated with the canals, properties, and essential infrastructure (including the Project) adjacent to the canal could be impacted by flooding from the canal should a breach or overtopping occur.

5.7.2. Stewartby Lake is located north-east of Millbrook Station and properties and essential infrastructure (including the Project) are within the areas of Fenny

Stratford, Bedford Road, Stewartby and Bedford that are identified to be at reservoir flood risk. Review of the Environment Agency's Flood Risk from Reservoir mapping also indicates that properties and essential infrastructure (including the Project) are within the extensive areas of Oxford that are identified to be at reservoir flood risk, as are properties and essential infrastructure (including the Project) within reservoir flood extents in Bedford, near the River Great Ouse and in Little Shelford.

5.7.3. A significant number of ponds are present within the study area of the Project. It is not clear based on available desk study data whether the ponds are natural or artificial in nature.

5.7.4. Information regarding flood risk associated with public sewerage systems and highway drainage systems has not yet been requested from the relevant authorities. This will be requested and reviewed to inform the ES and supporting FRA.

5.8. Future baseline

5.8.1. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the Project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.8.2. Climate change is expected to change baseline flood risk over the design life of the Project, with periods of rainfall likely to become more prolonged and intense and peak river flows predicted to increase. Sections of the Project that are already located in areas of fluvial flood risk are likely to be at risk of more frequent or intense flooding. The impacts of climate change on baseline fluvial flood risk will be assessed as part of the ES and supporting FRA as per the approach presented earlier for the assessment of fluvial flood risk for main rivers and ordinary watercourses.

5.8.3. For the construction of new track and supporting infrastructure, the recommended increase in peak river flow will be applied for each management catchment crossed by the Project. It is proposed to consider the Upper End

allowances for the 2080 epoch to assess potential future fluvial impacts to the Project.

5.8.4. Climate change could also increase the risk of flooding from surface water flooding, groundwater flooding and drainage systems. This will be assessed in greater detail as part of the ES and supporting FRA. The approach to these assessments will be agreed with the relevant LLFAs but at this stage it is expected that consideration of climate change from existing sources of flood risk will comprise a qualitative assessment.

5.8.5. A minimum design life of 120 years will be applied for the assessment of climate change.

5.8.6. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

6. Sources of impact

6.1. Overview

6.1.1. The following sources of flood risk will be considered in the ES and supporting FRA:

- Fluvial (main rivers and ordinary watercourses);
- Surface water overland flows;
- Groundwater;
- Reservoirs and other artificial sources including sewerage systems; and
- Site-generated surface water runoff.

7. Potential impacts and effects

7.1. Potential permanent and operational effects

7.1.1. The Project has the potential to impact flood risk in the following ways:

- Construction of new infrastructure in areas of fluvial or overland flow surface water flood risk (taking climate change into account) that may pose flood risk to the Project or increase flood risk elsewhere as a result of impeding/changing flood flow conveyance or displacing floodplain storage;
- Diversion of watercourses to enable construction of new infrastructure or construction of new or extended watercourse crossings (including culverts) that may reduce channel capacity, impede, or increase flood flow conveyance, interact with existing flood defence infrastructure, increase risk of blockage or require watercourse realignment;
- Increasing groundwater flood risk to the Project and adjacent land, typically through introducing a barrier to groundwater flow that causes groundwater levels to rise at the upstream face, or introducing cuttings that extend below the groundwater table and that may act as a drain for groundwater flow. Interception drainage that diverts groundwater flow to adjacent land/watercourses can also pose increased flood risk to the Project and elsewhere associated with increased fluvial or overland flow surface water flood risk;
- Increase in impermeable surfaces that could subsequently increase the rate and volume of surface water runoff, thereby increasing flood risk to the Project or elsewhere, either as direct surface water runoff or by increasing fluvial flow in receiving watercourses; and
- Constructing a barrier to natural catchment overland flow, subsequently changing hydrology in receiving watercourses or causing overland flow to ‘back up’ behind new infrastructure.

7.1.2. Permanent and operational effects are likely to be associated with works such as:

- New track;
- Change in rail route;
- New stations (including relocated stations);
- New highways;
- Re-aligned highways;
- New highway overbridges/underpasses;
- Drainage works;
- River diversion, realignment or improvement works; and
- Flood management works (e.g. flood compensation provision).

7.1.3. The elements of the Project most relevant to flood risk will be the construction and operation of the new railway because these works would be most likely to directly interact with watercourses, overland flow routes and groundwater flow,

therefore posing greatest change to flood risk. Similar impacts would also be anticipated where modification of existing assets (for example, culverts or cuttings) are required to facilitate changes to existing infrastructure, although the extent of these types of works are limited.

7.1.4. The creation of new infrastructure to support the Project, including new highways and stations, could also impact flood risk in much the same way as set out in the preceding paragraph.

7.1.5. A summary of each key section of the Project is presented below.

7.1.6. Changing climate conditions into the future, together with the impacts of the project on flood risk may exacerbate (or occasionally ameliorate) the significance of the Project effects. For example:

7.1.7. Increased intensity rainfall events and greater fluvial flows resulting in greater and more frequent flooding events.. These climatic changes, combined with the effects of the project upon reduced existing flood risk may cause potentially significant effects.

7.1.8. The influence of climate change in exacerbating or ameliorating the significance of Project effects will be incorporated within the evaluation stage.

Oxford to Bletchley

7.1.9. The works in the Oxford to Bletchley section are at a number of discrete locations to improve existing track infrastructure, including potential passing loops and platform extensions, as well as external works to the stations and removal of a level crossings. Works within areas of flood risk (from all sources) will require assessment and appropriate mitigation will be developed.

Fenny Stratford to Kempston

7.1.10. The works in the Fenny Stratford to Kempston section are at a number of discrete locations to improve existing track infrastructure. Works within areas of flood risk (from all sources) will require assessment and appropriate mitigation will be developed.

Bedford

7.1.11. The works in the Bedford section are also at a number of discrete locations and include improvements to existing track infrastructure, the construction of new stations, improvement or removal of existing stations and removal of level crossings. For the most part the works are likely to be outside the fluvial flood extent although some works may interact with the mapped Flood Zone 2 and 3.

Works within areas of flood risk (from all sources) will require assessment and appropriate mitigation developed.

Clapham Green to Colesden; Roxton to east of St Neots; and Croxton to Toft; Comberton to Shelford

7.1.12. Between Bedford and Harston, the new tracks will likely be the main interaction between the route and sources of flood risk. This section will require multiple crossings of watercourses, floodplains and overland flow routes with potentially significant effects on flood risk receptors as a consequence. Significant excavation and cutting is also proposed for this section.

7.1.13. The route re-joins the existing track at Harston. Works within this section are at a number of discrete locations to improve existing track infrastructure, including existing stations. Works within areas of flood risk (from all sources) will require assessment and appropriate mitigation will be developed.

Cambridge

7.1.14. Works within this section are at a number of discrete locations to improve existing track infrastructure, including existing stations. Works within areas of flood risk (from all sources) will require assessment and appropriate mitigation will be developed.

7.2. Potential temporary effects

7.2.1. Temporary effects will be those that last only for the duration of the construction phase or less than five years afterwards. Permanent effects will be those that last more than five years after construction ends.

7.2.2. The Project has the potential to impact flood risk in the following ways:

- Temporary works in areas of fluvial or overland flow surface water flood risk that may increase flood risk elsewhere as a result of impeding/changing flood flow conveyance or displacing floodplain storage;
- Temporary works within watercourse channels or temporary diversion of watercourses to enable construction of new infrastructure or construction of new or extended watercourse crossings (including culverts) that may reduce channel capacity, impede or increase flood flow conveyance, interact with existing flood defence infrastructure, increase risk of blockage or require watercourse realignment;
- Temporary increase in groundwater flood risk through works such as introducing a temporary barrier to groundwater flow or excavations that extend below the groundwater table;
- Introduction of temporary impermeable surfaces that could subsequently increase the rate and volume of surface water runoff, thereby increasing

flood risk elsewhere either as direct surface water runoff or by increasing fluvial flow in receiving watercourses; and

- Temporary increase in flood risk associated with construction phasing, such as introduction of a barrier to overland flow prior to the construction of cut off drains, or construction of new impermeable surfaces prior to construction of associated drainage and attenuation features.

7.2.3. Temporary construction effects are likely to be associated with works such as:

- Phased construction of the Project;
- Temporary construction compounds; and
- Haul routes (within site).

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project will therefore have various mitigations measures embedded; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part.

8.1.3. The draft Order limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. It is assumed that mitigation measures are designed which take climate change into account, for example through the mitigation design and timing. Any effects on mitigation will be identified and recorded within the ES.

8.1.5. It is possible that future climate conditions may impede the effectiveness of assumed mitigation. For example, increased risk of extreme events such as heavy rainfall may exceed the capacity of SuDS or increase the risk of channel erosion, and any resultant changes in groundwater levels may impact groundwater ingress rates and could therefore exceed the capacity of recharge schemes for cuttings.

8.1.6. It is proposed that mitigation measures are designed which take climate change into account, for example through the design of the Project and required mitigation design and timing. Any effects on the design of the Project and mitigation will be identified and recorded within the ES.

8.2. Design principles

8.2.1. The overall objective for flood risk is that the Project shall be designed such that flood risks are assessed and where necessary mitigated so that over the lifetime of the assets they are resilient to flooding, remaining operational in all events and from all sources, up to and including the design event, without increasing flood risk elsewhere.

8.2.2. The overarching approach to flood risk management is to apply the hierarchy to first avoid then reduce and then mitigate, for example:

- Step 1: avoid areas of flood risk insofar as reasonably practicable;
- Step 2: reduce and manage flood risk impacts insofar as reasonably practicable through design of the Project elements such as the use of a viaduct instead of embankment; and
- Step 3: mitigate the residual flood risk impacts such as providing flood compensation.

8.2.3. Mitigation for all permanent and operational effects will be embedded into the developing design of the Project and reported within the ES and FRA submitted to support the DCO application. Measures will be developed in consultation with the relevant authorities, namely the Environment Agency, LLFAs and IDBs as appropriate

8.2.4. The measures that could be included into the design to avoid, reduce or mitigate the potential flood risk impacts that otherwise may occur include, but are not limited to:

- Reducing interaction with areas of Flood Zone 2 and Flood Zone 3 as far as practicable;
- Where the location of new infrastructure in the Flood Zone is unavoidable, the provision of compensatory flood storage shall be considered to mitigate for the loss of floodplain storage during the 1% annual exceedance probability (AEP) event plus allowance for climate change. Replacement floodplain storage will be provided as either direct or indirect replacement to mitigate the loss of existing floodplain as a result of the Project, with EWR Co's preference given to direct replacement where practicable;
- New track infrastructure shall include a freeboard of 1.0m above the design flood event;
- Any works that affect a watercourse shall aim to retain, but preferably enhance, the watercourse with regards to its flow profile, existing character, and ecological value;
- New watercourse crossings or realigned channels shall have adequate capacity for the design flows of a 1% AEP event with an allowance for climate change;

- Railway viaduct and bridge structures shall have a freeboard allowance of 0.6m to the structure's soffit level above the 1% AEP event peak flood level with an allowance for climate change;
- All culverts shall be designed to include a minimum of 300mm freeboard above the 1% AEP event peak flood level with an allowance for climate change;
- Where possible, watercourse crossings shall be designed to be perpendicular to associated track and road crossings, in order to reduce crossing lengths;
- Watercourse crossing designs shall include an internal mammal ledge to allow for dry passage through the culvert (e.g. by badger or otter). Mammal ledges shall be located at least 150mm above the 10% AEP design flood level. Where mammal ledges are unable to be provided, an alternative safe dry passage for mammals shall be provided; and
- Sustainable drainage solutions would be embedded within the design and follow key principles outlined in CIRIA SuDS Manual C753.

8.2.5. The design standard for the Project will be the 1% AEP event with an allowance for climate change. The recommended increase in peak river flow will be applied for each management catchment crossed by the Project. It is proposed to consider the Upper End allowance for the 2080 epoch to assess and manage impacts to the Project. It is also proposed to apply the Central allowance to assess impacts to people, property, and infrastructure elsewhere; or the Higher Central allowance to assess impacts to essential infrastructure elsewhere; also considering likely future land uses shown by local plan allocations.

8.2.6. The mitigation presented above applies to new sections of track and new infrastructure (including new or realigned highways). It is not expected that the same standards will apply to sections of existing track or associated infrastructure that are not expected to require significant improvement. However, any significant alterations to existing rail, station, or highway assets (i.e. relocation, replacement and improvement) shall apply the same mitigations principles as provided above as far as practicable and utilise the same recommended climate change allowances for their design.

8.3. Code of Construction Practice

8.3.1. Construction work can be one of the chief causes of environmental impact. A draft Code of Construction Practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to abide by in undertaking their work.

8.3.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and

historic environment assets. The assessment of flood risk impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a scheme of this nature.

8.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts flood risk may include the following generic categories:

- Site specific measures;
- Construction site layout and good 'housekeeping';
- Construction traffic routes;
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Emergency preparedness and access;
- On-site and off-site protection;
- Site drainage, watercourse and groundwater protection;
- Extreme weather events; and
- Protection and reinstatement of land and soils.

8.3.4. Examples of measures that are relevant for the flood risk assessment and therefore expected to be included in the CoCP include:

- Construction works and storage of materials to be outside of floodplain where practicable;
- Avoidance or reduction of in-channel working and excavations;
- Provision of flood risk mitigation measures prior to works;
- Provision of risk assessments covering excavations and dewatering; and
- Provision of a construction phase drainage strategy to manage surface water runoff without increasing flood risk elsewhere.

8.3.5. The mitigation required to manage temporary construction effects will be agreed with the relevant authorities and take the duration of the risk into account. It is not considered appropriate to apply the same design standards to the mitigation of temporary construction effects as would be applied to the mitigation of permanent effects. Instead it is considered reasonable that a proportionate approach is adopted that considers the duration of the risk and the vulnerability of the receptors that may be affected. It is proposed that the 3.3% AEP event (without climate change) is applied for the assessment of flood risk during construction and inform the need for further assessment and mitigation, although the Project will strive to locate temporary works outside of the 1% AEP floodplain as far as practicable.

8.3.6. A register of environmental actions and commitments (REAC) will also be developed alongside the ES and the CoCP.

9. Evaluating significance

9.1. Overview

9.1.1. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the Flood Risk chapter of the ES.

9.1.2. The assessment of the effects during the construction and operation phases of the Project will be undertaken following the principles set out within the Design Manual for Roads and Bridges (DMRB) LA 113 – Road Drainage and the Water Environment. Although not directly applicable to all aspects of the Project, the DMRB guidance provides a good basis for assessing effects of developments on the water environment, including flood risk. The DMRB LA 113 promotes the following approach:

- Estimation of the sensitivity of the receptor. The importance of the feature or resource is based on the value and sensitivity of the feature or resource as shown in Table 4;
- Estimation of the magnitude of the impact. The magnitude of an impact is estimated based on the potential size or scale of change compared to the baseline and is independent to the sensitivity of the receptor as shown in Table 5; and
- Assessment of the significance of the effect. The overall significance of the effect is determined by combining the importance of the receptor (Table 4) and the magnitude of the impact (Table 5). The significance of effect matrix is shown in Table 6.

Table 4 – Criteria for estimation of the importance of flood risk receptors.

Receptor importance	Criteria	Examples
Very high	Nationally significant receptor of high sensitivity	Essential infrastructure or highly vulnerable development (as defined by the NPPF to include essential transport infrastructure which has to cross the area at risk).
High	Locally significant receptor of high sensitivity	More vulnerable development (as defined by the NPPF).
Medium	Of moderate quality and rarity	Less vulnerable development (as defined by the NPPF).
Low	Lower quality	Water compatible development (as defined by the NPPF).

Table 5 – Criteria for estimation of the magnitude of impact of flood risk receptors.

Magnitude of impact	Examples
Major adverse	Increase in peak flood level (1% (1 in 100) AEP) >100mm (beyond model tolerance).
Moderate adverse	Increase in peak flood level (1% (1 in 100) AEP) of greater than 50mm but under 100mm (beyond model tolerance).
Minor adverse	Increase in peak flood level (1% (1 in 100) AEP) greater than 10mm but under 50mm (beyond model tolerance).
Negligible	Negligible change in peak flood level (1% (1 in 100) AEP) <+/- 10mm (beyond model tolerance).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction (beyond model tolerance).
Minor beneficial	Creation of flood storage and decrease in peak flood level (1% (1 in 100) AEP) greater than 10mm but under 50mm (beyond model tolerance).
Moderate beneficial	Creation of flood storage and decrease in peak flood level (1% (1 in 100) AEP) greater than 50mm but under 100mm (beyond model tolerance).
Major beneficial	Creation of flood storage and decrease in peak flood level (1% (1 in 100) AEP) >100mm (beyond model tolerance).

9.1.3. The significance of potential impacts is classified by considering both the importance of the receptor (Table 4) and the magnitude of impact (Table 5), using the matrix shown in Table 6, adapted from Table 3.8.1 of DMRB LA104. Where the significance of the effect is described as between two levels, professional judgement is used to identify a level of significance. Only effects that are Moderate or greater than Moderate are considered to be significant.

Table 6 – Effect significance.

		Magnitude of impact				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Receptor importance	**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	Neutral or Slight	Slight	Slight or Moderate

9.2. Approach to the assessment of flood risk: potential permanent and operational effects

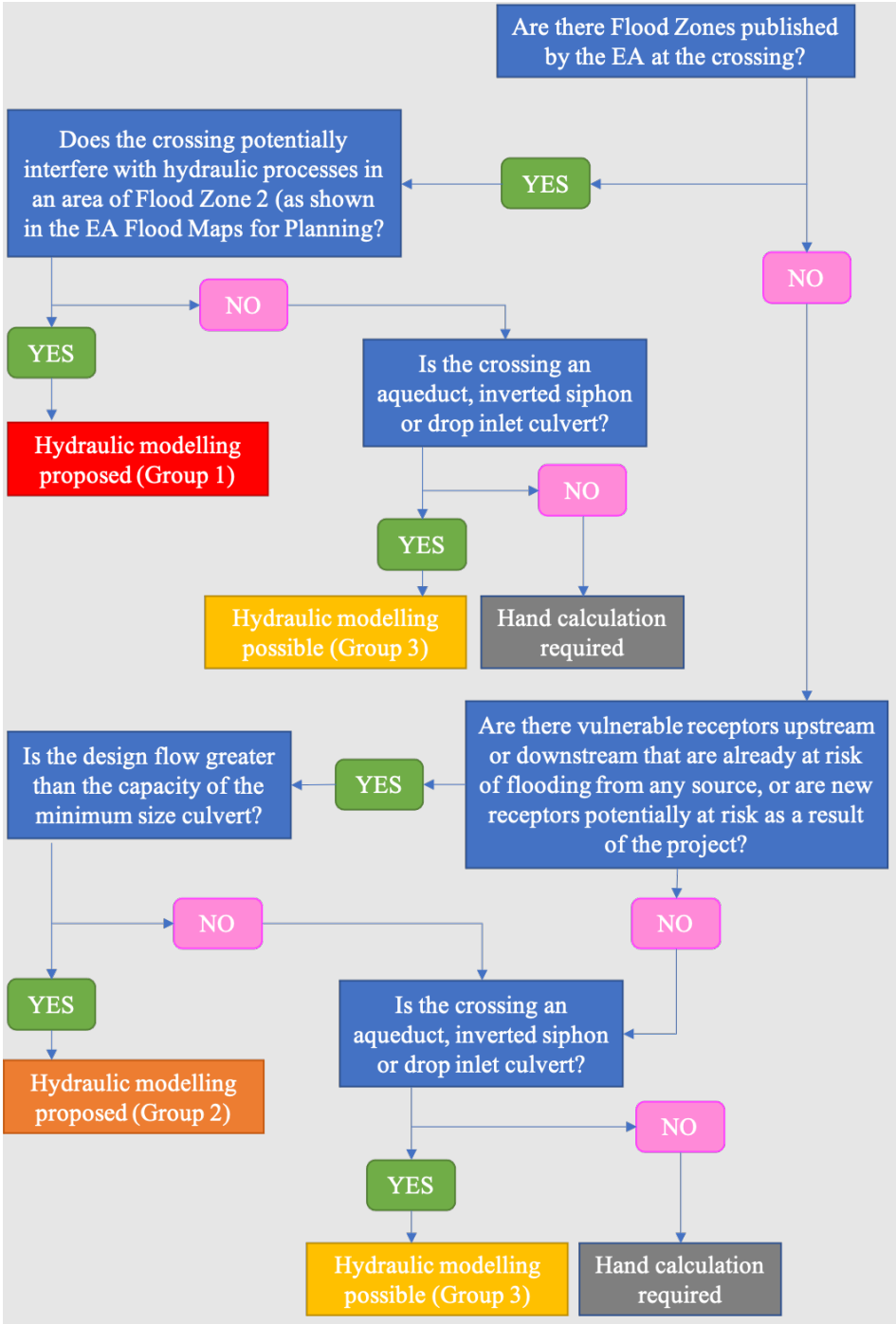
Fluvial flood risk

9.2.1. For the construction of new track and supporting infrastructure, it is proposed to undertake hydraulic modelling of significant watercourses crossed by the Project that have an associated fluvial floodplain or that may pose flood risk to identified receptors. The following decision tree will be used to determine the proposed modelling methodology to assess flood risk impacts:

- Group 1: these sites correspond to crossings where there is known fluvial flooding (Flood Zone 2) and the Project has potential to increase associated flood levels. Hydraulic modelling is proposed even if there are no receptors currently at risk, as the hydraulic model can inform the decision to replace a viaduct with a bridge or culvert for cost saving purposes;
- Group 2: these sites correspond to crossings where the capacity of the minimum structure size is inadequate to convey the peak 1% annual probability flow, including an allowance for climate change, where there are receptors with potential to be affected;
- Group 3: these sites are where the proposed hydraulic infrastructure is more complex (e.g. inverted siphons) and checks may be required to assess whether the design flows can be conveyed through the Project without causing flooding problems; and
- Group 4: these sites correspond to straightforward crossings, with no existing flood risk issues, where only hand calculations are required.

9.2.2. The approach above can be illustrated by the flow diagram in Figure 1.

Figure 1 – Approach to the assessment of flood risk flow diagram.



9.2.3. The method for undertaking hydraulic modelling will follow the Environment Agency's River Modelling: Technical Standards and Assessment guidance and be agreed in consultation with the Environment Agency and, where appropriate, LLFA during the FRA.

9.2.4. The scope of the hydraulic modelling will be to assess potential impacts to the Project, as well as potential impacts to people, property, and infrastructure elsewhere as a result of the Project as well as opportunities for wider benefits. The assessment will consider the present day scenario and future flood risk over the lifetime of the Project that takes the potential impacts of climate change into account.

9.2.5. At this stage it is not proposed to model watercourses that are crossed by the Project along sections of existing track. The need to undertake modelling for these sections will depend on the nature of any proposed works and, at the time of preparing this Method Statement, there are no known works that are considered to require hydraulic modelling. As the design develops and FRA progresses there may be works in areas of flood risk that are deemed to require quantitative analysis; the need for hydraulic modelling of additional watercourses will be considered and agreed with the Environment Agency and LLFA as appropriate.

Surface water flood risk

9.2.6. The assessment of surface water flood risk will comprise a qualitative assessment informed by review of the Environment Agency's Risk of Flooding from Surface Water maps. The need for subsequent quantitative analysis will be identified during the course of the FRA and will depend on the identified magnitude of the risk to the Project, the potential impact of the Project on flood risk elsewhere, and the design of mitigation required to manage the risk (for example, if analysis if required to inform the necessary drainage provision to manage an identified risk).

9.2.7. The FRA will be informed by the proposed drainage strategy for the Project. This will summarise how surface water runoff will be managed to mitigate flood risk to the Project and elsewhere as well as risk to the quality of the water environment. The impacts of climate change associated with the Project generated surface water runoff and the Project drainage network will be embedded within the design of the proposed drainage system, with core design principles reported within the ES and supporting FRA. Predicted increases in peak rainfall intensity will be applied for each management catchment crossed by the route.

9.2.8. The proposed drainage strategy for the Project will also consider risks associated with changes to catchment hydrology and overland 'sheet flow',

recognising that the introduction of the Project across a natural hydrological catchment could lead to significant ponding on the upstream face of an embankment, or could pose risk to at-grade infrastructure or infrastructure in cutting. The impacts of the drainage strategy on existing catchment hydrology will be assessment in the FRA.

Groundwater flood risk

9.2.9. The assessment of groundwater flood risk will also comprise a qualitative assessment informed by available data. Subsequent qualitative analysis will depend on the magnitude of risks identified and where it is not possible to rule out significant effects both to the Project or to groundwater flood risk elsewhere.

9.2.10. The assessment of groundwater flood risk will be informed by reviewing the BGS susceptibility to groundwater flooding dataset and by reviewing historical records of groundwater flooding as laid out in the SFRAs of relevant local authorities. The BGS mapping will provide a groundwater flooding probability on a 1km square grid to identify general areas most at risk of groundwater flooding, while the historical information will provide any specific locations along the route in which flood risk has been realised. Additionally, groundwater level and groundwater flow direction information will be obtained from Environment Agency, BGS and local water companies where applicable to provide supporting data.

9.2.11. The proposed design and drainage strategy for the Project will also be reviewed to identify elements which may act as a barrier to groundwater flow or where drainage discharges may increase groundwater flooding risk.

Sewer flood risk

9.2.12. The assessment of flood risk from sewers will also comprise a qualitative assessment informed by available data. Subsequent qualitative analysis will depend on the magnitude of risks identified and where it is not possible to rule out significant effects both to the Project or to sewerage flood risk elsewhere.

Reservoirs and other artificial sources

9.2.13. The assessment of risks associated with reservoirs, canals and other artificial water bodies will be informed by review of the Environment Agency's Risk of Flooding from Reservoirs map and information provided within the relevant SFRAs. No qualitative of these risks is proposed unless the Project requires physical works to existing water retaining structures that may pose flood risk.

9.3. Approach to the assessment of flood risk: potential temporary construction effects

9.3.1. For significant temporary works such as access tracks, construction compounds or working platforms located within the present 3.3% AEP flood event, it is proposed to undertake hydraulic modelling to assess the risk to the works or to people, property and infrastructure elsewhere.

9.3.2. The assessment of potential temporary construction effects for works located outside of the 3.3% AEP event and all other sources of flood risk, is proposed to undertake a qualitative assessment.

9.3.3. The need and approach for quantitative analysis will be identified during the course of the FRA and will depend on the location and duration of the works, the potential impact of the works on flood risk elsewhere, the vulnerability of receptors that may be affected, and the uncertainty of the effectiveness of proposed mitigation to manage the identified risk. Consideration will also be given to a range of flood magnitudes and durations, for example the potential for smaller magnitude events that could pose long term impact to construction works located in close proximity to watercourses.

9.3.4. It is not proposed to take climate change into account during the assessment of temporary construction effects.

10. Proposed scope

10.1.1. At this stage of the assessment, all potential impacts listed in Section 0 for permanent and temporary impacts will be considered for all sections of the Project, including new sections of track and new infrastructure, as well as improvement works to existing sections of track and existing infrastructure. Whilst the nature of works in sections of existing track are more unlikely to give rise to certain impacts (for example it is unlikely that significant earthworks would be required along existing track that may pose increased groundwater risk) the detail of the works is currently unknown and therefore (at this stage) consideration will still be given to the possibility of risk from all sources of flooding.

10.1.2. Where there are no proposed works to existing infrastructure (i.e. track, stations and highways) it will be assumed there are no potential impacts and therefore these sections will be scoped out of future assessment.

Table 7 – Summary of scope for assessment of temporary effects.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Temporary works in areas of fluvial or overland flow surface water flood risk	✓	✓	✓	✓	✓	✓	✓	✓
Temporary works within watercourse channels or temporary diversion of watercourses	✓	✓	✓	✓	✓	✓	✓	✓
Temporary increase in groundwater flood risk	✓	✓	✓	✓	✓	✓	✓	✓
Introduction of temporary impermeable surfaces	✓	✓	✓	✓	✓	✓	✓	✓
Temporary increase in flood risk associated with construction phasing	✓	✓	✓	✓	✓	✓	✓	✓

Table 8 – Summary of scope for assessment of permanent and operational effects.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Construction of new infrastructure in areas of fluvial or overland flow surface water flood risk	✓	✓	✓	✓	✓	✓	✓	✓
Diversion of watercourses to enable construction of new infrastructure or construction of new or extended watercourse crossings	✓	✓	✓	✓	✓	✓	✓	✓
Increasing groundwater flood risk to the Project and adjacent land	✓	✓	✓	✓	✓	✓	✓	✓
Increase in impermeable surfaces that could subsequently increase the rate and volume of surface water runoff	✓	✓	✓	✓	✓	✓	✓	✓
Constructing a barrier to natural catchment overland flow	✓	✓	✓	✓	✓	✓	✓	✓

11. Assumptions and risks

11.1. Overview

11.1.1. The EIA will set out any limitations encountered, or assumptions made as part of the assessment process. At this stage the following limitations and assumptions have been identified for the purposes of the proposed scope and methodology for the flood risk assessment:

- Hydraulic modelling will be used to inform the assessment of flood risk associated with the most significant watercourses crossed by new sections of track between Bedford and Cambridge. At this stage it is assumed that the assessment of risk associated with other watercourses crossed by the Project will comprise qualitative assessment, with mitigation informed by quantitative analysis to inform detailed design as required following DCO award. If it is identified during the assessment that other watercourses crossed by the Project may result in likely significant impacts and greater certainty about mitigation options is required, hydraulic modelling or other detailed assessment could be required;
- The Environment Agency's Risk of Flooding from Surface Water mapping will be used for the assessment of flood risk from surface water; unless it is identified during the assessment as being unsuitable in an area with likely significant impacts. Where this is the case, hydraulic modelling or other detailed assessment could be required;
- Up to date data regarding groundwater flooding susceptibility were not reviewed at this stage. These would be obtained and considered for the ES; and
- The Environment Agency's new national scale fluvial, surface water and combined sources on flood risk, may identify new areas that have been discounted, or prompt hydraulic modelling where it had previously been scoped out. This information is expected to be available at the end of 2024 following completion of the NaFRA2 project.

EWR-MWJV Technical Partner

Routewide – Environmental – EIA Scoping Method Statement – Historic Environment

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)1 sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on the historic environment and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. This historic environment Method Statement considers how the Project will change and protect the historic environment. The historic environment includes

[1] *National policy statement for national networks* (2024) *GOV.UK*. Available at: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf (Accessed: 13 Nov 2024).

designated heritage assets such as scheduled monument, listed buildings, conservation areas, and registered parks and gardens. It also includes non-designated heritage assets such as archaeological sites and remains, buildings, structures and historic landscapes which are an important part of local history. The assessment will consider how the Project will impact the ability to understand the importance of these heritage assets, including their historic relationships with each other and the wider landscape and how to mitigate these impacts. It will also consider the archaeological potential and character of the route to understand likely impacts on archaeological remains that are not currently recorded and how these impacts can be managed and mitigated.

2. Abbreviations and definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
AD	'Anno Domini', dates year 0 and after.
AN12	Historic England Advice Note 12
BC	'Before Christ', dates before year 0.
BBC	Bedford Borough Council
BGS	British geological survey
CCC	Cambridgeshire County Council
CBC	Central Bedfordshire Council
CIfA	Chartered Institute for Archaeology
CoCP	Code of construction practice
DCO	Development consent order
DMRB	Design manual for roads and bridges
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
HER	Historic environment record
IEMA	Institute of Environmental Management and Assessment
MKCC	Milton Keynes City Council
MWJV	Mott MacDonald WSP-Joint Venture

Abbreviation	Definition
MVL	Marston Vale Line
NHLE	National heritage list for England
NPPF	National planning policy framework
NNNPS	National networks national policy statement
NSIP	Nationally significant infrastructure project
PCHIA	Principles of cultural heritage assessment in the UK
PEIR	Preliminary environmental information report
POW	Prisoner of war
ZTV	Zone of theoretical visibility

3. Relevant standards and guidance

3.1. Overview

3.1.1. This section summarises the relevant legislation, standards and guidance relating to the assessment of the historic environment in respect of the Project. National and local planning policy relevant to decision making in the historic environment can be found in the EIA Scoping Report.

3.2. Legislation

3.2.1. Legislation includes:

- The Ancient Monuments and Archaeological Areas (AMAA) Act 1979; and
- The Planning (Listed Building and Conservation Areas) Act 1990.

3.3. Standards and guidance

3.3.1. The following standards and guidance have informed the production of this Method Statement and the development of the methodology for the Environmental Impact Assessment process, as described in section 8. This notably includes:

- Chartered Institute for Archaeology (CIfA) Code of conduct: professional ethics in archaeology (2014, updated 2022);
- CIfA Standard and Guidance for historic environment desk-based assessment (2014, updated 2020);
- Historic England Conservation Principles, Policies and Guidance (2008);
- Historic England Statements of Heritage Significance: Analysing Significance in Heritage Assets Historic England Advice Note 12 (AN12) (2019);
- Historic England Planning and Archaeology Historic England Advice Note 17 (2022);
- Historic England Making Changes to Heritage Assets Historic England Advice Note 2 (2010, Updated 2016);
- Institute of Environmental Management and Assessment (IEMA), Institute of Historic Building Conservation (IHBC) and CIfA principles of cultural heritage impact assessment (PCHIA) in the UK (2021); and
- United Nations Educational, Scientific and Cultural Organization (UNESCO), International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), International Council on Monuments and Sites (ICOMOS) and International Union for Conservation of Nature (IUCN) (2022) Guidance and Toolkit for Impact Assessments in a World Heritage Context.

4. Establishing the baseline

4.1. Overview

4.1.1. This section sets out the information and resources that were used and analysed to establish the historical baseline of the proposed route, against which the effects of the Project can be understood for scoping. It also contains a summary description of the baseline, to enable an understanding of the impacts and effects which are later described.

4.2. Resources

4.2.1. A preliminary understanding of the historic environment baseline has been established by reference to the sources listed below:

- Designated heritage assets from data obtained from the national heritage list for England (NHLE: scheduled monuments, listed buildings and registered parks and gardens);
- Known non-designated heritage asset information supplied by the Historic Environment Records (HERs) of Oxford City Council (OCC), Oxfordshire County Council (OxCC), Buckinghamshire Council (BC) Milton Keynes City Council (MKCC), Central Bedfordshire Council (CBC license Central Bedfordshire historic environment record (CBCHER) 009) Bedford Borough Council (BBC Licence Bedford Borough historic environment record (BBHER) 003) and Cambridgeshire County Council (CCC Licence 20-4261a) (see below with regard to limitations for this data);
- Available online resources - for Ordnance Survey maps, non-ordnance survey maps (for example tithe maps and Speeds maps), historic and modern aerial photographs;
- Relevant local planning authority online planning information - for information on conservation areas and local lists;
- The Portable Antiquities Scheme - for information on archaeological finds reported from the 500m study area;
- The British geological survey (BGS) - for information on local and regional geology;
- Survey data from the geophysical surveys that have occurred within the route of the Project;
- Local Planning Authority guidance including local lists and conservation area appraisals and management plans;
- Resource Assessments within the Regional resource frameworks for the east of England and south-east England; and

- Highways England (2021): A428 Black Cat to Caxton Gibbet improvements, ES.

4.2.2. This baseline includes a high-level understanding of heritage value for key assets within the study area. The terminology ‘heritage value’ has been used in place of ‘significance’ to prevent confusion with the terminology around ‘significance of effect’ within the EIA process. This is equivalent to significance in every way. Heritage value has been understood in accordance with Historic England 2019 Statement of Heritage Significance, further information on the assessment of heritage value within the EIA processes is given within section 8.

4.3. Study area

4.3.1. For the purposes of this document, baseline data has been gathered within 1km of the draft Order limits for designated assets and 500m of the draft Order limits for non-designated assets. This is considered sufficient to provide a baseline to inform scoping and provides an understanding of the heritage assets with the potential to be affected by the Project which will require further assessment as part of an ES. This hard boundary has been used for the purposes of this Method Statement to provide an indicative understanding of the likely significant effects, as opposed to a comprehensive understanding of all potential effects of the Project.

4.4. Consultation

4.4.1. Consultation will be ongoing to inform the assessment of historic environment as the DCO application progresses. A non-statutory consultation commenced in November 2024.

4.4.2. The table below describes the consultation undertaken to date specifically relevant to the production of this Method Statement and related Scoping Report. These comments include those on the initial draft Scoping Report produced in July 2021.

Table 2 – Consultation record.

Consultation date	Parties consulted	Summary of engagement	Relevance to this document
22/07/2021	Central Bedfordshire Council	1. With regards to built heritage the approach on significance aligns with [National Planning Policy Framework or] NPPF and welcome reference to a zone of theoretical	The following points have been captured in the EIA approach:

Consultation date	Parties consulted	Summary of engagement	Relevance to this document
		visibility (ZTV) regarding geographic scope. 2. If there are any noise or vibration effects on listed buildings, remedial measures will need to be set out. 3. Is NNNPS included in the Methodology/guidance? 4. Must ensure there is good correlation between ZTV and the heritage assets. 5. Archaeological remains should be scoped in. 6. There is an issue with 'significance' terminology in the heritage chapter because it is being used in two different ways. 7. An intrusive evaluation should be included with the baseline survey. 8. Heritage "interests" in AN12 better align with NPPF than the heritage "values" in Conservation Principles 9. Findings of the ZTV are important. The study area should take into account any attributes of setting which may mean an asset further away is affected. 10. Importance of Toseland House Grade II listed building. 11. Confirmation requested regarding treatment of Grade I and Grade II listed building. Both are nationally important and so should be of same value.	• A ZTV will continue to be considered as part of the approach. • Potential for impact from noise and vibration will be considered as part of the impact assessment undertaken at ES to inform appropriate mitigation. • NNNPS is discussed in the *EIA Scoping Report* • Archaeological remains have not been scoped out in Bedfordshire. Identified archaeological remains will be subject to the method described in section 9.4 • AN12 Heritage interests will be used in understanding the heritage value of assets at ES. • Assets of national importance will be considered high heritage value, inclusive of Grade II listed buildings. This is unless there is an asset specific reason for a different heritage value to be understood, in relation to the AN12 heritage interests. • Specific assets mentioned will be considered at ES.

Consultation date	Parties consulted	Summary of engagement	Relevance to this document
		12. Importance of Tithe Farm, undesignated.	
20/08/2021	Oxfordshire County Council	1. Storyboard provides insufficient information to allow comment. 2. If ground disturbance is proposed, then the search buffer of 250m either side of the railway line may not be appropriate and further advice should be sought. 5. A 1km search area is needed for assessment at stations at either end of this section of the route, as main development would concentrate on these stations.	The following points have been captured in the EIA approach: • The study area used at ES will be agreed through consultation with heritage stakeholders.
17/09/2021	Greater Cambridge Council	1. Reliance on methodology limited to [Design Manual for Roads and Bridges or] DMRB Magnitude/sensitivity matrix approach to assessment is not considered sufficient for a robust assessment. 2. The Methodology should be broadened so a full assessment of significance and impact, particularly of setting issues, does not rely on the DMRB matrix in isolation. Attention is drawn to guidance of the IEMA PCHIA. 3. The output from the matrix process needs to be subjected to furthermore discursive analysis. 4. There will need to be a cross reference between Historic Environment and Landscape and	The following points have been captured in the EIA approach: • The methodology used at ES will be developed in conjunction with all relevant guidance, including the 2021 PCHIA. Whilst a sensitivity matrix may be employed to assist in explaining significance of effects, a qualitative approach developed in line with all relevant guidance will be used for impact assessment in the ES.

Consultation date	Parties consulted	Summary of engagement	Relevance to this document
		Visual Impact, including when reporting impacts. 5. Effects to be scoped in and out are generally agreed.	
29/07/2021	Bedford Borough Council	1. Guidance listed seems generally acceptable. 2. No issue with study area. 3. Assessment needs to be qualitative. 4. Confirmation sought on whether there would be demolition of undesignated heritage assets.	The following points have been captured in the EIA approach: • Qualitative assessment process will be used in the ES to support the DMRB matrix approach.
20/3/2024 and 27/3/2024	Cambridge City Council, Oxfordshire County Council, Buckinghamshire Council, Milton Keynes City Council, Central Bedfordshire Council, Bedford Borough Council, Cambridgeshire County Council, Huntingdonshire Council, South Cambridgeshire, Cambridge City Council	Historic Environment Briefing sessions were held updating on the progress of the project to date and setting out upcoming work. The submission of the scoping report and the approach to scoping was briefed to the stakeholders.	The stakeholders were updated on the approach and submission of this document.

Source: EWR 2021

5. Preliminary baseline description

5.1. Overview

5.1.1. This section sets out the historical baseline of the Project and discusses the geoarchaeological and archaeological potential of the route. This has informed the high-level appraisal of potential effects on known and buried heritage assets. For the purposes of the heritage baseline, the Project has been divided into eight route sections. These comprise:

- Oxford to Bletchley;
- Fenny Stratford to Kempston;
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

5.1.2. A proportionate approach to the production of this summary baseline has been adopted. As such, more detailed information is provided where there is anticipated to be the greatest impact and to the greatest number of assets. This broadly aligns with those areas where the Project comprises an entirely new alignment, rather than upgrades to existing rail.

5.2. General description

5.2.1. The route runs from Oxford to Cambridge, of which 54% is on the existing rail route between Oxford and Bedford, and Shelford and Cambridge. The existing line between Oxford and Bletchley is a surviving remnant of the former cross-country Varsity line from Oxford Rewley Road to Cambridge (opened in stages between 1854 and 1862) for passengers and goods. The Varsity line became a strategic route during World War II for freight avoiding London but after the war, its use as a passenger railway was never fully implemented and its main use was for transport of goods, with most passenger services withdrawn from the line in 1968. The Marston Vale Line (MVL) that runs between Bletchley and Bedford was opened in 1846 by the London and North Western Railway. The railway route to Cambridge opened in 1845 with the Great Eastern Railway's London to Norwich line.

5.2.2. The Project follows a route largely on river terrace deposits within the shallow valleys between Oxford to Cambridge. The Project runs from the valley of the River Cherwell across the high Buckinghamshire clay lands towards the valley

of the River Ouzel at Bletchley. It then follows the undulating landscape of the Marston Vale to the valley of the Great Ouse at Bedford; subsequently crossing the higher ground of the Bedfordshire clay lands to again meet the Great Ouse to the south of St Neots. It then crosses the Cambridgeshire clay lands meeting the northern side of the A428 slightly to the east of Cambourne, before running through an undulating landscape to the west of Comberton and to the south-west of Harston where it meets the extant rail line south of Great Shelford.

5.2.3. The Project runs through the townscapes of Oxford, Bicester, Bedford and Cambridge; and follows the modern suburban edges of Bletchley and St Neots. The route lies within the river terrace of four main rivers, the River Cherwell, the River Ouzel, the River Great Ouse and the River Cam. Outside the footprint of the existing railway and urban areas, the route follows a rural landscape of undeveloped arable fields running between the towns and villages.

5.2.4. The river terrace deposits of the rivers within the Project, attracted early prehistoric activity due to the watercourses and free draining sands and gravels. Early hunter-gatherers would exploit the rivers resources and dense flint scatters dating to the Palaeolithic period (800,000 to 9500 BC) and the Mesolithic period (9500 to 4000 BC), have been discovered.

5.2.5. Within the shallow river valleys, settlement activity intensified during the Neolithic period (4000 to 2400 BC) when early farming communities expanded and the focus on monumental features and evolved. Funerary activity continued into the Bronze Age (2400 to 700 BC) with numerous barrow cemeteries in the form of ring ditches appearing within the river valleys such as Money Hill barrow cemetery and evidence of ring ditches and banjo enclosures to the northeast of Clapham, as well as cremation burials within Collared Urns and Beakers.

5.2.6. During the Iron Age (800 BC to AD (Anno Domini) 43) and Roman periods (AD 410–1066), the expansion of settlement on to the higher clay lands away from the river valleys occurred across the Project with a focus on round houses, enclosures, and linear features relating to farmsteads. Larger Roman settlements appeared across the route as well as local tracks and Roman roads, the distribution of different types of settlement and the framework of roads, suggests that a hierarchy of settlement had developed.

5.2.7. The period immediately following the end of Roman administration in Britain (AD 410–1066) was a time of considerable change. Settlement pattern altered with dispersed early Anglo-Saxon farmsteads or isolated hamlets often focussed near streams and rivers such at the Land North of Brickhill, Bedford and the Great Barford Bypass. Many of the Roman sites were abandoned, though some show limited continued use; at Highfields Caldecote and Clapham where Roman field systems continued in use into the Early Medieval period. During the Early Medieval period, nucleated settlement began to be

established. In the 9th and 10th centuries, the Saxon Minster system began to be replaced by manorial estates, often including a principal settlement situated near a parish church. Caldecote, Comberton, Haslingfield and Harston are example of settlements where agricultural land was reorganised into nucleated villages surrounded by arable fields that was divided into strips.

5.2.8. During the Medieval period (AD 1066 to 1540), many of the villages along the route were established and most parishes have evidence for the development of sub-manors in the form of moated sites. Most of the route will have been agricultural land utilised as part of the open field system of the surrounding villages and manors. This continued into the post-medieval period (1540 to 1750) with the intensity of the agricultural economy and food production.

5.2.9. During the post-medieval to modern periods, settlements along the route were developed and expanded with the changing technologies of the industrial revolution. With the implementation of the railway in the late 19th century, towns such as Oxford, Bedford, St Neots and Cambridge expanded into the wider landscape to deal with the growing populations and demand that industrialisation created. Road schemes to link the growing towns and improve the movement of people and goods were introduced in the early 21st century; changing the character of areas within the route from an agricultural landscape into one of large-scale infrastructure.

5.3. Oxford to Bletchley

Historic development

5.3.1. This section of the Project is characterised by post-medieval rural fields scattered with small settlements. This area comprises primarily low-lying land with taller hills dotted across the landscape and the Chiltern Hills located to the east of the Project. There are no large rivers running within proximity of the Project however small tributary rivers like the River Cherwell and the River Ouzel run through Oxford and Bletchley respectively. At the eastern end of this route section, the town of Bletchley is located to the south-west of Milton Keynes and is characterised by a suburban town surrounded by agricultural fields.

5.3.2. The Palaeolithic and Mesolithic periods were represented by hunter-gatherer communities moving around the landscape to hunt for animals and forage. As such, the archaeological record is poorly represented and mostly comprises of stone objects. There is little evidence within Oxfordshire from these periods.

5.3.3. The Neolithic period was characterised by a more settled lifestyle as it comprised the domestication of livestock, crop cultivation and the construction of permanent monuments. As settlement was more stationary than the

predeceasing periods, this period witnessed a transformation in the landscape as farming became popular. This was mirrored during the Bronze Age as woodlands were cleared for farming purposes and settlement became more permanent. Rural settlements grew during the Iron Age and groups of roundhouses and enclosures scattered the landscape of Oxfordshire.

5.3.4. The Oxfordshire landscape was influenced by the Roman invasion; the landscape was transformed from Iron Age roundhouses with associated enclosures to vast road networks dotted with farmsteads that lead to larger settlements. Various Roman road networks run through the Project and may include associated Roman sites. More dispersed occupation sites were also within the landscape, and these consist of villas and smaller farmsteads. Within Bletchley, the Fenny Stratford (Magiovinium) to Buckingham Roman Road runs east to west along the existing B4034 Buckingham Road and the Roman Road now known as Watling Street, ran south-east to north-west at the western end of Bletchley. Alongside the road, the small Roman town of Magiovinium (NHLE ref: 1006943), now a scheduled monument, was developed and dates from the 1st to the 4th centuries AD.

5.3.5. Evidence for the Early Medieval period is limited within Oxfordshire. It is likely that the landscape retained much of its Romano-British character at the start of the Early Medieval period but Romano-British settlements were slowly abandoned for Anglo-Saxon settlement. Within Bletchley, settlement pattern changed, and the town was a minor village on the outskirts of Fenny Stratford. The town name is Anglo-Saxon and means Blæcca's clearing. Administration of the area was in Hundreds and Bletchley was in Sigelai Hundred.

5.3.6. The Domesday Survey of 1068 records various settlements within Oxford making it a large settlement area, with Oxford itself holding 18 households. There were also small settlements scattered throughout the landscape surrounding the Project. The closest settlement to Bletchley was located to the south-east and was referred to as [Water] Eaton Arable fields were still utilised for agricultural purposes during this period and open field systems were introduced to the landscape.

5.3.7. Post-medieval Oxfordshire and Buckinghamshire witnessed rapid change as population grew. During the late 16th century the landscape was dominated by open, rural fields that were utilised for cultivation and dispersed settlements that originated during the medieval period. However, during this period the landscape transformed as following the Enclosure Acts and Commons Acts between 1773 and 1882; fields were enclosed, and intensive industrialised farming practices were carried out across the landscape. Due to the act of enclosure, many open fields that were utilised during the medieval period were lost and replaced by rectilinear field systems. Development was also influenced

by the growing popularity of large-scale extractive industries which also impacted the landscape. Brick, clay and tile production sites were the focus for parish growth and the landscape was utilised to extract clay.

5.3.8. Prior to the designation of Milton Keynes during the late 19th century, Bletchley was a market town almost entirely dedicated to agricultural activity. Bletchley began to change during the post-medieval period mostly due to the construction of the railway during the 19th century. Prior to the opening of the London and Birmingham Railway in 1838, Bletchley was a small village with little development. However. the construction of the line encouraged more development around Bletchley railway station. Bletchley railway station was first opened between November 1838 and June 1839 and formed part of the London and North Western Railway, it was referred to as Bletchley and Fenny Stratford station between 1841 and 1846 but then changed to Bletchley Junction in 1851 and 1868. This line later became a part of the cross-country varsity line and ran between Oxford and Cambridge, however the Bletchley to Oxford and Bedford to Cambridge sections were closed in 1967 but the Bletchley to Bedford section of the line continued.

5.3.9. Oxford was first introduced to the railway when the Great Western Railway company built a line between London and Oxford in 1844, this also included the construction of a station in Grandpont. The railway services were expanded throughout the mid to late 19th century as more lines were added and ran to places like Birmingham. This development led to the increase in infrastructure and buildings within Oxford and as such, changed a relatively rural town to a more industrial one. Outside of Oxford, the rural landscape located between Oxford and Bletchley was also altered; the Varsity Line was built between in the mid-19th century and ran between Oxford and Bletchley. Following the industrialisation of the railways, major roads were built within the rural landscape between Oxford and Bletchley. The A40 road was built in 1923, altered in 1935 and rerouted in in the 1930s. It still exists as a major road network linking London and Oxford. Another major road that runs through the Project includes the A413 road which was built in the late 20th century and runs between Denham to Towcester. As such, the landscapes of Oxfordshire and Buckinghamshire was changed to support the movement of people, raw materials and manufactured goods. Many extraction and production sites were situated along the railway lines and many ponds and lakes have been left in the landscape from this development.

Heritage assets - designated heritage assets

5.3.10. Designated heritage assets which sit within the draft Order limits comprise:

- Osney Town Conservation Area;
- Jericho Conservation Area;

- Islip Conservation Area;
- Alchester Roman site, scheduled monument (NHLE ref: 1006365);
- Station House approximately 15 metres north-west of level crossing, Grade II listed (NHLE ref: 1046495);
- Bicester Conservation Area;
- Bletchley Conservation Area; and
- Denbigh Hall Railway Bridge, Grade II listed (NHLE ref: 112540).

5.3.11. Number of designated heritage assets within the study area (1km):

- 13 scheduled monuments;
- 127 Grade I listed buildings;
- 64 Grade II* listed buildings;
- 875 Grade II listed buildings;
- 11 registered parks and gardens; and
- 10 conservation areas.

5.3.12. Within the footprint of the draft Order limits there is one scheduled monument, two Grade II listed buildings and five conservation areas. The scheduled monument is a heritage asset of high significance and highlights the historical value of the Roman town. The Grade II listed buildings are of high significance as they reflect the architectural and historical significance of railway infrastructure and the relationship with the railway line. The five conservation areas are of medium significance and reflect the architectural style within the villages and towns as well as the historical connections within them.

Heritage assets - non-designated heritage assets

5.3.13. Non-designated heritage assets which sit within the draft Order limits comprise:

- Cluster of Late Iron Age curvilinear and linear ditches;
- Later Iron Age-early Roman field system and associated features;
- Iron Age enclosure and metalworking activity and Roman field system;
- Late Iron Age to Roman settlement;
- Middle Iron Age settlement and Late Iron Age to Roman field system;
- Late Iron Age to Roman agricultural activity;
- Possible Iron Age to Roman settlement complex SW of Middle Farm;
- Late C1st- early C3rd Roman settlement;
- Edge of Roman Settlement;
- Roman Inhumations;
- Roman Regular Aggregate Field System (700m NW of Merton Grounds)
- 5 Roman Road sections; Akeman Street (East section), Alchester to Dorchester Roman Road, Magary 162, Margary 166 and Margary 169a;
- Late Saxon field system;

- Cutteslowe Deserted Medieval Village;
- System of agricultural furrows;
- Ridge and furrow within Buckinghamshire County;
- Sheepwash Channel;
- Oxford Ridgeway;
- Civil War Defences, Oxford;
- Ditch West of Furze Lane;
- Ditch West of Whaddon Road;
- Drainage ditches east of East Claydon;
- Extractive pit and trackway at Redfield, Winslow;
- Ditch East of Woodlands Farm;
- Post-medieval extractive pit, Furzen Farm;
- Oxford Canal;
- Seventeen assets relating to the railway directly; Yarnton Loop Railway, LNWR Banbury-Buckingham-Verney junction line, Birmingham and Oxford Junction Railway, Aynho and Ashendon Railway, Bicester Military Railway, Site of Launton Station, Bicester London Road Station, Bicester Road Underbridge, Bletchley station, Bletchley, Wolvercote Halt, railway station, GWR Station, Oxford, Winslow Railway Station, Verney Jct-Banbury Railway, Verney Jct-Banbury Railway, Grendon-Ashendon Railway, Swanbourne Station, Marsh Gibbon and Poundon Station and Claydon Station;
- Site of MoD Bicester, Graven Hill;
- Gosford Grain Silos;
- LMS Swing Bridge;
- Castle Mill Stream;
- Port Meadow; and
- Settlement Block W1-W3.

5.3.14. Number of non-designated heritage assets within the study area (500m):

- 1 Neolithic site;
- 6 Bronze Age sites;
- 42 Iron Age sites;
- 51 Roman sites;
- 5 Early Medieval sites;
- 83 medieval sites;
- 228 post medieval sites; and
- 59 modern sites.

5.3.15. In addition, findspots recorded in the HER identify activity from the Mesolithic, Bronze Age, Roman and Second World War within the draft Order limits and

especially mesolithic, Roman, medieval and post-medieval activity within 500m of the draft Order limits.

5.3.16. The Oxford Heritage Asset Register, which covers Oxford city, has highlighted the following heritage assets which have the potential to be affected by the Project:

- 8th Oxford Scout Hut (formerly All Saints Mission Chapel);
- Abbey Road No 29 (formerly St Frideswide's Curate's House);
- All Saints Church, Lime Walk, Arthur Street;
- The Former Oxford Electric Lighting Power Station, Banbury Road;
- No 333 (Summerhill House), Bedford Street;
- No 16 (The Motz House), Botley Road;
- No 2, The One (former Botley Road Turnpike Tollhouse), Botley Road;
- The River Hotel;
- Brasenose Farmhouse;
- Brasenose Squash Courts;
- Bridge over Bulstake Stream, Binsey Lane, Central Morrell Avenue, Charles Street;
- No 6a, The Prince of Wales, Charles Street;
- Church of St Alban the Martyr, Chester Street;
- The Chester Arms;
- Church of St Francis Assisi, Cowley Road;
- No 108, Old Music Hall, Cowley Road;
- No 118, Cowley Road No 119;
- The Corridor Public House;
- Cowley Road No 172; and
- The Cowley Retreat.

5.3.17. The Buckinghamshire local list identifies three locally listed buildings within the draft Order limits:

- Addington Manor;
- Horwood House; and
- Hazlebach (formerly station master's house) and bridge.

5.3.18. Within this section of the route, there is evidence for some activity dating from the mesolithic and Bronze Age, but primarily from the Iron Age to modern periods. There is significant evidence of late Iron Age and Roman activity, as well as medieval and post-medieval agriculture and settlement.

5.3.19. Archaeological remains associated with Iron Age/Roman settlement would be of medium to high heritage value however findspots and finds associated with

field boundaries would be of low heritage value. Remains associated with medieval and post-medieval activity would be of medium heritage value.

5.3.20. The ‘Oxford Heritage Asset Register’ lists all the locally important heritage assets within the city. Within this section, the locally listed buildings range from churches, hotels, homes, shops and areas associated with the University of Oxford. They were predominantly built between the early 19th to the early 20th century as part of the expansion of Oxford. The locally listed buildings in Oxford range in style and signify the diversity of the city; domestic residences in historically affluent areas were built in a Georgian or Victorian style whereas businesses have an industrial style.

5.3.21. The variety in architectural styles characterises the city and shows the different phases of development. The assets within the Heritage Register signifies Oxford's post-medieval development (particularly during the 19th and 20th centuries) and how they mix with the designated heritage assets. There are some structures related to the railway heritage of this section.

Archaeological potential

5.3.22. There have been 47 archaeological investigations within the footprint of the Project. These consist of 14 geophysical surveys, 1 metal detecting survey, 1 walkover survey, 14 trial trench evaluations, 8 watching briefs, 4 Aerial Investigation Surveys and 1 excavation.

5.3.23. There have been 458 archaeological investigations within the 500m study area, these mainly consist of geophysical surveys, trial trench evaluations, excavations and watching briefs.

5.3.24. The Oxford to Bletchley section of the route has moderate to high potential for late prehistoric, Roman and medieval and post-medieval settlement and agricultural remains. Late Prehistoric and Roman activity is most likely to be present towards the Oxfordshire end of this route section, in addition to medieval and post-medieval activity. Towards the Bletchley end of this route section remains relating to post-medieval and modern activity are most likely.

5.4. Fenny Stratford to Kempston (MVL)

Historic development

5.4.1. Fenny Stratford is located within the south-west of Milton Keynes, Buckinghamshire, to immediately east of Bletchley. It is surrounded by rural fields to the east, south and west and the urbanised settlement of Milton Keynes to the north. This broader landscape is characterised by planned post-medieval fields scattered by small settlements. These fields are replaced by modern development as it gets closer to Fenny Stratford, with the town

containing modern and suburban elements due to expansion in the late 20th century. It is situated within low lying land with hills located to the east and west. The River Ouzel is located 1.6km to the east of the Project and runs north-west through Milton Keynes. It is significant as it a tributary of the Great Ouse which flows through a large area of England starting in south Northamptonshire and running south-west through Buckinghamshire and Bedford and ends in Norfolk.

5.4.2. This section of the Project is located on a Mudstone bedrock on low lying land which means it may have been prone to seasonal flooding. As such, much of the prehistoric archaeological remains within Bletchley and its hinterlands consist of hand-axes, flintworks and artefacts.

5.4.3. The Mesolithic hunter-gatherers inhabited a still largely wooded environment and were most active within proximity of river valleys and coasts due to the valuable resources they contained. Fragments of bone, burnt stones, and at least two flint scatters including numerous cores were found near to a paleochannel of the River Ouzel during the construction of Caldecotte Lake.

5.4.4. During the Neolithic period, the forested areas were cleared, and farming was established. Various Neolithic/Bronze Age flint scatters were discovered to the east of the Project during the M1 widening at Ridgmont, including scrapers, an axe head, flakes and an arrowhead. The Iron Age period witnessed centralised settlement and new burial customs. Many of the archaeological features (comprising crop marks) is recorded west of the Project at land located between Brogborough and Marston Moretaine.

5.4.5. The Bronze Age was a period of technological change and this is visible within the study area as structures were built which encouraged larger settlements to form and lead to the landscape becoming more organised. Ring ditches scatter the Ouse and Ouzel valleys with the closest Bronze Age settlement comprises a large roundhouse found in Bancroft. Previous investigations found a middle Iron Age waterside settlement at Newton Leys, to the south of Fenny Stratford.

5.4.6. In the decades following the Roman invasion of Britain in AD 43, the Roman Road now known as Watling Street, ran south-east to north-west through Fenny Stratford. Alongside the road, the small Roman town of Magiovinium (NHLE ref: 1006943), now a scheduled monument, was developed. Previous archaeological investigations have shown that it dates from the 1st to the 4th centuries AD and comprises a defended core with suburbs extending along the road to the south-east. A possible Roman fort and vicus, identified from cropmarks, may lie to the south-east and it has been suggested that this was the original focus from which the town developed.

5.4.7. A Roman Road also runs through the Project from Marston Moretaine through to Kempston. Evidence of rural settlement activity is extensive within this section of the Project and various farm sites are scattered through the landscape along the Roman road. Farm complexes have also been found, however these lie to the west of the Project in the outskirts of Bedford. These bigger farm complexes appear to be centred around the Roman settlement in Bedford. Much of the archaeological remains (mostly comprising projected Roman roads, enclosures and occupation sites) were found to the west of the Project at land located between Brogborough and Marston Moretaine.

5.4.8. Following the withdrawal of the Romans in the early 5th century, settlement patterns changed, and the town of Fenny Stratford was originally a minor village within the parish of Water Eaton. Administration of the area was in Hundreds and Fenny Stratford was in Seckley Hundred. There is some evidence of early Anglo-Saxon activity at Wavendon Gate, limited to a small number of pits and posthole alignments. Concentrations of artefacts in the tops of Roman ditches were suggested to be indicative of hollows being used as sunken featured buildings. Within the bathing station site at Magiovinium, burials believed to be Anglo-Saxon, and a bronze brooch of Anglo-Saxon design were found.

5.4.9. During the later medieval period, many villages were established and captured in the Domesday Survey carried out in c.1086. The closest and largest settlement was still Water Eaton, located to the south-east. Arable fields were still utilised for agricultural purposes during this period and open field systems were introduced to the landscape. The village of Marston Moretaine which is located 2.6km to the west of the Project is also mentioned in the Domesday book, showing that it had been established by the late Early Medieval period. The Grade I listed Woburn Abbey (NHLE ref: 1114006), located 5.3km to the west of the Project, was founded as a Cistercian abbey in 1145 however it was dissolved in 1538 during the dissolution of the monasteries.

5.4.10. Throughout the post-medieval period, the section to the west of Fenny Stratford, remained agricultural possibly due to the influence of the Dukes of Bedford and the Grade I listed Woburn Abbey estate. After its dissolution in the 16th century, the estate was bought by the Duke of Bedford in 1547 and it was developed and rebuilt in c. 1630. This was followed by more reworks throughout the 18th century. Woburn Abbey was a significant estate throughout the post-medieval period as key political players visited the estate including John Adams and Thomas Jefferson in 1786. Due to the estates influence and the Duke of Bedford owning a vast amount of land within the area, it was likely that the rural landscape was maintained to emphasise the estate.

5.4.11. Before Milton Keynes was designated in the 19th century, Fenny Stratford was a small settlement dedicated to agriculture activity. However, with the

construction of the railway during the 19th century, the town started to change and expand. The opening of the London and Birmingham Railway in 1838 encouraged development and in 1846 the station at Fenny Stratford was opened as part of the London and North Western Railway. This line later became a part of the cross-country varsity line and ran between Oxford and Cambridge, however the Bletchley to Oxford and Bedford to Cambridge sections were closed in 1967 while the Bletchley to Bedford section of the line continued.

5.4.12. The rural landscape of Fenny Stratford was interrupted by the construction and opening of the Marston Vale Line in 1846. Much of the line was built within the 7th Duke of Bedford's land who had great influence over how the railway stations within his land were built. As a result, all of the stations located within his estate were built using a half-timbered style. The stations that were built using this design consists of Fenny Stratford, Woburn Sands, Ridgmont and Millbrook. Despite the installation of the Marston Vale Line, the landscape surrounding the railway remained primarily agricultural with small settlement located along the line. The Ordnance Survey of 1885 – 1900 (not reproduced) shows that the villages of Fenny Stratford, Woburn Sands, Wavendon and Aspley Guise exist within proximity to the railway. The Ordnance Survey 1:25,00 scale map of 1937 – 1961 shows that these villages have expanded. Modern satellite imagery demonstrates large scale residential development to the west of the Project due to the construction of Milton Keynes and surrounding villages. Development within the northern section of the Project is less widespread: Stewartby Brickworks opened in 1897 and became the largest brickworks, in terms of output, in the world during the 20th century. The brickworks established the model village of Stewartby in 1926, it was instrumental in the creation of Bedfordshire's rich multi-cultural society. Between the mid-20th century to the present day, this section of the Project has remained primarily agricultural as the majority of the landscape has remained rural; the only development comprised the installation of the Marston Vale railway line and the expansion of the nearby villages and towns.

Heritage assets - designated heritage assets

5.4.13. Designated heritage assets which sit within the draft Order limits comprise:

- Crossing House, Grade II listed (NHLE ref: 1386644)
- Ridgmont Station, Grade II listed (NHLE ref: 1114037); and
- Stewartby Conservation Area.

5.4.14. Number of designated heritage assets within the study area (1km):

- 8 scheduled monuments;
- 2 Grade I listed buildings;

- 11 Grade II* listed buildings;
- 104 Grade II listed buildings;
- 2 registered parks and gardens; and
- 3 conservation areas.

5.4.15. Within the footprint of the draft Order limits there is one conservation area and two Grade II listed buildings that are of high heritage value and have the potential to be impacted by the Project. The listed station and crossing house were built in c. 1846 and have timber frames with a roughcast exterior showing that they have a relationship to each other through their architectural style and location along the railway line. The Stewartby conservation area is of medium heritage value and was constructed between 1927 and 1978 to be a model village associated with the London Brick Company. As such the architectural style reflects the villages relationship with the London Brick Company and its industrial nature.

Heritage assets - non-designated heritage assets

5.4.16. Non-designated assets which sit within the draft Order limits comprise:

- Prehistoric flint scatter, Ridgemont Bypass;
- Iron Age settlement, Ridgemont;
- Iron Age to Roman enclosures, Stewartby;
- Roman farmstead, Stewartby
- Roman occupation site, Simpson;
- Roman settlement, Stewartby;
- Roman street and enclosures, Bow Brickhill;
- Medieval to post-medieval ridge and furrow and field boundaries across the section;
- Medieval deer park, Ridgemont;
- Medieval settlement, Boughton End;
- Medieval moated site, Stewartby
- Deserted medieval village, Thrupp End;
- Medieval preceptorial farm, Millbrook;
- Medieval moat, Stewartby;
- Site of post-medieval infectious diseases hospital, Marston Valley;
- A post-medieval railway station, Fenny Stratford;
- Post-medieval brickworks, Woburn Sands;
- Post-medieval features relating to railway;
- Post-medieval barn, Husborne Crawley;
- Post-medieval brickworks, Marston Valle, Marston Moreteyne and Stewartby;
- Post-medieval clay pits, Stewartby; and
- World War II rifle range, Lidlington.

5.4.17. Number of non-designated heritage assets within the study area (500m):

- 1 later medieval to post-medieval site in Simpson;
- 2 post-medieval sites, brickworks and domestic in Simpson;
- 1 post-medieval farmstead in Fenny Stratford;
- 1 Roman inhumation cemetery in Fenny Stratford;
- 1 Mesolithic flint scatter, Walton;
- 3 Neolithic to late Iron Age/Roman settlement, Fenny Stratford, near the M1 and Wootton;
- 1 Mesolithic/Neolithic/Bronze Age settlement, Fenny Stratford;
- 2 Iron Age/Roman occupation site, Marston Moreteyne and Kempston;
- 1 Roman road, Bow Brickhill;
- 3 Roman occupation site, Fenny Stratford and Bow Brickhill;
- 1 Roman settlement cemetery, Bow Brickhill;
- 1 Roman site, Little Brickhill;
- 4 Roman field systems, Walton and Bow Brickhill;
- 1 Roman farm, Kempston;
- 1 Anglo-Saxon site, Marston Moreteyne;
- 1 medieval moat, Wavendon;
- 1 deserted medieval village, near the M1;
- 7 areas of medieval ridge and furrow, Walton, Wavendon, Woburn Sands, Ridgmont and Brogborough;
- 1 Iron Age/ Roman site, Walton;
- 2 Iron Age ditched enclosure, Walton;
- 2 medieval boat remains, Walton and Marston Valley;
- 1 medieval building remains (shrunken village), Walton;
- 1 post-medieval site including watermill, Walton;
- 1 post-medieval wharf basin, Fenny Stratford;
- 1 post-medieval canal dock, Fenny Stratford;
- 3 evidence of post-medieval buildings, Fenny Stratford; and
- 1 post-medieval agricultural site, Brogborough.

5.4.18. In addition, findspots recorded in the HER identify activity from the Roman and post-medieval within the draft Order limits and especially Roman, medieval and post-medieval within 500m of the draft Order limits.

5.4.19. Within this section of the route, there is evidence for activity dating from the Iron Age to the post-medieval period. The heritage value of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage value.

5.4.20. Archaeological remains associated with Iron Age/Roman settlement would be of medium to high heritage value however findspots and finds associated with

field boundaries would be of low heritage value. Remains associated with medieval and post-medieval settlement activity will be of medium heritage value.

5.4.21. The heritage value of locally listed buildings is low as although they are important to the local character and heritage of an area they are not of national importance. Currently there are no locally listed heritage assets in the 'New Town Heritage Register' located within Fenny Stratford. Three assets are currently being considered for the local list however this will not be determined until 2024. Despite not having a heritage register, there will be non-designated built heritage assets of local significance associated with Fenny Stratford. It is likely that the character of these assets will relate to the development and expansion of Fenny Stratford during the 19th and 20th centuries when it was established as a transport link to London and as a significant player during World War II. As such, the character of the non-designated above ground heritage assets will likely reflect the industrialisation of Fenny Stratford and will mostly comprise businesses, domestic residences and will likely include assets associated with the area's war efforts. There may be some structures related to the railway heritage of this section.

Archaeological potential

5.4.22. There have been 34 archaeological investigations within the footprint of the Project. These consist of ten geophysical surveys, thirteen trial trench evaluations, three watching briefs and three excavations.

5.4.23. There have been 133 archaeological investigations within the 500m study area, these mainly consist of geophysical surveys, trial trench evaluations, excavations, rescue excavation, watching briefs and one borehole survey. These investigations found evidence for activity from the late Iron Age to the post-medieval period with evidence mostly relating to settlement activity and possible agricultural activity.

5.4.24. The Fenny Stratford to Kempston section of the route has high potential for prehistoric, Roman and medieval settlement and agricultural remains. It has low potential for Early Medieval settlement and agricultural remains and high potential for post-medieval agricultural remains.

5.5. Bedford

Historic development

5.5.1. Bedford is located on low lying land on the banks of the Great Ouse. It is surrounded by hills to the north, south and west. This section of the Project is characterised by its urban development as it runs through the urban core of Bedford which rapidly grew in the 20th century. Despite this growth, Bedford is

historically an agricultural town and is surrounded by a rural landscape that is intersected by A roads, railway lines and smaller settlements.

5.5.2. The Great Ouse attracted early prehistoric inhabitants as hand axes, retouched flake, flakes and four Levallois flakes have been found in the northern area of Bedford.

5.5.3. The early farming communities of the Neolithic period are evident in the archaeological record around the Ouse Valley with the river acting as a focus of settlement and ceremonial activity. This period witnessed the expansion of early farming communities and ritual activity and ditched enclosures containing burials have been found on the Biddenham Loop. It was also a period of widespread woodland clearance which resulted in the increased concentrations of flint scatters, monuments and settlements.

5.5.4. The Iron Age period saw a shift in settlement activity as many were located on to the higher clay lands away from the river valleys.

5.5.5. In the decades following the Roman invasion of Britain in AD 43, three unnamed Roman Roads ran within close proximity of Bedford. The Roman Road that went through the city was unnamed and ran north-west to south-east through the centre of Bedford. During this period, Bedford witnessed an increase of farms and villas within the rural landscape along with their associated field systems.

5.5.6. Bedford is first referenced in the 9th century during the Treaty of Alfred and Guthrum where the boundary between the English and the Danish territory followed the Great Ouse. As such, a burh (referred to as King's Ditch) was built to the south of the river to fortify the borough and from this a township on both banks of the river was formed and thrived until the Danish raided it in 1010. St Pauls Church (NHLE ref: 1321436) and its associated square became the centre of the town during the 13th century and Bedford became an agricultural town in the 14th century but was impacted by the Black Death in c. 1349 as it is estimated up to a third of the population of Bedfordshire perished. Due to this, there were not enough people to farm the land which greatly impoverished Bedfordshire. It is likely that development of Bedford as a town was halted during this period and the landscape remained rural as profits declined due to a lack of agricultural labours which would result in a lack of development within the town.

5.5.7. During the post-medieval period, Bedford began to industrialise and utilised its position on the Great Ouse to trade grain, timber and coal which became the main industries within the town. This change led to an increase of the population during the early 19th century. Alongside these expanding industries, the manufacturing of agricultural tools also grew during the mid-19th century.

The development of the railways within England throughout the 19th century had a huge impact on Bedford. Between 1839 and 1840 the Midland Railway company founded the Bedford and Northampton line which was opened in 1846. This was followed by the Bedford and Cambridge line in 1860 which was later combined with the London and North Western line in 1864 and in 1868, the Midland main line opened a station. As such, Bedford was at the centre of two significant lines and was in close proximity to London which encouraged industrial growth within the town.

5.5.8. Bedford experienced rapid growth in the 20th century due to industrial growth and the town extended to include surrounding estates like the new estate at Brickhill. Agricultural produce was still at the centre of Bedford however other trades like brickmaking were introduced during the 20th century. Bedford contains two railway stations referred to as Bedford railway station and Bedford St Johns railway station; both are located within the footprint of the Project. The stations are located along the Marston Vale line however the Bedford railway station is larger and runs between Bedford and Luton Airport. It was damaged in World War II when the booking hall's glass ceiling was destroyed by a bomb however, the station was rebuilt and reopened in 1978. The Bedford St Johns railway station was the first station on the Varsity Line however after the lines closure in the 20th century, the railway station's role was reduced and in 1984 the station was moved to its current location and now runs between Bedford and Bletchley. As such, the growing industrialisation of Bedford during the 19th and 20th centuries has altered the appearance and character of Bedford. However, it retains some of its rural characteristics as the outskirts of the town are semi-rural and consist of a mix of industrial sites and rural areas. The townscape reflects and highlights rural elements due to careful planting of foliage along roads and green patches scattered throughout the city.

Heritage assets - designated heritage assets

5.5.9. Designated heritage assets within the draft Order limits comprise:

- Bedford Conservation Area.

5.5.10. Designated heritage assets within the study area (1km):

- 6 scheduled monuments;
- 8 Grade I listed buildings;
- 10 Grade II* listed buildings;
- 117 Grade II listed buildings;
- 3 registered park and garden; and
- 2 conservation areas.

5.5.11. Within the footprint of the draft Order limits there is one conservation area that is of high heritage value that has the potential to be impacted by the Project. Bedford conservation area was first designated in 1969 and was revised in 2008. The conservation area is characterised by its inclusion of the historic market town and its surviving medieval street patterns, it's relationship with the Great Ouse and the quality historic architecture. As such, the conservation area represents the historical heritage value of Bedford as a historic town and its relationship with the surrounding area including the Great Ouse. The area within the Project is characterised by its industrial ties to the post-medieval railway. The Project includes modern industrial sites and therefore does not capture the features protected within the conservation area.

Heritage assets - non-designated heritage assets

5.5.12. Non-designated heritage assets which sit within the draft Order limits comprise:

- A possible Bronze Age, Iron Age or Roman ring ditch, Bedford;
- An Iron Age ditch, Elstow;
- Iron Age hut and Roman settlement, Bedford;
- An Iron Age or Roman rectilinear enclosure, Elstow;
- Possible Roman Road, Bedford;
- Medieval town, Bedford;
- Medieval ridge and furrow and boundary ditches, Bedford;
- Bedford Racecourse, a post-medieval racecourse, Kempston;
- Post-medieval railway lines, Bedford;
- Post-medieval pits, Bedford;
- Post-medieval brick and tile works, Bedford;
- Post-medieval brick kiln and lime kiln, Bedford;
- Post-medieval limestone quarry, Bedford;
- Post-medieval gravel extraction site, Bedford; and
- Undated circular cropmark, Kempston.

5.5.13. Number of non-designated heritage assets within the study area (500m):

- 1 area of undated rectilinear enclosures and possible trackway, Kempston;
- 2 Roman occupation sites, Elstow;
- 2 late Iron Age and Roman occupation sites, Elstow;
- 1 Iron Age to medieval cropmarks and occupation site, Elstow;
- 3 World War II sites, Kempston, Elstow and Bedford;
- 1 post-medieval parish church, Elstow;
- 1 area of undated earthworks, Elstow;
- 1 medieval village, Elstow;
- 1 post-medieval domestic site, Elstow;
- 1 area of Iron Age and Roman rectilinear enclosures, Bedford

- 1 post-medieval settlement, Bedford;
- 1 medieval town, Bedford region; and
- 1 agricultural site, Bedford.

5.5.14. In addition, findspots recorded in the HER identify activity from the Palaeolithic and medieval within the draft Order limits and Palaeolithic, Bronze Age, Iron Age, Roman, Early Medieval, Medieval and Post-medieval within 500m of the draft Order limits.

5.5.15. Within this section of the route, there is evidence for activity dating from the Bronze Age to the post-medieval period. The heritage value of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage value.

5.5.16. Currently, there is no local heritage register for Bedford. Despite this, there will still be non-designated above ground heritage assets that are of local significance to Bedford. These assets will likely be dated to the 19th and 20th centuries during the expansion and industrialisation of Bedford. As such, assets of local significance will likely reflect the growth of Bedford and will comprise industrial buildings and domestic residences.

5.5.17. Archaeological remains associated with Iron Age and Roman settlement will be of medium to high heritage value whereas remains associated with agricultural activity would be of medium heritage value. Remains associated with medieval settlement activity would be of high heritage value and agricultural activity would be of low to medium heritage value depending on their nature. Post-medieval remains associated with settlement activity would be of low to medium heritage value.

Archaeological potential

5.5.18. There have been 17 archaeological investigations within the footprint of the Project, consisting of one field walking survey, one geophysical survey, one strip, map and sample, two trial trench evaluations, nine excavations and three watching briefs.

5.5.19. There have been 62 past investigations within the 500m study area. These mainly comprise of geophysical surveys, trial trench evaluations, excavations and watching briefs. The investigations revealed evidence mostly associated with settlement, industrial and agricultural activity.

5.5.20. The Bedford section of the route has moderate to high potential for prehistoric, Roman and later medieval remains relating to settlement and agricultural activity. It has low potential for Early Medieval remains. It has high potential for remains relating to post-medieval settlement remains and remains associated with industrial activity.

5.6. Clapham Green to Colesden

Historic development and character

5.6.1. The Clapham Green to Colesden section of the route lies within the fertile and well-watered valley of the Great Ouse at Bedford, crossing the elevated clay lands of eastern Bedfordshire to Colesden. The now defunct Varsity line once crossed this section on the line between Bedford and Cambridge, opening in 1862. The river terrace of the Great Ouse, located to the east of Clapham, attracted early prehistoric activity and evidence of Mesolithic and Neolithic scrapers was discovered at Highfields Farm in Ravensden.

5.6.2. Hengiform monuments, a ritual shaft within an oval monument and inhumation burials, dating to the Neolithic period, appeared at the confluence of watercourses within Biddenham Loop to the north-east of Bedford. The discovery of these monuments near watercourses indicate the areas were significant as a place of spiritual importance during the Neolithic period

5.6.3. Widespread cropmark evidence for rural enclosures dating to the Iron Age is consistent with the evidence for settlement of these periods of small unenclosed and enclosed farmsteads. By the time of the Roman period, the area between Clapham Green and Colesden was a landscape of farmsteads and small hamlets, enclosed fields, open grazing and woodland, connected by a network of local tracks and long-distance routeways. To the northeast of Clapham, an Iron Age or Roman settlement enclosure in the form of a banjo enclosure, ring ditch, boundary and drainage ditches can be seen as cropmarks on aerial photographs.

5.6.4. Anglo-Saxon settlement within this section is minimal, but a sunken-featured building and associated settlement activity as well as cremation burials, was discovered within Clapham at the Land North of Brickhill. This may be an indication of smaller hamlets outside the main settlement of Bedford during this period.

5.6.5. During the Medieval period, many of the villages along the route were established and most parishes have evidence for the development of sub-manors in the form of moated sites. Most of the route will have been agricultural land utilised as part of the open field system of the surrounding villages and manors.

5.6.6. The intensity of the agricultural economy in the post-medieval period is evident on early mapping which show very few surviving woodlands and the character area is dominated by largely planned post-medieval fields following the enclosure of the open fields during the 18th and 19th centuries. The planned field systems are surrounded by the villages established in the earlier period,

which have now expanded. During the 20th century, the landscape saw the industrialisation and therefore intensification of food production, which resulted in the removal of hedgerow field boundaries, many had been planted less than 200 years earlier during enclosure of the open fields.

5.6.7. The character area has largely remained the same since the agricultural development of the 19th and 20th centuries. The small settlements of Ravensden, Wilsden and Colesden outside of the main settlement of Bedford have remained small.

Heritage assets - designated heritage assets

5.6.8. There are no designated heritage assets which sit within the draft Order limits within the Clapham Green to Colesden route section.

5.6.9. Number of designated heritage assets within the study area (1km):

- 2 scheduled monuments;
- 3 Grade I listed buildings;
- 1 Grade II* listed buildings;
- 45 Grade II listed buildings; and
- 0 registered parks and gardens.

Heritage assets - non-designated heritage assets

5.6.10. Non-designated heritage assets which sit within the draft Order limits comprise:

- A Mesolithic to Neolithic scraper, Highfields Farm Ravensden;
- Bronze Age or Iron Age Curvilinear enclosures, south-east of College Farm;
- Iron Age settlement sites, Clapham and north-east of College Farm;
- Iron-Age/Romano-British settlements, north-east of College Farm and north-west of Highfield Farm;
- Roman Roads, Clapham to Ravensden;
- Romano-British cremation, Clapham Road;
- Medieval bank and ditch, Clapham;
- Medieval Pilgrims Ampulla found in Clapham;
- Bronze Age/Iron Age curvilinear enclosure, College Farm Clapham;
- Settlement activity from the Neolithic to post-medieval period at Black Cat Quarry site, Roxton;
- Iron Age or Roman settlement enclosure: banjo enclosure, ring ditch, boundary and drainage ditches, Northeast of Clapham;
- Scatter of Iron Age/Roman settlement activity of enclosures, linear ditches, curvilinear enclosures seen as cropmarks between Ravensden and Tempsford;
- Medieval ridge and furrow in Clapham, Wilden and Roxton;

- Medieval moat, Greys Hill Farm;
- Medieval holloways, earthworks and fishponds, Ravensden;
- Medieval/post-medieval linear features, trackways, field boundaries, Clapham Park Wood;
- Post-medieval Brickworks, Clapham;
- Undated pit, Clapham;
- Post medieval parish boundary and field boundaries, Clapham; and
- Second World War prisoner of war (POW), Clapham.

5.6.11. Number of non-designated heritage assets within the study area (500m):

- 1 Mesolithic to bronze age flint working site in the Clapham region;
- 3 Iron Age occupation sites in the Clapham region;
- 1 Roman site in the Clapham region;
- 2 Anglo-Saxon sites in the Clapham region;
- 5 medieval to post-medieval agricultural sites in the Clapham region;
- 2 Iron Age to Romano-British sites in the Ravensden region;
- 3 medieval settlement sites and deserted medieval village (DMV) in the Ravensden region;
- 2 post-medieval sites, brickworks and agricultural in the Ravensden region;
- 2 Iron Age to Romano-British sites in the Wilden region;
- 3 medieval agricultural sites in the Wilden region; and
- 2 post-medieval sites in the Wilden region.

5.6.12. In addition, findspots recorded in the HER identify activity from the Iron Age, Roman and Post-medieval periods within the draft Order limits and especially the medieval and post-medieval within 500m of the draft Order limits.

5.6.13. Locally listed assets within Clapham:

- Woodlands Manor;
- Clapham War Memorial;
- Methodist Church and front wall on High Street;
- 27A High Street (former Blacksmith's workshop);
- Airfield buildings at Twinwoods Airfield;
- Former Second World War POW;
- Camp Buildings at The Baulk; and
- The Ford River crossing.

5.6.14. Locally listed assets within Little Barford relating to the Manor House:

- North Lodge;
- South Lodge;
- Boundary Wall at New Manor House;

- South Close (former Vicarage);
- Garden Wall;
- Barns; and
- 1-8 The Cottages.

5.6.15. Within this section of the route, there is evidence for activity dating from the early prehistoric periods to the post-medieval. Significance of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage significance.

5.6.16. Archaeological remains associated with prehistoric/Roman settlement, funerary or ceremonial activity would be of medium or high heritage value. Remains associated with Anglo-Saxon sustained settlement activity or funerary activity would be of high heritage value, while agricultural remains are of medium heritage value. Medieval remains of settlement activity will be of medium heritage value, derived from archaeological and historical value. Remains of the former ridge & furrow, unless extensive and which could date to either the later medieval or post-medieval period, together with former field boundaries, ditches and trackways would be of low heritage value.

5.6.17. Locally listed buildings have important local heritage value due to their architectural, historic or archaeological significance relating to the local history of an area. Buildings are added to the local list in recognition of their value as irreplaceable historic assets which contribute to the quality of the local environment by enhancing the street scene and sustaining a sense of distinctiveness.

5.6.18. The character of the locally listed buildings between Clapham Green and Colesden is related to the rural hinterland and villages outside the busy town of Bedford, with 18th and 19th century domestic dwellings and workshops. The buildings also have the potential to reflect the war time character of the area associated with the RAF Twinwood Farm airfield.

Archaeological potential

5.6.19. There have been 15 archaeological investigations within the footprint of the Project, consisting of three geophysical surveys, seven trial trench evaluations, four watching briefs, and one excavation.

5.6.20. There have been 4 past investigations within the 500m study area. These mainly comprise aerial photographic surveys, geophysical surveys and trial trench evaluations, with a few watching briefs and targeted excavations. The wider area contains evidence for activity from the prehistoric to the post-medieval period with evidence predominately of settlement and land exploitation/agriculture.

5.6.21. Holocene paleochannels have been identified at the west of the Great Ouse north of Bedford. These sediments have the potential to seal or include significant geoarchaeological deposits and residual or stratified prehistoric artefactual evidence.

5.6.22. The Clapham Green to Colesden section of the route has a high potential for prehistoric and Roman settlement remains, a low potential for Early Medieval settlement and agricultural remains, a low potential for medieval and post-medieval settlement remains and a high potential for medieval and post-medieval agricultural remains.

5.7. Roxton to east of St Neots

Historic development and character

5.7.1. The Roxton to east of St Neots section of the route lies within the fertile valley of the Great Ouse, crossing the river terrace of the Great Ouse and Hen Brook to the east of St Neots. The route crosses the modern infrastructure of the A421 Great Barford Bypass which began in 2004 and was completed by the end of 2010. The road introduced a major travel link between Oxford, Milton Keynes, Bedford and Cambridge. To the northeast of Roxton, the A428 Black Cat to Caxton Gibbet improvement scheme is currently ongoing. As part of that scheme a large-scale programme of archaeological investigation was implemented, comprising geophysical survey, trial trenching and open excavation.

5.7.2. The river terrace of the Great Ouse, located to the east of Roxton, attracted early prehistoric activity and dense flint scatters dating to the Palaeolithic and the Mesolithic period, as well as hand axes, blades and arrowheads used for hunting have been discovered during the trial trenching for A428 Black Cat to Caxton Gibbet scheme, illustrating historic settlement patterns dating to the early prehistoric periods.

5.7.3. During the Neolithic period, the clay uplands of Bedfordshire within Roxton saw activity in the form of dispersed pits, pottery sherds, flintwork and several Neolithic crouched inhumations. Bronze Age barrow cemeteries in the form of ring ditches appear along the Great Ouse as well as cremation burials within Collared Urns and Beakers, discovered during the A428 Black Cat to Caxton Gibbet improvement scheme. The discoveries indicate that this area may have been a significant Neolithic landscape and that the inhabitants of the Neolithic period regarded these areas as a place of importance.

5.7.4. Evidence of small enclosed and unenclosed farmsteads demonstrating settlement activity dating to the Iron Age is widespread throughout the section in the form of cropmarks. By the Roman period, settlement activity increased, and the landscape was characterised by farmsteads, enclosed fields and hamlets connected by roads. During trial trenching for A428 Black Cat to Caxton Gibbet scheme, a Roman inhumation cemetery containing 16 inhumations and grave goods (decorative glass vessel, beakers and a coin) was found illustrating the historic Roman settlement patterns within the area of Roxton.

5.7.5. Anglo-Saxon settlement within this section is minimal, but a focus of activity was discovered within the Great Ouse valley at Black Cat Quarry to the north of Tempsford during the A428 improvement scheme, in the form of sunken feature

buildings. During this period, the Great Ouse may have been a significant trade route to wider settlement.

5.7.6. During the Medieval period, many of the villages along the route were established and most parishes have evidence for the development of sub-manors in the form of moated sites. Most of the route will have been agricultural land utilised as part of the open field system of the surrounding villages and manors.

5.7.7. The agricultural character of the area has remained since the 20th century, but areas of modern development have occurred, such as the A428 to the east of St Neots.

Heritage assets - designated heritage assets

5.7.8. Designated heritage assets which sit within the draft Order Limits comprise:

- Grade II listed Tempsford Bridge and Flanking Flood Bridges (NHLE 1321633); and
- Tempsford Bridge Scheduled Monument (NHLE 1005393).

5.7.9. Number of designated heritage assets within the study area (1km):

- 5 scheduled monuments;
- 4 Grade II* listed buildings;
- 80 Grade II listed buildings;
- 0 registered parks and gardens; and
- 1 conservation area (Roxton).

5.7.10. Within the footprint of the draft Order limits there is one scheduled monument and one Grade II listed building. The scheduled monument is a heritage asset of high significance and highlights the historical value of 19th century engineering and architecture. Tempsford Bridge and Flanking Flood Bridges (NHLE 1321633) was constructed in 1820 and links the historic parishes of Roxton and Tempsford. The bridge has historical value as an example of 19th century engineering and its historical relationship to the surrounding area.

Heritage assets - non-designated heritage assets

5.7.11. Non-designated heritage assets which sit within the draft Order Limits comprise:

- Prehistoric flint flake scatter, St Neots;
- Iron Age cropmarks and enclosures, Roxton to Croxton;
- Iron Age or Roman settlements, near the Black Cat Quarry site;
- Scatter of Iron Age/Roman settlement activity as seen in cropmarks, Roxton and St Neots;

- Roman Roads, St Neots;
- Anglo-Saxon occupation sites, near the Black Cat Quarry site;
- Medieval ridge and furrow by the Black Cat Quarry site;
- Post-medieval toll roads, Roxton and St Neots; and
- Site of post-medieval kiln building, near Black Cat Quarry site.

5.7.12. Number of non-designated heritage assets within the study area (500m):

- 2 areas of early prehistoric occupation in the Roxton region;
- 2 Bronze Age sites in the Roxton region;
- 2 Iron Age to Romano-British sites between Roxton to east of St Neots;
- 2 Anglo-Saxon sites in the Roxton region;
- Areas of medieval ridge and furrow from Roxton to east of St Neots;
- 4 medieval villages and associated features in the Roxton region; and
- 3 post-medieval sites of gravel extraction in the Roxton region.

5.7.13. In addition, findspots recorded in the HER identify activity from the Iron Age, Medieval and Post-medieval within the draft Order limits and especially the Prehistoric, Roman and post-medieval within 500m of the draft Order limits.

5.7.14. Within this section of the route, there is evidence for activity dating from the early prehistoric periods to the post-medieval. Significance of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage significance.

5.7.15. Archaeological remains associated with prehistoric/Roman settlement, funerary or ceremonial activity would be of medium or high heritage value. Remains associated with Anglo-Saxon sustained settlement activity or funerary activity would be of high heritage value, while agricultural remains are of medium heritage value. Medieval remains of settlement activity will be of medium heritage value, derived from archaeological and historical value. Remains of the former ridge & furrow, unless extensive and which could date to either the later medieval or post-medieval period, together with former field boundaries, ditches and trackways would be of low heritage value.

5.7.16. Locally listed buildings have important local heritage value due to their architectural, historic or archaeological significance relating to the local history of an area. Buildings are added to the local list in recognition of their value as irreplaceable historic assets which contribute to the quality of the local environment by enhancing the street scene and sustaining a sense of distinctiveness.

5.7.17. There is currently no list of locally important structures within the Huntingdonshire district of Cambridgeshire, however, there will be non-designated built heritage assets associated within these areas. The character of

the locally listed buildings between Roxton and east of St Neots is related to the rural hinterland and villages outside the busy town of St Neots, with 18th and 19th century domestic dwellings and farm buildings.

Archaeological potential

5.7.18. There have been 16 archaeological investigations within the footprint of the Project, consisting of four geophysical surveys, two field walking surveys, two aerial photographic surveys, four trial trench evaluations and two watching briefs., and two excavations.

5.7.19. There have been 29 past investigations within the 500m study area. These mainly comprise aerial photographic surveys, geophysical surveys and trial trench evaluations, with a few watching briefs and targeted excavations. The wider area contains evidence for activity from the prehistoric to the post-medieval period with evidence predominately of settlement and land exploitation/agriculture.

5.7.20. Holocene paleochannels have been identified at the area south of St Neots and there are also extensive Pleistocene River Terrace deposits flanking the Great Ouse to the south of St Neots. These sediments have the potential to seal or include significant geoarchaeological deposits and residual or stratified prehistoric artefactual evidence.

5.7.21. The Roxton to east of St Neots section of the route has a high potential for prehistoric and Roman settlement remains, a low potential for Early Medieval settlement and agricultural remains, a low potential for medieval and post-medieval settlement remains and a high potential for medieval and post-medieval agricultural remains.

5.8. Croxton to Toft

Historic development and character

5.8.1. The Croxton to Toft section of the route travels along the Cambridgeshire clay lands to the east of St Neots before entering the valley of Bourne Brook within Toft. The existing A428, built in 2007, crosses the Project to the east of St Neots and follows a line, just south of the route to Cambourne.

5.8.2. Early prehistoric activity within the Great Ouse valley, dating to the Palaeolithic and Mesolithic period of flint scatters and hunting tools demonstrates the mobile hunter-gatherer communities exploiting natural resources.

5.8.3. Between Croxton and Toft, Neolithic and Bronze Age settlement evidence within the landscape is rare, with the Ouse Valley between Bedford and St Neots acting as a focus of settlement and ritual activity.

5.8.4. During the Iron Age, settlement density increased with a focus on round houses, enclosures, and linear features relating to Iron Age farmsteads. A number of established and suspected villa sites reinforce the impression of a carefully planned, intensively occupied and cultivated landscape in the Bourn Valleys. The Roman period also saw the introduction of roads and a major road crosses the Project within this section of the route; Ermine Street.

5.8.5. The Early Medieval period following the Roman withdrawal saw major abandonment of settlements within this section of the route, with activity focussing on the larger towns such as St Neots and Cambridge. Towards the end of this period, small hamlets and villages of farming communities started to emerge along the route within Caldecote, Comberton and Toft. The agricultural activity associated with these early farming communities is seen in this section of the Project in the form of linear ditches.

5.8.6. During the medieval period, villages started to be abandoned, possibly because of the unviability of the area and the move to larger settlements. The section of the route between Croxton and Toft is evident of the desertion but also the development of estates into major post-medieval aristocratic estates, some with designed landscapes, e.g., Croxton Park. The landscape between Croxton and Toft is dotted with medieval moated manors and associated fishponds, but most of the area will have been agricultural land utilised as part of the open field systems of surrounding villages and manors.

5.8.7. This section of the route has remained a broadly agricultural landscape from the post-medieval period until present; first as open fields and then as a planned field system, with smaller fields surrounded by hedgerows, following Parliamentary enclosure during the 18th and 19th centuries. Significant rationalisation of field boundaries occurred during the 20th century, with many of the enclosure hedgerows removed and fields amalgamated.

5.8.8. The agricultural character of the area has remained since the 20th century, but areas of modern development have occurred, such as the creation of Cambourne in 1998. Development also occurred during World War II within this section of the route, with an airfield (RAF Bourn) situated to the east of the new town of Cambourne. The airfield was built in 1940/41 and became a bomber station in early 1942. Several wartime aircraft crash sites are known around and at the airfield, and it was attacked on multiple occasions by Luftwaffe intruders. Few of the airfield buildings are now extant, but the runways largely survive and are partly in use as a recreational airfield.

Heritage assets - designated heritage assets

5.8.9. Designated heritage assets which sit within the draft Order limits comprise:

- Grade II listed New Inn Farmhouse, St Neots Road (NHLE 1127144); and

- Grade II listed Barns to north of New Inn Farmhouse, St Neots Road (NHLE 1331400).

5.8.10. Number of designated heritage assets within the study area (1km):

- 6 scheduled monuments;
- 4 Grade II* listed buildings;
- 89 Grade II listed buildings;
- 1 registered parks and gardens; and
- 5 conservation areas.

5.8.11. Within the draft Order limits there are two Grade II listed assets of high heritage value that have the potential to be impacted by the Project. New Inn Farmhouse (NHLE 1127144) and Barns to north of New Inn Farmhouse (NHLE 1331400) are late 18th to early 19th century buildings, illustrative of the historical architecture used in the area at the time.

Heritage assets - non-designated heritage assets

5.8.12. Non-designated heritage assets which sit within the draft Order limits comprise:

- Bronze Age ring gullies, Black Cat to Caxton Gibbet;
- Multiphase Iron Age enclosures and Roman ladder settlement, Black Cat to Caxton Gibbet;
- Iron Age enclosures, Croxton;
- Iron Age to Romano-British settlement of curvilinear enclosures and ditches, Toft;
- Complex Iron Age to Roman settlement of ditches, small enclosures and ring gullies, Bourne Airfield;
- Ermine Street Roman Road;
- Medieval agricultural activity of ridge and furrow, field boundaries and ditches across this section;
- Medieval to post-medieval routeways, field boundaries and ditches, Toft;
- WW2 pillbox, beacons and mileposts, Bourne Airfield; and
- Enclosures of unknown date, Croxton.

5.8.13. Numbers of non-designated heritage assets within the study area (500m):

- 2 Iron Age to Roman sites in the Eltisley region;
- 2 medieval sites in the Eltisley region;
- 4 medieval to post-medieval furrow areas in the Eltisley region;
- 1 Mesolithic to Neolithic site in the Cambourne region;
- 1 Bronze Age site in the Cambourne region;
- 3 Iron Age to Roman sites in the Cambourne region; and
- 4 medieval to post-medieval sites in the Cambourne region.

5.8.14. In addition, findspots recorded in the HER identify activity from the Mesolithic and Neolithic, Roman and Post-medieval within the draft Order limits and Neolithic, Roman and Medieval within 500m of the draft Order limits.

5.8.15. Within this section of the route, there is evidence for activity dating from the early prehistoric periods to the post-medieval. The heritage value of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage value.

5.8.16. Archaeological remains associated with prehistoric/Roman settlement, funerary or ceremonial activity would be of medium or high heritage value. Remains associated with Anglo-Saxon sustained settlement activity would be of high heritage value, while agricultural remains are of medium heritage value. Medieval remains of settlement activity will be of medium heritage value, derived from archaeological and historical value. Remains of the former ridge & furrow, unless extensive and which could date to either the later medieval or post-medieval period, together with former field boundaries, ditches and trackways would be of low heritage value.

5.8.17. There is currently no list of locally important structures within the Huntingdonshire district of Cambridgeshire, however, there will be non-designated built heritage assets associated within these areas. The character of the local buildings is likely to be related to the rural hinterland and villages that run between Croxton to Toft, including 18th and 19th century domestic dwellings and farm buildings.

Archaeological potential

5.8.18. There have been 14 archaeological investigations within the footprint of the Project, consisting of three aerial photographic surveys, four geophysical surveys, three fieldwalking exercises, three trial trench evaluations and one excavation.

5.8.19. There have been 78 past investigations within the 500m study area. These mainly comprise aerial photographic surveys, geophysical surveys and trial trench evaluations, with a few watching briefs and targeted excavations. The wider area contains evidence for activity from the prehistoric to the post-medieval period with evidence predominately of settlement and land exploitation/agriculture.

5.8.20. The bedrock along this section comprises of mudstone. The overlying geology of alluvium, localised peat, paleochannels and the river terrace sand, gravel, clay and silt have potential to seal or include significant geoarchaeological deposits and residual or stratified earlier prehistoric artefactual evidence.

5.8.21. The Croxton to Toft section of the route has a high potential for prehistoric and Roman settlement remains, a low potential for Early Medieval settlement and agricultural remains, a low potential for medieval and post-medieval settlement remains and a high potential for medieval and post-medieval settlement and agricultural remains.

5.9. Comberton to Shelford

Historic development and character

5.9.1. The Comberton to Shelford section of the route follows the low-lying undulating landscape within the shallow valleys of the Bourne Brook and the River Cam, where a pattern of settlement for rural villages was established, before meeting the extant rail line to the south of Great Shelford. The M11 crosses the route between Hauxton and Little Shelford and was constructed between 1975 and 1980 to connect Cambridge to London.

5.9.2. Within the higher ground of the Cam valley, to the west of Cambridge, Neolithic and Bronze Age settlement and funerary activity is prevalent in the form of a barrow cemetery at Money Hill to the south of Haslingfield. While, to the south-east of Hauxton there is evidence of flint working and a Neolithic causeway enclosure in the form of cropmarks.

5.9.3. During the Iron Age, settlement density on the Cambridgeshire clay lands increased with a focus on round houses, enclosures, and linear features relating to Iron Age farmsteads. An extremely complex and extensive settlement of probable Iron Age/Roman date is visible as cropmarks within Harston. This demonstrates the system of settlement continuing in use into the Roman period and larger ladder settlements starting to emerge. A number of established and suspected villa sites reinforce the impression of a carefully planned, intensively occupied and cultivated landscape in the Cam Valleys. The Roman period also saw the introduction of roads and three major roads cross the Project within this section of the route; the Sandy to Godmanchester Roman Road, the Cambridge to Hauxton Mill-Mare Way and the Cambridge to Barton Roman Road.

5.9.4. The Early Medieval period following the Roman withdrawal saw major abandonment of settlements within this section of the route, with activity focussing on the larger towns such as St Neots and Cambridge. Towards the end of this period, small hamlets and villages of farming communities started to emerge along the route within Harston, Haslingfield, Hauxton, Little Shelford and Great Shelford. The agricultural activity associated with these early farming communities is seen in this section of the Project in the form of linear ditches.

5.9.5. During the medieval period, villages started to be abandoned, possibly because of the unviability of the area and the move to larger settlements. Within the area between Comberton and Shelford, five main villages were established, Harston, Haslingfield, Hauxton, Little Shelford and Great Shelford. The establishment of these villages demonstrates broadly the surviving character of this landscape, of isolated villages connected by the rural landscape and a single road, within the lower valleys. Earthworks within the vicinity of these villages show the agricultural use of the area in the later medieval period and the exploitation by the known settlements.

5.9.6. The agricultural use of the area continued into the post-medieval period and the known settlements expanded. As a result of the Parliamentary Enclosure Acts of the 19th century, the fields were enclosed, until the amalgamation of field boundaries in the 20th century removed hedgerows. During the 20th century, Great Shelford was colonised by academics of the University of Cambridge, and the character of the area became more residential as it transformed into a home for commuters.

5.9.7. The area around Chapel Hill to the south of Haslingfield, demonstrates the historic landscape character of the area as the higher ground has been utilised since the prehistoric period and there is a medieval pilgrimage link from an old chapel on top of the hill to Harston, through the Money Hill barrow cemetery.

5.9.8. This section of the route has remained a broadly agricultural landscape from the post-medieval period until present; first as open fields and then as a planned field system, with smaller fields surrounded by hedgerows, following Parliamentary Enclosure during the 18th and 19th centuries. Significant rationalisation of field boundaries occurred during the 20th century, with many of the enclosure hedgerows removed and fields amalgamated.

Heritage assets - designated heritage assets

5.9.9. Designated heritage assets which sit within the draft Order limits comprise:

- Settlement site at Manor Farm Scheduled Monument (NHLE 1006809);
- Moated complex 260m north-west of Fryers Cottage Scheduled Monument (NHLE 1019179);
- West of White Hill Farm Scheduled Monument (NHLE 1006891);
- Settlement north-west of Little Shelford Scheduled Monument (NHLE 1006902); and
- Grade II listed Milestone about 400 yards north of Crossroads (NHLE 1127854).

5.9.10. Number of designated heritage assets within the study area (1km):

- 10 scheduled monuments;

- 5 Grade I listed buildings;
- 15 Grade II* listed buildings;
- 213 Grade II listed buildings;
- 0 registered park and gardens; and
- 4 conservation areas.

5.9.11. Within the draft Order limits there are five assets that have heritage value and that have the potential to be impacted by the Project. Four of the assets are Scheduled Monuments and are of high heritage value; the Settlement site at Manor Farm (NHLE 1006809) demonstrates the early inhabitation of the area and carries historical value. While the Moated complex 260m north-west of Fryers Cottage (NHLE 1019179) to the north-west of Harlton, has historical value as an example of a significant historical tradition of constructing and using fishponds that peaked in the 12th century in England. The West of White Hill Farm (NHLE 1006891) and the Settlement north-west of Little Shelford Scheduled Monument (NHLE 1006902) demonstrate the early inhabitation and historical value of the area.

5.9.12. There is one Grade II listed asset within the draft Order limits which is of high heritage value. The Milestone about 400 yards north of Crossroads (NHLE 1127854) to the north of Newton is an important feature dating to 1730 and is an example of early sign posting and markers for the route into Cambridge.

Heritage assets - non-designated heritage assets

5.9.13. Non-designated heritage assets which sit within the draft Order limits comprise:

- Bronze Age round barrow, Comberton;
- Roman and post medieval quarry pits, Great Shelford;
- Bronze Age round barrow cemetery at Money Hill, Haslingfield;
- Prehistoric enclosures associated with the settlement site at Manor Farm Scheduled Monument, Harston;
- Multiphase enclosures associated with Moated Scheduled Monument, north-west of Harlton;
- Sandy to Godmanchester Roman Road, Cambridge to Bolnhurst Roman Road, Arrington to Cambridge Roman Road and Red Cross to Hauxton Roman Road;
- Scatter of Anglo-Saxon findspots including a brooches, pottery and pits, Money Hill;
- Medieval agricultural activity of ridge and furrow, field boundaries and ditches across this section; Medieval to post-medieval routeways, field boundaries and ditches, Cambourne;
- Medieval to 19th century Windmill Mound, Toft;
- 19th century coprolite industry at Haslingfield; and

- WW2 installations, Little Eversden.

5.9.14. Numbers of non-designated heritage assets within the study area (500m):

- 1 Mesolithic to Neolithic site in the Cambourne region;
- 1 Bronze Age site in the Cambourne region;
- 3 Iron Age to Roman sites in the Cambourne region;
- 4 medieval to post-medieval sites in the Cambourne region;
- 3 Iron Age sites in the Hardwick region;
- 2 Romano-British sites in the Hardwick region;
- 1 Anglo-Saxon site in the Hardwick region;
- 4 medieval to post-medieval sites in the Hardwick region;
- 2 Bronze Age sites in the Haslingfield region;
- 4 Iron Age sites in the Haslingfield region;
- 2 Roman sites in the Haslingfield region;
- 4 Medieval sites in the Haslingfield region;
- 3 post-medieval sites in the Haslingfield region; and
- Areas of medieval ridge and furrow in the Newton and Haslingfield area.

5.9.15. In addition, findspots recorded in the HER identify activity from the Bronze Age, Iron Age, Roman, Medieval and Post-Medieval within the draft Order limits and the above as well as Neolithic and 500m of the draft Order limits.

5.9.16. Within this section of the route, there is evidence for activity dating from the early prehistoric periods to the post-medieval. The heritage value of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage value.

5.9.17. Archaeological remains associated with prehistoric/Roman settlement, funerary or ceremonial activity would be of medium or high heritage value. Remains associated with Anglo-Saxon sustained settlement activity would be of high heritage value, while agricultural remains are of medium heritage value. Medieval remains of settlement activity will be of medium heritage value, derived from archaeological and historical value. Remains of the former ridge & furrow, unless extensive and which could date to either the later medieval or post-medieval period, together with former field boundaries, ditches and trackways would be of low heritage value.

5.9.18. There is currently no list of locally important structures within the south Cambridgeshire district of Cambridgeshire, however, there will be non-designated built heritage assets associated within these areas. The character of the local buildings is likely to be related to the rural hinterland and villages that run between Comberton to Shelford, including 18th and 19th century domestic dwellings and farm buildings.

Archaeological potential

5.9.19. There have been 42 archaeological investigations within the footprint of the Project, consisting of four aerial photographic surveys, one geophysical survey, one fieldwalking exercise, 16 evaluations, five archaeological monitoring exercises, and four excavations.

5.9.20. There have been 111 past investigations within the 500m study area. These mainly comprise aerial photographic surveys, geophysical surveys and trial trench evaluations, with a few watching briefs and targeted excavations. The wider area contains evidence for activity from the prehistoric to the post-medieval period with evidence predominately of settlement and land exploitation/agriculture.

5.9.21. The bedrock geology of the Cam valley comprises Chalk and Mudstone. The overlying geology of alluvium, localised peat, paleochannels and the river terrace sand/gravels have potential to seal or include significant geoarchaeological deposits and residual or stratified earlier prehistoric artefactual evidence.

5.9.22. The Comberton to Shelford section of the route has a high potential for prehistoric and Roman settlement remains, a low potential for Early Medieval settlement and agricultural remains, a low potential for medieval and post-medieval settlement remains and a high potential for medieval and post-medieval settlement and agricultural remains.

5.10. Cambridge

Historic development and character

5.10.1. The section of the route within Cambridge follows the extant rail line from Great Shelford to Cambridge North.

5.10.2. Cambridge has a rich history and has been the focus of activity from the early prehistoric period. During the Iron Age, a large hillfort was constructed on Castle Hill and marked the area as an important focal point for defensive settlements and trade. With the arrival of the Romans, the settlement was requisitioned and the principal Roman site of Duroliponte was established, as a small fort and military station. The fort was expanded and converted to civilian use in the 2nd century and by the 3rd century it had become a town with walled defences. Numerous farmsteads and villages have been discovered around Cambridgeshire within the agricultural hinterland surrounding the city. It is likely that these smaller settlements would trade with the main settlement of Cambridge.

5.10.3. By the time of the Early Medieval period, the settlement on Castle Hill had expanded on both sides of the river and was called Cair Grauth, one of the 28 cities known to be in Briton at this time. Small historic Parishes outside the main focal point of Cambridge started to emerge with evidence of farming communities in Little Shelford, Great Shelford and Milton. When the Vikings arrived in 875, their trading habits resulted in the rapid growth of the town and the town centre shift from Castle Hill to Quayside. During the Norman Conquest of 1066, William the Conqueror erected a castle on Castle Hill, the motte of which still survives, and Cambridge fell under the Kings control. In the 12th century many churches were erected, including the Round Church and in the 13th century, Cambridge University was founded.

5.10.4. Within the footprint of the Project, the character area is dominated by the historical development of Cambridge, including the railway, commercial and domestic expansion and university buildings. The railway came to Cambridge in 1845 with the opening of the Great Eastern Railway's London to Norwich line. With the arrival of the railway and associated employment, came development of areas around the station. The rail link to London stimulated heavier industries, such as the production of brick, cement and malt.

5.10.5. In the 19th century, Cambridge expanded rapidly, due in part to increased life expectancy and improved agricultural production leading to increased trade in town markets. The Enclosure Acts of 1801 and 1807 enabled the town to expand over surrounding open fields and in 1912 and again in 1935 its boundaries were extended to include Chesterton, Cherry Hinton, and Trumpington.

5.10.6. From the 21st century, the increase in population meant the size of the city of Cambridge increased. Major development ensued with the introduction of large council estates; including Milton to the north, Cherry Hilton to the east and Trumpington to the south. During World War II, Cambridge was an important centre for defence of the east coast. The town became a military centre, with an R.A.F. training centre and the regional headquarters for surrounding counties.

Heritage assets - designated heritage assets

5.10.7. Designated heritage assets which sit within the draft Order limits comprise:

- Grade II listed Railway Station, Cambridge (NHLE 1343683).

5.10.8. Number of designated heritage assets within the study area (1km):

- 4 scheduled monuments;
- 4 Grade I listed buildings;
- 12 Grade II* listed buildings;
- 155 Grade II listed buildings;

- 2 registered parks and gardens; and
- 6 conservation areas.

5.10.9. Within the draft Order limits there is one Grade II listed asset of high heritage value. The Cambridge railway station (NHLE 1343683) is an obvious historical asset and demonstrates the engineering and architectural ability of the 19th century.

Heritage assets - non-designated heritage assets

5.10.10. Non-designated heritage assets which sit within the draft Order limits comprise:

- Neolithic Causeway cropmarks, Hauxton;
- Series of prehistoric enclosures associated with West of White Hill Farm Scheduled Monument;
- Iron Age to Roman settlement enclosures, ditches and pit alignments associated with the Settlement north-west of Little Shelford Scheduled Monument;
- Iron Age to Romano-British settlement evidence and field systems at Grahams Farm;
- Cemetery site featuring Iron Age cremations and Anglo- Saxon burials, Milton;
- Early Anglo-Saxon remains of possible settlement in the form of pit clusters and a well, Addenbrookes Link Road;
- Medieval agricultural activity of ridge and furrow and field boundaries between Hauxton and Little Shelford;
- Granhams medieval Manor Chapel;
- WW2 concrete base, Cromwell Road;
- Features relating to the earlier railway; Engine shed, warehouse, coal yard, and tracks, south of Cambridge Station.
- Post medieval remains, Homerton College;
- Pre-historic stone object, Purbeck Road;
- Milestone, B1369, Newton;
- WWII Bombing craters, Fen Ditton;
- Chesterton railway Junction, Milton;
- Former site of Coldham's Lane Crossing, Coldhams Lane; and
- Cropmark complex, south of Long Road.

5.10.11. Numbers of non-designated heritage assets within the study area (500m):

- Areas of Cropmarks of coprolite extraction, Fen Ditton region;
- Barnwell Baptist Church, Cambridge;
- 3 Iron Age/Roman sites in the Hauxton to Great Shelford region;
- 3 Roman sites in the Hauxton to Great Shelford region;

- 1 Anglo- Saxon site in the Hauxton to great Shelford region;
- 3 medieval sites in the Hauxton to Great Shelford region;
- 2 post-medieval sites in the Hauxton to Great Shelford region;
- 1 Roman site in the Cherry Hinton region;
- 1Iron Age settlement in the Cherry Hinton region;
- 1 Mesolithic site in the Trumpington region;
- 2 Neolithic to Bronze Age site in the Trumpington region;
- 3 Iron Age to Roman site in the Trumpington region;
- 1 Anglo- Saxon site in the Trumpington region;
- 2 medieval sites in the Trumpington region;
- 2 post-medieval sites in the Trumpington region;
- 2 Bronze Age sites in the Cambridge region;
- 2 Iron Age to Roman sites in the Cambridge region;
- 2 Roman site in the Cambridge region;
- 3 medieval sites in the Cambridge region;
- 4 medieval to post-medieval sites in the Cambridge region;
- 5 post-medieval sites in the Cambridge region;
- 2 air raid shelters in Fen Ditton;
- Late iron age/roman features and activity Fulbourn Park; and
- Medieval and post medieval activity, area surrounding Fulbourn Hospital.

5.10.12. Locally listed buildings within the study area (500m):

- 33 to 38 Abbey Walk;
- St Bede's Secondary School - Birdwood Road;
- University Bowls Club, 18, 20 & 22 Wyndham House, 22A Elmhurst – Brooklands Avenue;
- Pumping Station and Manager's House – Cheddars Lane;
- 121 Wroxton House – Church End, Cherry Hinton;
- 101 The Weigh House – Coldham's Lane;
- 3 to 9 Fitzwilliam Road;
- The Bath House, Former Dales Brewery and 186 The David Parr House – Gwydir Street;
- 41 Claremont, 55 to 59 (with 1 to 7 Station Road) and 63-69 Eastbourne Terrace, 101 to 125 College Terrace, The Earl of Derby, Great Hall, Homerton College and Hills Road Sixth Form College and Lodge – Hills Road;
- 102 Friarswood, 127 to 133 Mill Cottages and Long Road Sixth Form College – Long Road;
- 1 to 5 Mackenzie Road;
- 90A Lloyds Bank, Ditchburn Place, St Philip's Church, 238 to 240 Former St Philip's Vicarage, 274 Romsey House, 292 Royal Standard, Brookfields Hospital, Mill Road Baptist Church, Romsey Town Labour Club, The Salisbury

Club, Sally Ann's, St Barnabas Church and No's 32, 34, 84, 92A to 104A, 175, 177, 184, 186, 191, 206, 212 and 228 – Mills Road;

- Rock Road Library;
- St Philips Infant School – Ross Street;
- 20 to 62, 11A to 51, 59 to 61, St Barnabas Church Hall and The Old School, Rear of St Barnabas Church – St Barnabas Road;
- 21 Argyle Villa – St Phillip's Road;
- Water Alms Houses – Seymour Street;
- 4 Shaftesbury House – Shaftesbury Road;
- 1 to 7 (with 55-59 Hills Road), 6 to 9 Salisbury Villas, 9 to 15 Arundel Villas, 17 St Andrews, Foster Mills and Statue of Ceres – Station Road; and
- Salvation Army Citadel, 23 Bolton's Warehouse, 67 and 83 to 91 – Tenison Road.

5.10.13. Within this section of the route, there is evidence for activity dating from the early prehistoric periods to the post-medieval. The heritage value of non-designated remains will depend upon the nature of the remains and the extent of survival. Any isolated or residual artefacts would be of low heritage value.

5.10.14. Archaeological remains associated with prehistoric/Roman settlement, funerary or ceremonial activity would be of medium or high heritage value. Remains associated with Anglo-Saxon sustained settlement activity or funerary activity would be of high heritage value, while agricultural remains are of medium heritage value. Medieval remains of settlement activity will be of medium heritage value, derived from archaeological and historical value. Remains of the former ridge & furrow, unless extensive and which could date to either the later medieval or post-medieval period, together with former field boundaries, ditches and trackways would be of low heritage value.

5.10.15. Within this section, the listed and locally listed buildings are predominately buildings related to the University and religious institutions, as well as examples of the 18th to 20th century expansion of Cambridge and the architectural style that characterises the city and surrounding areas. The buildings highlight the historical relationship of the expansion of the city of Cambridge from medieval architecture to early modern houses, schools and recreational facilities.

Archaeological potential

5.10.16. There have been 42 archaeological investigations within the footprint of the Project, consisting of five aerial photographic surveys, one geophysical surveys, one fieldwalking exercise, 16 trial trench evaluations, two watching brief, five archaeological monitoring, and two excavations.

5.10.17. There have been 198 past investigations within the 500m study area. These mainly comprise trial trench evaluations and geophysical surveys with a few

watching briefs and targeted excavations. The wider area contains evidence for activity from the prehistoric to the post-medieval period with evidence predominately of settlement and land exploitation/agriculture.

5.10.18. The shallow valleys of the Gallow Brook and the River Cam have deposits of glacial till underlain by mudstone bedrock. In the Cam valley to the east are Pleistocene River Terraces and alluvium on the valley floor. The river terraces have the potential to reveal Middle and Late Palaeolithic and Mesolithic stratified sedimentary sequences with associated archaeology and environmental evidence, especially in the finer interstadial deposits. Holocene alluvium associated with the valley floor of the River Cam have potential for depositional microenvironments, each associated with distinctive deposits that can be used in paleoenvironmental reconstruction and may contain deposits from the Mesolithic.

5.10.19. The Cambridge section of the route has a high potential for prehistoric and Roman settlement remains, a low potential for Early Medieval/ Anglo-Saxon settlement and agricultural remains, a low potential for medieval and post-medieval settlement remains and a high potential for medieval and post-medieval agricultural remains.

5.11. Future Baseline

5.11.1. An understanding of the future baseline will form part of the assessment of cumulative impacts within the ES. This section explains how an understanding of the future baseline twill be approached with specific regard to the historic environment. The future baseline will be understood in relation to expected change within the study area in a 'do nothing' scenario, including where East West Rail is not constructed.

5.11.2. There are two specific factors which will form the historic environment future baseline. These are the changes as a result of climate change, and as a result of committed development.

5.11.3. Climate change is manifesting as a variety of climate hazards which may pose risks to historic environment assets. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.11.4. Refer to the section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

5.11.5. An understanding of the specific climate trends within the study area to 2100 AD is provided in the climate resilience Method Statement. This will inform an understanding of potential climatic effects on historic environment assets to enable assessment of cumulative effects of the Project and effect from climate change to an accurate future baseline.

5.11.6. Future planned developments within the study area also have the potential to present cumulative effects for the historic environment. Increased levels of effect to a heritage asset or group of heritage assets may be experienced where both a committed development and the Project affect their heritage value. For example committed development to the south of Cambridge may result in a set of important historic views from a conservation area being disrupted. The Project may result in a different set of historic views from the same conservation area being disrupted. Whilst individually this would have a limited effect on the heritage value of the conservation area cumulatively disruption of two sets of views could have a significant overall impact on the value of the conservation area.

6. Impacts

6.1. Overview

6.1.1. This section describes how the Project has the potential to cause change to the historic environment. These potential impacts have informed the assessment methodology (see section 8) and the scoping exercise (see section 10). The relationship between impact, heritage value and significance of effect is described below in section 7 with regard to the ES methodology.

6.2. Types and sources of impacts

6.2.1. This section describes the types and sources of impacts which are anticipated from the Project with regard to the historic environment. The impact to the historic environment will differ considerably along the length of the Project, due to greatly differing degrees of intervention. From Oxford to Bedford and Shelford to Cambridge proposals relate largely to additions and changes to existing railway infrastructure. However, between Bedford and Shelford the proposed development consists of the creation of an entirely new railway and associated works. There will therefore be greater overall change within Bedford to Shelford, with more localised impacts affecting selected assets predicted between Oxford to Bedford and Shelford to Cambridge.

6.2.2. To fully assess the potential impact of the Project on the historic environment, assets will be assessed for the following;

- Temporary impacts; and
- Permanent impacts.

6.2.3. The types and sources of impacts anticipated in relation to each of these is discussed below using illustrative examples where appropriate.

Temporary impacts

6.2.4. Temporary impacts are those changes which will be time limited and are generally associated with the construction of the Project.

6.2.5. The appearance of temporary construction compounds, access routes and work sites will introduce visual and noise intrusion into the setting of heritage assets for the duration of construction. Movement of plant and construction traffic within construction sites, temporary haul routes or on the existing road network has the potential to visually and audibly impact the setting of heritage assets and the historic landscape character. Temporary traffic diversions may also have a similar impact, especially in conservation areas or important historic landscape character areas.

Around extant station buildings, where there is an intensity of proposed activity over longer periods, this is likely to alter how buildings are understood and alter functionality during the works. These may alter how station buildings are experienced for the duration of construction. In rural contexts, and where there are open views, the introduction of construction activities has the potential to alter the setting of heritage assets and historic landscape character. These may affect the tranquillity, darkness at night and other aspects of a rural setting of assets. However, where noise and/or light forms part of the setting of a building already, for example in a working farmyard or urban context, impact from the temporary presence of construction activity may be lesser.

Permanent impacts

6.2.6. Permanent impacts are those which will result in permanent changes to the built environment and landscape, and from the operation of the Project. The areas between Bedford and Shelford have the greatest potential for permanent impacts to the historic environment due to the construction and operation of a new section of railway, however there is potential for permanent impacts along all the route.

6.2.7. Assets closest to the route and construction areas have potential for permanent physical impact. Permanent impacts to existing buildings, for example Cambridge Station, are expected where they are subject to changes to accommodate the Project, and impacts may result from altering the design, layout or circulation patterns of the building.

6.2.8. Some locally important buildings and structures may need to be demolished to facilitate the Project. These may include, for example, historic rail structures within the existing rail corridor and buildings in Bedford to facilitate new tracks. There is also potential for permanent impacts from the vibration of construction activities which can loosen historic mortar damaging brickwork. Impacts by way of accidental damage could also result from the movement of construction vehicles and construction itself, when in proximity to heritage assets.

6.2.9. Excavation and other ground disturbance is likely to cause physical permanent impacts to the historic environment, most substantially where new track is laid, diversions of roads and utilities are required, new stations and compounds are constructed, drainage works including balancing ponds and ground levelling activities occur. This has the potential to permanently impact archaeological remains through disturbance or removal. Drainage works also have the potential to change the hydrology which may result in impacts to historic water bodies, for example moated sites.

6.2.10. The presence of new infrastructure including stations at Tempsford and Cambourne, tracks, landscape and engineering earthworks, buildings,

structures, road and utility diversions, is likely to result in permanent impacts related to changes to visual and historic relationships between heritage assets and the historic landscape and to the setting of designated and non-designated heritage assets. Where overhead electrification is required, this could result in greater visual intrusion from the constructed Project, due to the presence of additional above ground structures on the railway. This would include visibility of the continuous, linear overhead lines and supporting infrastructure.

6.2.11. Permanent impacts resulting from Project operation are likely to result from visual and audible changes in the setting of heritage assets or within the historic landscape from movement of trains. Similar changes may also occur through additional vehicular and pedestrian traffic, most likely focussed around new and existing stations, as a result of the use of the railway. The presence of freight trains on the route, including overnight will result in greater noise than passenger trains would alone. Additional light within the setting of heritage assets may also result in impact, where this is introduced as fixed lighting part of stations and platforms and from train movements at night. Freight trains will contribute to this as they operate through the night. Impacts through visual and audible changes, are likely to also occur to a lesser extent as a result of maintenance requirements related to the Project.

7. Assumed design, mitigation and enhancement measures

7.1. Mitigation principles

7.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

7.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on cultural and heritage assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce or otherwise mitigate potentially likely significant effects. The Project proposals will therefore have embedded within them various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

7.1.3. The draft Order limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

7.1.4. For the assessment of impacts on the historic environment embedded mitigation might include:

- Where design has been adapted to avoid or reduce impacts on heritage assets or their setting;
- Where land requirements have been reduced to avoid or reduce impacts to heritage assets or their setting;
- Where design has been adapted to better reveal the heritage value of a heritage asset or group of assets;
- Where proposed landscape has been integrated into the historic landscape character; and
- Where proposals for biodiversity net gain (BNG) have been integrated into the historic landscape character.
- Where historic landscapes or landscape features have been reinstated.

7.1.5. Where there will be the loss of the whole or part of a heritage asset's value the NNNPS requires that the applicant proportionally records and advances understanding of the asset before this loss. The ability to record assets is not a factor in granting consent and cannot be considered to mitigate the loss of significance. However, it may offset harm by allowing a gain in knowledge and understanding of the asset and creates a record for future research. Non-intrusive and intrusive survey work to inform the ES baseline is ongoing. Requirements for recording of assets as per the NNNPS requirements will be determined during production of the ES.

7.2. Code of construction practice

7.2.1. Construction work can be one of the chief causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

7.2.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and cultural assets. The environmental assessment of historic environment impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a Project of this nature.

7.2.3. Controls will be implemented to manage impacts on designated and non-designated historic environment assets. The CoCP will set out the following:

7.2.4. General provisions;

- A written scheme of investigation, setting out objectives, technical standards and procedures to be followed during construction of the Project;
- Procedures for human remains;
- Compliance with the Treasure Act 1996; and
- Measures in relation to unexpected discoveries of heritage assets including those of national importance.
- The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

7.2.5. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on the historic environment may include the following generic categories:

- Timing of construction works and working hours;

- Construction site layout and good ‘housekeeping’;
- Construction traffic routes;
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Hoarding, fencing, screening and lighting;
- Site access;
- Pollution prevention measures;
- Unexpected discoveries;
- On-site and off-site protection;
- Site drainage and groundwater protection;
- Extreme weather events;
- Pre-emptive environmental surveys to guide on-site activities;
- Demolition;
- Selection and management of materials;
- Protection and reinstatement of land and soils;
- Procedures for ground settlement;
- Ground investigation and remediation;
- Tree protection;
- Site specific measures; and
- Monitoring requirements.

7.2.6. A register of environmental actions and commitments (REAC) will also be developed alongside the ES and the CoCP.

7.2.7. It is possible that future climate conditions may impede the effectiveness of assumed mitigation. For example, increased risk of drought conditions may reduce the effectiveness of mitigation planting designed to integrate the scheme into the historic landscape and its ability to mitigate the effects of the project on the loss of historic landscape features and connectivity.

7.2.8. It is assumed that mitigation measures are designed which take climate change into account, for example through the mitigation design and timing. Any effects on mitigation will be identified and recorded within the ES.

8. Description of the likely significant effects

8.1. Overview

8.1.1. This section summarises and explains the likely significant effects of the Project. This is not a comprehensive list of likely significant effects on an asset-by-asset basis but a summary of the type of significant effects likely to be experienced with illustrative examples. These likely significant effects are based on the heritage value of the historic environment as understood in section 4 and the type of impacts described in section 6. The likely significant effects have included consideration of the mitigation principles outlined in section 7.

8.1.2. The removal of archaeological remains has the potential to result in an adverse significant effect. Impacts on the ability to interpret remains fully, as well as a physical loss of remains will result in partial or total loss of heritage value. The value of the archaeological remains will inform the level of significant effect. For example, where the loss of remains is within or associated with a scheduled monument, such as where track widening may result in part of the scheduled area West of White Hill Farm being removed, then this will result in a large or very large adverse significant effect. However, where an area of excavation would remove a find spot this is not likely to cause a significant effect as the artifact has already been removed.

8.1.3. Physical impacts to historic structures, such as listed buildings or locally listed buildings, also have the potential to cause significant effects. The level of significant effect will depend on the extent and location of impact and the value of heritage asset. For example, where a historic building is potentially being , such as non-designated buildings on Spenser Road, Bedford, this will result in the total loss of the heritage value of the asset. This is because the asset will no longer exist and will subsequently result in a large adverse significant effect. However, if the building or structure is being altered, for example at Grade II listed Cambridge Railway Station where alterations may be required to increase circulation, then the level of effect is likely to be less. It still has the potential to be significant where important features, fabric or layouts are being removed, however if alterations are made to areas or features which make limited or no contribution to heritage value then the Project would not result in a significant effect on the value of the historic building or structure.

8.1.4. Significant effects can also occur when changes are made in a heritage asset's setting. Not all changes in the setting of a heritage asset will cause impacts, only where the part of the setting being impacted contributes to the heritage value of the asset or group of assets. Setting is not just visual, it is about how an asset is experienced so can include levels of noise and even smells.

Changes in the setting can cause significant effects where key historic relationships are impacted. Where a station may be closed, for example at Fenny Stratford, then buildings associated with the historic station site, in this case the Grade II Station House, may have an important part of their heritage value (i.e. the ability to understand the building as a station), eroded or lost through the closure of the station. This is likely to result in a moderate to large significant effect. Setting effects can also occur on a larger landscape scale, for example between St Neots and Hauxton. The landscape character between Cambourne and Hauxton is a ribbon of villages, many containing listed buildings and conservation areas, which are connected by single roads and their rural landscapes. The construction of the Project through this area has the potential to result in landscape severance removing the ability to understand the historic development and connections of the landscape.

8.1.5. Significant effects through changes in setting can also result in significant effects to archaeological remains. For example, changes in the setting of a moated site may result in a change in hydrology which results in water levels dropping in the moat. This not only harms the heritage value by visually removing the ability to understand the site as moated by water it also has the potential to dry out and damage organic remains which have been preserved in the water. Scheduled monuments also have the potential to be significantly affected by changes to their setting. Monument boundaries do not necessarily protect all archaeological remains associated with the monument. Any excavation within the setting of the monument has the potential to remove or truncate important remains which may reveal more about the heritage value of the scheduled monument. Therefore, this has the potential result in a moderate to large adverse significant effect.

8.1.6. Changing climate conditions into the future, together with the impacts on the project on historic buildings, archaeological remains and historic landscapes may exacerbate (or occasionally ameliorate) the significance of the Project effects. For example:

- Changes in ground conditions, especially to the water table, can affect the survival and condition of archaeological remains;
- Extreme weather events can affect the survival and condition of historic buildings, especially where less durable materials have been used; and
- Differing climate may affect which plant species survive, altering the character of the historic landscape and survival of designed planting, for example specimen trees in registered parks and gardens.

8.1.7. The influence of climate change in exacerbating or ameliorating the significance of project effects will be incorporated within the evaluation stage.

9. Evaluating significance of effect

9.1. Overview

9.1.1. This section describes how the effect of the Project on the historic environment will be understood and assessed through the EIA process. This section explains how this will be provided to a sufficient level of detail to understand the impact to the historic environment and therefore the likely significant effects of the Project. It is critical that a robust baseline is established to understand the historic environment and its heritage value. It is also important to understand the inter-relationships, both within the historic environment, and also in relation to other aspects such as landscape, noise, vibration, and ecology, which inform this value. This baseline will then inform a detailed assessment of impacts on the historic environment as a result of the Project, and the likely effects these impacts will have on the heritage value of the historic environment.

9.1.2. Essential to this methodology to ensure the quality of baseline and assessment is an ongoing collaboration with heritage stakeholders before and during the production of the ES. To develop a clear and agreed rationale for the assessment, a framework of historic environment specific methodologies will be developed. These will ensure a cohesive historic environment approach to assessment and set the assessment in clear policy and best practice terms. They will also identify inter-relationships and how these will inform the assessment. Methodologies will cover;

- Assessment of heritage value;
- Assessment of setting and contribution to heritage value;
- Assessment of historic landscape character; and
- Assessment of archaeological remains and archaeological potential.

9.2. Resources for the ES

9.2.1. A complete list of resources that will be used to inform the baseline and establish heritage value of assets or groups of assets for the ES will be defined through consultation and the production of the above mentioned Method Statements. The following are anticipated to be included:

- Designated heritage assets from data obtained from the National Heritage List for England (NHLE: scheduled monuments, listed buildings and registered parks and gardens);
- Known non-designated heritage asset information supplied by the Historic Environment Records;
- Historic cartographic information available online Ordnance Survey maps, non-ordnance survey maps (for example tithe maps and Speeds maps);

- Relevant local planning authority online planning information - for information on conservation areas and local lists;
- The Portable Antiquities Scheme - for information on archaeological finds within the study area;
- The BGS - for information on local and regional geology;
- Survey data from surveys along the route of the Project (see below);
- Local Planning Authority guidance including local lists and conservation area appraisals and management plans;
- Online resources including the Archaeological Data Service and local history websites;
- Existing historic landscape characterisation surveys;
- Resource Assessments within the Regional resource frameworks for the east of England and south-east England; and
- Information available from local archives, including further historic maps.

Surveys

9.2.2. A complete list of surveys used to inform the baseline will be defined through consultation and the production of the above-mentioned Method Statements. The following are anticipated to be included:

- High-level walkover surveys for familiarity;
- Asset specific heritage value and setting assessment surveys;
- Remote Sensing surveys;
- Historic landscape characterisation survey;
- Ground investigation and borehole surveys; and
- Non-intrusive and intrusive archaeological surveys.

9.3. Study area for the ES

9.3.1. The study area for ES will be defined through consultation and the production of the above-mentioned Method Statements. The basic process is anticipated to be as follows;

- An initial buffer of the route alongside a ZTV will be used for the purposes of defining an area where impacts are reasonably expected to occur. However this will not be treated as a hard boundary and there will be scope for assets outside of this to be assessed where proportionate;
- Buffers defined will take into account type and level of works (for example entirely new railway, improvements to existing rail and differing degrees of intervention for improvements) as well as the context of the area (for example in urban centres vs rural landscapes) and therefore extent in which change is likely to be experienced;

- This buffer will include consideration of any off-route mitigation, for example land take for biodiversity net gain;
- All heritage assets and historic landscape character areas within this buffer, and any assets identified for consideration outside it will be subject to an initial high-level review exercise to inform a more proportionate baseline. This will consist of a high-level review, in collaboration with stakeholders, to group assets as appropriate, highlight areas of focus and identify if there are assets which will not be impacted which may at this stage be scoped out of further assessment in the ES;
- Impacts to unknown archaeological remains will be considered within the draft Order limits where there will be ground disturbance and potential for physical impacts. This assessment will only extend beyond the draft Order limits if there are clear arguments for potential impacts, for example an expected change to ground water levels affecting areas beyond the draft Order limits or where setting contributes to the heritage value of the remains. However, information on archaeological remains within a wider study will be used to inform understanding of the archaeological potential of the area within the draft Order limits; and
- Following the above, assets and groups of assets identified with the potential to be impacted will be taken forward to a more detailed assessment, as below described.

Temporal scope

9.3.2. The temporal scope of the ES is anticipated to be as given in section 6.2 temporary and permanent.

9.4. Assessment methodology

9.4.1. The assessment will use the following criteria to identify and assess the value of, and the magnitude of impacts and significance of effects on known historic environment assets, as presented below. The criteria is based on the criteria for environmental impact assessment set out in the Design Manual for Roads and Bridges. It is acknowledged that whilst this is a useful tool for reporting significant effects, as required by EIA Directive 2014/52/EU, it does not directly allow for qualitative assessment and the assessment of harm to the historic environment which is the policy test under the NNNPS. As such the following methodology sets out how the qualitative assessment to support the criteria set out below will be reported. It will also demonstrate how harm will be incorporated into the assessment.

Assigning heritage value

9.4.2. A baseline for the heritage value of assets will be established in accordance with the below, Table 3. A qualitative summary of the heritage value of the asset or group of assets will be reported, including the contribution setting makes to that value, to support the level of heritage value assigned.

9.4.3. Where the heritage value of an asset is currently unknown, for example unknown archaeological remains, a heritage value will be applied to the asset which will be assigned based on the findings of the archaeological potential assessment and a balance between the potential likelihood of discovering an asset and if discovered the likely heritage value.

9.4.4. Heritage value of assets will be described in accordance with the 'interests' in the 2019 Historic England guidance, as opposed to 'values' in the 2008 conservation principles. This is in accordance with consultation responses in section 2.5, to follow latest guidance and prevent confusion with the use of 'values' to multiple meanings.

Table 3 – Heritage value of assets.

Heritage value	Description
Very high	Very high importance and rarity, international scale, includes World Heritage Sites, some designated assets.
High	High importance and rarity, national scale, including most designated heritage assets.
Medium	Medium or high importance and rarity, regional scale, including most conservation areas, locally identified buildings and structures with important surviving qualities in their fabric or historic association and sites of moderate archaeological resource.
Low	Low or medium importance and rarity, including Heritage assets of local importance including locally identified buildings and structures with surviving qualities in their fabric or historic association and sites of limited archaeological resource.
Negligible	Very low importance and rarity, local scale where values are compromised by poor preservation, survival, or contextual associations.
Unknown	As yet unknown assets where the value is not understood at present. Where this is the case a likely heritage value will be understood, as above described, for the purpose of assessment.

Source: MWJV 2023

Assigning degree of impact

9.4.5. Once the heritage value of assets is understood, the impact to this asset from the Project will be described. To understand the comparative degree of change and assess the level of effect, which may be adverse or beneficial, the below criteria will be used to categorise the magnitude of impact. A qualitative summary of the impact to the heritage asset or group of assets will be provided, including any impacts on setting, to support the degree of impact assigned.

Table 4 – Degree of impact.

Degree	Type	Description
Major	Adverse	Loss of heritage asset and/or quality and integrity of heritage asset; severe damage to key characteristics, features or elements where the ability to understand its heritage value is substantially removed.
	Beneficial	Large scale or major improvement of heritage assets quality; extensive restoration; major improvement in the ability to understand the heritage value of the heritage asset.
Moderate	Adverse	Partial loss of/damage to key characteristics, features or elements of the heritage asset where the ability to understand its heritage value is compromised.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of heritage asset.
Minor	Adverse	Minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Minor adverse impact on the ability to understand the heritage value of the heritage asset.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on heritage asset or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements of the heritage asset, where there is minimal adverse impact on the ability to understand the heritage value of the heritage asset.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements of the heritage asset.
No Change	N/A	No loss or alteration of characteristics, features or elements; no observable impact in either adverse or beneficial.

Source: MWJV 2023

Assigning significance

9.4.6. The significance of an effect is dependent on the degree of impact (or magnitude of change) and how this effects the heritage value of the asset or group of assets it relates to. The significance of effect helps understand where an impact becomes a material consideration in decision making, as set out in Table 5.

Table 5 – Significance categories and typical descriptions.

Significance category	Typical description
Very large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.

Significance category	Typical description
Neutral	No effects or those which are beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.

9.4.7. For effects to be material in the decision-making process it is acknowledged that there will be a level of harm to the value of a heritage asset or group of assets. However, the harm tests as set out in the NPS, substantial harm, less than substantial harm and no harm, cover a broad spectrum and do not directly relate to significance of effect categories. In consultation with stakeholders and through the development of the methodologies noted above, a proportionate way of assessing and reporting harm will be agreed that allows for mitigation and public benefit justifications to be fully understood, assessed and reported to ensure compliance with local and national planning policies.

9.4.8. To establish where there is likely to be a significant effect, and the category of effect the matrix shown in Table 6 will be used. A qualitative summary of the effect that the Project will have on the heritage value of the asset or group of assets will be provided to support category of effect assigned. Where there is a judgement to be made on the category of effect, for example where a major impact on a low value heritage asset could result in slight or moderate effects professional judgement will be used to establish the relevant category of effect.

Table 6 – Significance of effect matrix.

Heritage value of asset						
		Negligible	**Low**	**Medium**	**High**	**Very High**
Degree of impact	No Change	Neutral	Neutral	Neutral	Neutral	Neutral
	Negligible	Neutral or Slight	Neutral or Slight	Neutral or Slight	Slight	Slight
	Minor	Neutral or Slight	Neutral or Slight	Slight	Slight or **Moderate**	**Moderate** or **Large**
	Moderate	Slight	Slight	Moderate or Large	**Moderate** or **Large**	**Large** or **Very Large**
	Major	Slight or Moderate	Slight or **Moderate**	**Moderate** or **Large**	**Large** or **Very Large**	**Very Large**

Source: MWJV

9.4.9. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the historic environment chapter of the ES.

10. Assumptions and limitations

10.1. Assumptions and limitations at the scoping stage

10.1.1. The following assumptions and limitations have applied to the production of this Method Statement including the baseline established for it:

- Pre-Ordnance Survey mapping already acquired only covers the area between Bedford and Cambridge (where the route follows a new alignment until Hauxton), mapping between the Bletchley to Bedford section of the route (on existing alignment) has not been acquired. The late 19th/early 20th century Ordnance Survey mapping only covers Bletchley to Bedford and St Neots to Cambourne. There is no historical mapping for the Oxford to Bletchley section of the route. Available online resources have been reviewed to improve understanding of the historic development of the study area, however this limits the ability to understand the post-medieval development of this section of the route. This will be addressed in the production of the PEIR and ES, as described in section 8;
- Some survey information has been gathered relating to the formerly proposed route for the Project; Abbotsley to south Cambourne. These consist of remote sensing and geophysical survey. This data has limited use where the alignment relates to the present proposals. Further remote sensing surveys covering the current DOL area is being undertaken; ;
- Non-intrusive surveys are currently being undertaken within an original 200m wide corridor from the central line between Bedford and Cambridge, as well as in the DOL where this extends outside the original survey corridor. Therefore there is potential for further non-designated assets to be discovered within the study area;
- There is currently no list of locally important structures within the Huntingdonshire and south Cambridgeshire districts;
- When discussing non-designated archaeological heritage assets within the draft Order limits and study area, these are known assets that have been discovered during archaeological investigations or as chance finds. The discoveries highlight the archaeological potential of the site in which they were found and support the understanding of the potential within the surrounding area; and

10.2. Assumptions and limitations for the ES

10.2.1. This section provides a summary of the assumptions and limitations which are expected to apply to the ES. Additional limitations are likely to be identified throughout production of the ES and will be reported in the final version.

10.2.2. Data sources on the historic environment can be limited by the dependence on opportunities for historical and archaeological research, fieldwork, and discovery. Where nothing of archaeological or historical interest is recorded in a particular area, this can be down to a lack of research or investigation, rather than no heritage assets being present. The following sources have known limitations:

- Information provided by the HER can be limited as it is reliant on previous archaeological and historical research;
- Documentary sources are rare before the medieval period, and many historical documents are inherently biased. Older primary sources often fail to accurately locate sites and interpretation can be subjective;
- Historic maps provide a glimpse of land-use at a specific moment. It is therefore possible that short-term structures or areas of land-use are not shown and therefore not available for assessment; and
- Land access arrangements may prevent surveys being undertaken in limited areas. Where surveys are not possible desk based information will be used to inform the environmental impact assessment. This assessment will exercise caution regarding the potential presence of heritage assets and the heritage value of any assets within land parcels which cannot be accessed. Assets within these areas will be assumed to have heritage value at the high end of what is indicated by desk-based research.

11. Proposed scope

11.1. Overview

11.1.1. The table below summarises aspects proposed to be scoped in and scoped out for the assessment of the historic environment with regard to the Project. Assessment items are scoped out because they are not present within the study area.

Table 7 – Items scoped in and out.

Assessment Item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Scheduled monuments	✓	✓	✓	✓	✓	✓	✓	✓
Listed Buildings	✓	✓	✓	✓	✓	✓	✓	✓
Conservation Areas	✓	✓	✓	✓	✓	✓	✓	✓
Registered Parks and Gardens	✓	✓	✓	✓	✗	✓	✗	✓
Historic Landscape	✓	✓	✓	✓	✓	✓	✓	✓
Locally important buildings and structures	✓	✓	✓	✓	✓	✓	✓	✓
Known archaeological remains	✓	✓	✓	✓	✓	✓	✓	✓
Unknown archaeological remains	✓	✓	✓	✓	✓	✓	✓	✓

Source: MWJV

EWR-MWJV Technical Partner

Routewide - Environmental - EIA Scoping Method Statement - Human Health

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

[1] Department for Transport (2024) *National Networks National Policy Statement*. Accessed at: National Networks - National Policy Statement (publishing.service.gov.uk) (Accessed April 2024).

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on human health and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The assessment of human health will consider how the Project affects the health and wellbeing of local populations.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
CoCP	Code of construction practice
DCO	Development consent order
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
IEMA	Institute of Environmental Management and Assessment
NNNPS	National policy statement for national networks
ONS	Office for National Statistics
PRoW	Public rights of way

3. Relevant standards and guidance

3.1. Legislation

3.1.1. There is currently no UK legislation that specifies the detailed content required to prepare human health assessments, or that provides defined standards or thresholds for assessing the significance of human health effects. The Infrastructure Planning EIA Regulations 2017 (EIA Regulations) identify population and human health as a factor to be considered within the assessment process but do not provide definitive guidance on the approach, process or methodology to follow. On this basis, the methodology has been based on accepted industry practice, and a review of human health assessments for other rail projects and significant infrastructure schemes.

3.2. Guidance

3.2.1. Relevant guidance to the assessment of human health includes:

- Planning practice guidance, healthy and safe communities 2022[2];
- Fair Society, Healthy Lives, The Marmot Review, 2010[3];
- UK Health Security Agency (formerly Public Health England) Health and Environmental Impact Assessment: A Briefing for Public Health Teams in England, 2017[4];
- The Health Foundation, What makes us healthy? An introduction to the social determinants of health, 2018[5];
- Health in environmental impact assessment: a primer for a proportionate approach (2017)[6];

[2] Ministry of Housing, Communities & Local Government, Planning Practice Guidance - Healthy and safe communities, 2022 [online] Available at: https://www.gov.uk/guidance/health-and-wellbeing

[3] The Institute of Health and Equality Fair Society Healthy Lives (The Marmot Review), 2010

[4] UK Health Security Agency (formerly Public Health England) Health and Environmental Impact Assessment: A Briefing for Public Health Teams in England, 2017 [online] available at: https://assets.publishing.service.gov.uk/media/5a82312440f0b6230269b540/Health_and_environmental_impact_assessment.pdf

[5] The Health Foundation, What makes us healthy? An introduction to the social determinants of health, 2018 [online] available at: https://www.health.org.uk/publications/what-makes-us-healthy

[6] Cave, B., Fothergill, J., Pyper, R., Gibson, G., and Saunders, P. (2017) Health in Environmental Impact Assessment: A Primer for a Proportionate Approach. Ben Cave Associates Ltd., IEMA and the Faculty of Public Health. Lincoln, England.

- Human health: Ensuring a high level of protection (Cave, B., et al, 2020)[7];
- Effective scoping of human health in environmental impact assessment (Institute of Environmental Management and Assessment ((IEMA), 2022)[8]; and
- Determining significance for human health in environmental impact assessment (IEMA 2022)[9].

[7] Cave, B., Claßen, T., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martín-Olmedo, P., Mekel, O., Pyper, R., Silva, F., Viliani, F., Xiao, Y. 2020. Human health: Ensuring a high level of protection. A reference paper on addressing Human Health in Environmental Impact Assessment. As per EU Directive 2011/92/EU amended by 2014/52/EU. International Association for Impact Assessment and European Public Health Association.

[8] IEMA, Effective Scoping of Human Health in Environmental Impact Assessment, 2022, [online] Available at: https://www.iema.net/resources/reading-room/2022/11/18/iema-guides-health-in-eia

[9] IEMA, Determining Significance for Human Health In Environmental Impact Assessment, 2022, [online] Available at: https://www.iema.net/resources/reading-room/2022/11/18/iema-guides-health-in-eia

4. Establishing the baseline

4.1. Overview

4.1.1. The baseline relevant for human health considers the resident population of the local authorities which are intersected by the draft Order limits.

4.2. Documentary records

4.2.1. The baseline draws on publicly available information on the population, provided by the Office for National Statistics (ONS) and the Office for Health Improvement and Disparities. Information on residential property and community facilities is based on the AddressBase dataset.

4.3. Surveys and stakeholder engagement

4.3.1. No community surveys have been undertaken to date. Community surveys will primarily be focussed on the use of community facilities, including public open space.

4.3.2. Stakeholder engagement is a key element of health assessment practice, and consultation activities should be used to identify matters that are of particular importance or of concern to affected communities. Stakeholder engagement, with local authorities and affected community receptors, will inform the identification and assessment of significant effects.

4.4. Study area

4.4.1. The study area is informed by the geographic extent of the likely impacts of the Project (see section 6). The study area is focused on those locations where the land use of receptors is likely to change, and areas affected by disturbance because of construction activities or the operation of the Project. Therefore, 500m from the draft Order limits has been used to consider impacts. In addition, some temporary and permanent components of the Project may result in changes in accessibility between community receptors. This may result in impacts that occur beyond 500m from the draft Order limits. These instances will be identified separately (informed by baseline analysis, stakeholder engagement and professional judgement) and the study area will be expanded where required in specific areas to assess impacts.

4.4.2. Using a single geographically defined community (site-specific population) to cover a range of effects across different wider determinants of health can provide appropriate flexibility and represents a proportionate approach to assessment. As the Project is predominantly linear, there will be distinct localities and multiple separate site-specific geographic populations (Lower Layer Super Output Areas) which will also be identified.

4.5. Consultation

4.5.1. Consultation will be ongoing to inform the assessment of human health as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. Baseline information for the human health assessment is set out in the Social Baseline. The Social Baseline information covers the study area and provides context, principally focusing on information at a local authority level.

5.2. Human health elements

5.2.1. The Social Baseline describes key features of the study area related to residential receptors (people living in residential dwellings in affected communities), commercial receptors (the commercial facilities, people who own, operate and use these facilities), and community receptors (the community facilities, people who own, operate and use these facilities).

5.2.2. Residential receptors include the people living in:

- Residential dwellings, including gardens, garages, outbuildings and associated parking;
- Permanent dwellings, including mobile homes (in an established location) and canal boats; and
- Private, rented and shared ownership dwellings, student accommodation, retirement housing.

5.2.3. Commercial receptors include:

- Businesses which are a privately owned or operated organisation or enterprise engaged in commercial, industrial or professional activities, including any commercial premises and assets as well as land used for or associated with the business operations; and
- Receptors include the people who own, operate and use these facilities, including employees.

5.2.4. Community receptors include:

- Education, health and social care, community venues, places of worship (including burial grounds), sports and recreational facilities, emergency services infrastructure, publicly accessible open space and recreational routes;
- Receptors include the people who own, operate and use these facilities. This includes local residents, organisations and community groups, pupils, patients

and congregations. Operators may be the owners, community organisations, or staff; and
- Local communities as a whole.

5.2.5. Key aspects of the Social Baseline relevant to human health receptors are:

- Population;
- Settlements;
- Commercial facilities; and
- Community facilities.

5.3. Future baseline

5.3.1. Future demographic baseline is set out in the Social Baseline.

5.3.2. New development can introduce new receptors into a location who may experience positive or negative effects of a scheme. The new developments that are assumed to be in place when a scheme is being constructed or operated are known as ‘committed development’. A list of committed developments will be considered in the future baseline.

5.3.3. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the Project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the Project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.3.4. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

6. Sources of impact

6.1.1. The Project includes works to existing stations (including closures), new stations, new railway track, works to the existing railway, works to level crossings and works to local highways and utilities.

6.1.2. The following aspects of the Project are likely sources of impact for human health receptors:

- Employment generation;
- Increased rail movements;
- Increased noise and vibration from increased rail movements;
- Changes to air quality from increased rail movements;
- Changes to the local landscape;
- Road diversions;
- Public rights of way (PRoW) diversions;
- Loss of community facilities; and
- Loss of land.

7. Potential impacts and effects

7.1.1. For the purpose of this report ‘receptors’ are the features of the environment (e.g. people, schools and hospitals) that might experience a change as a result of the Project. ‘Impacts’ have been defined as the changes that would result from an action linked to the construction, operation or maintenance of the Project, and ‘effects’ are defined as the consequences of the impacts.

7.1.2. Direct impacts are likely to occur as a result of employment, traffic, noise, vibration, air quality and emissions, change to the landscape, community severance, and loss of land or structures.

7.1.3. Specific activities of the Project (as identified above) could change a determinant of health and potentially result in changes to health outcomes (an effect). The circumstances leading to a change in health outcomes is described as a ‘Health Pathway’, comprising a ‘source’, a ‘pathway’ and a ‘receptor’ as follows:

- ‘Source’ – activity or factor that could affect the health outcomes of a receptor population;
- ‘Pathway‘– method or route of which the ‘source’ could affect the ‘receptor’; and
- ‘Receptor’ – is the recipient of an effect from the ‘source’, via the ‘pathway’.

7.1.4. The potential Health Pathways of the Project are detailed in Table 2 and Table 3.

7.2. Potential permanent and operational effects

7.2.1. The potential effects identified in Table 2 include permanent effects during construction and effects during operation which will continue for the life of the Project.

7.2.2. The influence of climate change is not anticipated to exacerbate or ameliorate the project effects to the extent that significant effects will occur. The effects that have been considered within this method statement have been considered against likely climate hazards, (e.g. increased levels of extreme heat and higher levels of rainfall etc.) and the effects identified are not anticipated to change as a result of these hazards.

Table 2 – Potential operational health pathways of the Project.

Potential Source	Potential Pathway	Potential Receptor
Operation		
Employment generation	Permanent opportunity for employment and income for the local community.	Site specific populations.
Increased rail movements	Permanent increase in rail services are likely to improve the populations' ability to undertake day to day activities e.g. travelling to school, work, and healthcare facilities.	Site specific populations.
Increased noise and vibration from increased rail movements	Permanent nuisance that could give rise to sleep disturbance, annoyance, and effects on health.	Site specific populations and sensitive receptors such as schools or residential homes where vulnerable groups are likely to be affected.
Changes to air quality from increased rail movements	Permanent nuisance and/or inhalation. Exposure to air pollutants have been linked to health risks including respiratory issues.	Site specific populations and sensitive receptors such as schools or residential homes where vulnerable groups are likely to be affected.
Changes to the local landscape	Permanent nuisance to visual amenity which may inhibit normal physical activity.	Site specific populations.
Road diversions	Permanent nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities.	Site specific populations and sensitive receptors such as schools or residential homes where vulnerable groups are likely to be affected.
PRoW diversions	Permanent nuisance that may inhibit normal physical activity.	Site specific populations.
Loss of community facilities	Permanent nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities. This may also impact levels of social cohesion.	Site specific populations and sensitive receptors such as schools or community venues where vulnerable groups are likely to be affected.
Loss of land or structures	Permanent changes in land use which could reduce the enjoyment, or use, of residential properties or community facilities, or which could reduce the viability of commercial facilities, leading to fear, stress and/or anxiety.	Site specific populations and sensitive receptors such as residential, community or commercial properties.

7.3. Potential temporary construction effects

7.3.1. The effects identified in Table 3 below include effects which are temporary during the construction phase only and which will be reversed or stopped at the end of the construction phase.

7.3.2. The assessment will consider the duration of effects (in temporal terms), recognising that some temporary effects could last months or even years.

Table 3 – Potential construction health pathways of the Project.

Potential Source	Potential Pathway	Potential Receptor
Construction		
Noise and vibration from construction activities and construction traffic movements	Temporary nuisance that could give rise to sleep disturbance, annoyance, and effects on health.	Site specific populations and sensitive receptors such as schools or residential homes where vulnerable groups are likely to be affected.
Dust generated during construction Emissions and particulate matter from construction machinery and vehicles	Temporary nuisance or inhalation. Exposure to air pollutants have been linked to health risks including respiratory issues.	Site specific populations and sensitive receptors such as schools or residential homes where vulnerable groups are likely to be affected.
Accidental spillage	Discharge to ground or surface water.	Site specific populations.
Changes to the local landscape from construction related infrastructure and activities	Temporary nuisance to visual amenity which may inhibit normal physical activity.	Site specific populations.
Temporary road diversions	Temporary nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities.	Site specific populations and sensitive receptors such as schools or residential homes where vulnerable groups are likely to be affected.
Temporary PRoW diversions	Temporary nuisance that may inhibit normal physical activity.	Site specific populations.
Temporary loss of community facilities	Temporary nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities. This may also impact levels of social cohesion.	Site specific populations and sensitive receptors such as schools or community venues where vulnerable groups are likely to be affected.
Employment generation	Temporary generation of employment and income for the local community.	Site specific populations.

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation could make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a project's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages by use of a prescribed process about potential impacts on the natural environment, people and communities, historic environment assets, or global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce or otherwise mitigate potentially likely significant effects. The Project will therefore have embedded within it various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The proposed draft Order Limits for the Project will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. No specific mitigation measures are anticipated in relation to climate change for this aspect.

8.2. Design principles

8.2.1. The approach to the design of the Project aims to include the following measures for human health:

- The avoidance of the demolition of residential properties in all cases unless it can be demonstrated that this cannot reasonably be achieved;
- The avoidance of loss of open space where reasonably practicable and consideration given to re-provision of an equivalent or greater area where required; and

- To design holistically with the wider loop in mind, rather than as an individual PRoW, where a realignment of a public footpath, bridleway or road is part of promoted routes for recreational walking, for example National Trails or locally promoted loops.

8.3. Code of construction practice

8.3.1. Construction work can be one of the chief causes of environmental effects. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to abide by in undertaking their work.

8.3.2. The draft CoCP will be a fundamental part of the Project and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic environment assets. The assessment of human health impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

8.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on human health may include the following generic categories:

- Community relations;
- Timing of construction works and working hours;
- Construction traffic routes;
- On-site working practice and amelioration;
- Hoarding, fencing, screening and lighting;
- Site access;
- Site safety and security;
- Pollution prevention measures;
- Emergency preparedness and access;
- Site drainage and watercourse and groundwater protection;
- Site waste management plans, including segregation and storage of waste;
- Workplace travel plans;
- Site specific measures; and
- Monitoring requirements.

8.3.4. Best practicable means will be employed throughout construction, considering risks, costs and best practice.

8.3.5. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

9. Evaluating significance

9.1. Assessing effects

9.1.1. Human health is influenced by a range of indirect and direct factors; some controllable such as lifestyle, and some uncontrollable such as genetics. In determining physical, mental and social wellbeing, factors known as “determinants of health” are considered which reflect the range of influences, from society and the environment, on an individual.

9.1.2. Specific activities of the Project could change a determinant of health and potentially result in health outcomes (an effect). This is identified as a ‘Health Pathway’ and are considered with regards to the source, pathway, and impact as detailed in section 7. Impacts from the Project that result in a change to determinants of health have the potential to cause beneficial or adverse effects on health, either directly or indirectly. The determination of the significance of these effects is based on the sensitivity of receptors and the magnitude of an impact. The sensitivity criteria are set out in Table 4.

9.1.3. Within a defined population, individuals will range in level of sensitivity due to a series of factors such as age, socio-economic deprivation and pre-existing health conditions. Some groups of individuals may be particularly vulnerable to changes in biophysical and socio-economic factors (adversely or beneficially) whereby they could experience differential or disproportionate effects when compared to the general population. The criteria for magnitude are set out in Table 5.

9.1.4. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the Human Health chapter of the Environmental Statement.

9.1.5. Based on the combination of ratings for receptor sensitivity and magnitude of impacts, the categorisation of effect for each determinant of health will be applied according to Table 6.

Table 4 – Human health sensitivity criteria.[9]

Level	Indicative criteria
High	High levels of deprivation (including pockets of deprivation); reliance on resources shared (between the population and a project); existing wide inequalities between the most and least healthy; a community whose outlook is predominantly anxiety or concern; people who are prevented from undertaking daily activities; dependants; people with very poor health status; and/or people with a very low capacity to adapt
Medium	Moderate levels of deprivation; few alternatives to shared resources; existing widening inequalities between the most and least healthy; a community whose outlook is predominantly uncertainty with some concern; people who are highly limited from undertaking daily activities; people providing or requiring a lot of care; people with poor health status; and/or people with a limited capacity to adapt
Low	Low levels of deprivation; many alternatives to shared resources; existing narrowing inequalities between the most and least healthy; a community whose outlook is predominantly ambivalence with some concern; people who are slightly limited from undertaking daily activities; people providing or requiring some care; people with fair health status; and/or people with a high capacity to adapt
Very Low	Very low levels of deprivation; no shared resources; existing narrow inequalities between the most and least healthy; a community whose outlook is predominantly support with some concern; people who are not limited from undertaking daily activities; people who are independent (not a carer or dependant); people with good health status; and/or people with a very high capacity to adapt.

Table 5 – Human health magnitude criteria.[9]

Level	Indicative criteria
High	High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/ injury outcomes; majority of population affected; permanent change; substantial service quality implications
Medium	Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications
Low	Very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications
Negligible	Negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life; very few people affected; immediate reversal once activity complete; no service quality implication.

9.1.6. The criteria for defining significance are set out in Table 6.

Table 6 – Significance matrix.[9]

		Sensitivity			
		High	**Medium**	**Low**	**Very Low**
Magnitude	**High**	Major	Major/moderate	Moderate/minor	Minor/negligible
	Medium	Major/moderate	Moderate	Minor	Minor/negligible
	Low	Moderate/minor	Minor	Minor	Negligible
	Negligible	Minor/negligible	Minor/negligible	Negligible	Negligible

9.2. Assigning significance

9.2.1. Effects rated as Major are considered to be 'significant'. Effects rated as Moderate are considered to be 'significant' in the majority of cases, on a precautionary basis. However, there may be instances where a 'Moderate' rated effect aligns more closely with some of the determining criteria in the lower rated categories for magnitude and sensitivity, or where part of the effect will be mitigated. In these instances, justification as to why the effect is considered 'not significant' will be provided.

9.3. Cumulative effects

9.3.1. Where two or more significant health effects combine in the same location, affecting the same receptors, there may be intra-project cumulative effects. In the event that these occur, these will be highlighted. It is not anticipated that another layer of assessment will be applied.

9.3.2. In addition, where significant health effects from the Project may combine (location, timing) with likely significant effects occurring as a result of other projects, these will be identified as inter-project cumulative effects.

10. Proposed scope

10.1.1. The potential impacts of the Project on human health are set out in section 7 of this document. These are the items that are considered to be scoped in (see Table 7). None of the potential effects and impacts in section 7 have been scoped out.

10.1.2. Different sections of the route are likely to experience different impacts, as the type of work required across the different sections varies.

10.1.3. Given the nature of the potential impacts relevant to human health, it is assumed that all of the potential impacts are relevant to all of the sections of the route. Therefore, no sections of the route are scoped out.

Table 7 - Elements of the Human Health assessment to be scoped in.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Permanent opportunity for employment and income for the local community.	✓	✓	✓	✓	✓	✓	✓	✓
Permanent increase in rail services are likely to improve the populations' ability to undertake day to day activities e.g.	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
travelling to school, work, and healthcare facilities.								
Permanent nuisance that could give rise to sleep disturbance, annoyance, and effects on health.	✓	✓	✓	✓	✓	✓	✓	✓
Permanent nuisance and/or inhalation. Exposure to air pollutants have been linked to health risks including respiratory issues.	✓	✓	✓	✓	✓	✓	✓	✓
Permanent nuisance to visual amenity which may inhibit normal physical activity.	✓	✓	✓	✓	✓	✓	✓	✓
Permanent nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities.	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Permanent nuisance that may inhibit normal physical activity.	✓	✓	✓	✓	✓	✓	✓	✓
Permanent nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities. This may also impact levels of social cohesion.	✓	✓	✓	✓	✓	✓	✓	✓
Permanent changes in land use which could reduce the enjoyment, or use, of residential properties or community facilities, or which could reduce the viability of commercial facilities, leading to fear, stress and/or anxiety.	✓	✓	✓	✓	✓	✓	✓	✓
Temporary nuisance that could give rise to sleep	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
disturbance, annoyance, and effects on health.								
Temporary nuisance or inhalation. Exposure to air pollutants have been linked to health risks including respiratory issues.	✓	✓	✓	✓	✓	✓	✓	✓
Discharge to ground or surface water.	✓	✓	✓	✓	✓	✓	✓	✓
Temporary nuisance to visual amenity which may inhibit normal physical activity.	✓	✓	✓	✓	✓	✓	✓	✓
Temporary nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities.	✓	✓	✓	✓	✓	✓	✓	✓
Temporary nuisance that may inhibit normal physical activity.	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Temporary nuisance that may inhibit day to day activities e.g. travelling to school, work, and healthcare facilities. This may also impact levels of social cohesion.	✓	✓	✓	✓	✓	✓	✓	✓
Temporary generation of employment and income for the local community.	✓	✓	✓	✓	✓	✓	✓	✓

11. Assumptions

11.1. Key assumptions

11.1.1. Key assumptions underlying the human health assessment in the ES include:

- The assessment will be based on a desk-based study, using publicly available information;
- The assessment will rely, in part, on data provided by third parties (e.g. Ordnance Survey Mapping, local authorities, ONS) which are the most up-to-date data available at the time of writing. No significant changes or limitations in these datasets have been identified that would affect the robustness of the assessment;
- Human health impacts would be identified in the ES down to the lowest defined population group available according to ONS survey outputs (lower layer super output areas). No significant changes or limitations in these datasets have been identified that would affect the outcome of the assessment;
- The assessment of effects on human health relies on the use of reasonable assumptions, professional judgement, and above guidance to determine the significance of effects; and
- Vulnerable groups, including those with protected characteristics as defined by the Equality Act 2010 would be assumed to be present throughout the Study Area. Where specific areas have been identified as deprived, these areas will be emphasised.

11.2. Opportunities

11.2.1. The Project presents opportunities for improvements to be made to safety and accessibility. New stations should be designed to ensure they are safe and accessible for all passenger groups, with considerations given to greater inclusivity particularly for neurodivergent passengers. Any pedestrian and/or cycle routes that are lost should be re-provided in a condition that makes them accessible to all, and the design of these routes should consider the safety of all potential users.

11.2.2. Where any open space is lost due to the Project and replacement land has been identified as required, the replacement land should, where reasonably practicable, be to an equivalent or greater amount that which is lost. Locations for re-provided open space should be chosen that are accessible to a range of people, including those with limited mobility.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping Method Statement – Landscape and Visual

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of landscape and visual impacts and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The landscape and visual impact assessment (LVIA) will assess the effects of the Project on the landscape of the study area where the route passes through the countryside, and the townscape of the study area where it passes through

[1] *Department for Transport* (2024) *National Networks National Policy statement, GOV.UK*. Available at: https://www.gov.uk/government/publications/national-networks-national-policy-statement

urban areas such as Oxford, Bicester, Bletchley, Bedford, and Cambridge. In the following Method Statement, the term landscape, as in landscape and visual impact assessment, should be taken to include townscape, except where landscape and townscape are dealt with separately.

1.1.7. The landscape assessment will consider how the Project will change the character of the landscape and whether these changes will be beneficial or adverse. For the assessment, separate landscape character areas[2] will be defined. These will be based on the landscape character assessments defined for each local authority, as well as Natural England's national character areas (NCA).

1.1.8. The visual assessment will consider how the Project will affect people's views and specific viewpoints will be used to represent these impacts. The viewpoints may represent groups of people (such as people living in the same street) if the change to their view is likely to be similar. Impacts will be evaluated by considering how the view will change and the number of people whose views will be affected.

[2]A landscape or townscape character area is an area with a distinct and recognisable combination of elements (such as geology, soils, landform, vegetation, land use and human settlement).

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
AONB	Area of outstanding natural beauty
CoCP	Code of construction practice
CPRE	Council for the Protection of Rural England
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HS2	High Speed 2
LCA	Landscape character area
LDA	Landscape design associates
LVIA	Landscape and visual impact assessment. The term is used throughout the document in reference to both landscape and townscape assessment.
NCA	National character areas
PRoW	Public right of way
SBR	Shepreth Branch Rail
SLR	Single lens reflex
TCA	Townscape character area
TPO	Tree protection order
ZTV	Zone of theoretical visibility

3. Relevant policy and guidance

3.1.1. The methodology for the LVIA will be informed by the following guidance:

- The National Networks National Policy Statement (NNNPS) (May 2024)[1];
- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (Swanwick, 2013);
- An Approach to Landscape Character Assessment (Tudor, 2014);
- Technical Information Note 05/2017 – Townscape Character Assessment (Landscape Institute, Revised April 2018);
- Technical Guidance Note 06/19 – Visual Representation of Development Proposals (Landscape Institute, 2019); and
- Institution of Lighting Professionals' Guidance Note 01/21.

4. Establishing the baseline

4.1. Study area

4.1.1. Where the Project passes through the rural landscape, the LVIA will assess the likely landscape and visual impacts and effects within 2.0km of the draft Order Limits. It is considered that at distances beyond 2.0 km, if visible, the Project would be barely perceptible.

4.1.2. In predominantly urban areas, the LVIA will assess the likely impacts and effects of the Project on townscape and views within 750m of the draft Order Limits. The urban study area will be less extensive than the rural study area because of the screening effect of buildings, which typically limit longer views.

4.1.3. More distant views in both situations will also be considered from areas of higher ground or more open areas of the landscape or townscape, and in response to the feedback from consultation and engagement with stakeholders.

4.2. Surveys

LVIA Surveys

4.2.1. The baseline surveys for the LVIA started in 2023 with summer surveys, when deciduous vegetation was in leaf. They will continue with winter surveys, when deciduous vegetation is out of leaf, in 2024 and 2025. Additional summer surveys were conducted in 2024 and further surveys will be conducted in 2025.

Arboricultural Surveys

4.2.2. Arboricultural surveys in accordance with *BS5837:2012 Trees in relation to design, demolition and construction – recommendations*, are ongoing. These surveys will provide the baseline data for trees within and adjacent to the Project footprint and identify key arboricultural constraints. The baseline data will then be used to produce an Arboricultural Impact Assessment to determine the arboricultural impact of the Project and identify any tree removal requirements to facilitate construction. The arboricultural report will be contained within the LVIA as a technical appendix and support assessment of the landscape impacts.

4.2.3. Veteran trees surveys, to identify individually significant trees (veteran, ancient or notable trees), are ongoing and will provide additional information if these trees are present within or adjacent to the Project.

4.3. Temporal scope

4.3.1. The landscape and visual effects of the Project will be evaluated during winter during the construction phase to capture the effects when construction will be

most visible. They will be evaluated during winter and summer in year 1 of operation and during summer in year 15 of operation. The mitigating effects of maturing mitigation planting, implemented as part of the Project, will be considered in the evaluation of effects in summer year 15 to demonstrate the maximum effectiveness of the planting.

4.4. Modelling

4.4.1. The zone of theoretical visibility (ZTV) has not yet been modelled. It will be prepared when the Project has reached a sufficient level of development to provide a reasonable assurance of accuracy. The ZTV will inform the final definition of the study area and the LVIA.

4.5. Figures

4.5.1. This Method Statement is supported with figures 77-87 which can be found in EIA Scoping – Figures. These show:

- Designated landscape features including common land, Green Belt, historic environment, and ecological features relevant to the landscape and visual baseline, public rights of way and national trails;
- Landscape character areas, landscape character types and national character areas (NCA);
- Representative viewpoint locations; and
- The topography of the study area.

4.6. Consultation

4.6.1. Consultation will be ongoing to inform the assessment of landscape and visual as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

4.6.2. Table 2 describes the consultation undertaken to date relevant to the production of this Method Statement. These comments include those on an initial draft Scoping Report produced in July 2021.

Table 2 – Record of consultation.

Consultee	Date	Summary of engagement	Response
Central Bedfordshire Council	22 July 2021	The methodology looks reasonable. Confirmation is requested on whether all receptors mentioned in the consultation will be considered during the assessment.	The potential visual receptors mentioned in the consultation will be considered during the assessment. A single representative viewpoint from one location may be used to represent a group of receptors if the change

Consultee	Date	Summary of engagement	Response
			to their view is likely to be similar.
Oxfordshire County Council	20 August 2021	DMRB guidance LA107 should be used in conjunction with GLVIA3 as DMRB does not offer the same level of detail in assessment process. The assessment should consider the impacts at different stages of project i.e. construction phase, year 1 and year 15. The impact of lighting will need to be considered for both, during construction and operation.	The methodology set out in section 14.10 of the initial draft Scoping Report is based on GLVIA3 and will offer a higher level of detail than is provided in the DMRB methodology. The LVIA will include an assessment of effects during construction, at Year 1 and Year 15. The impacts of temporary and permanent lighting will be considered in the LVIA in construction and operation.
Greater Cambridge Shared Planning	17 September 2021	Existing views to key landmarks should be captured in the visual baseline.	Viewpoints including protected views and views looking towards key landmarks will be captured in the visual baseline.
Bedford Borough Council	No date available	Confirmation requested that lighting will be assessed. Confirmed that GLVIA method generally acceptable. Noted update of Landscape Character Assessment in 2020.	Lighting will be considered as part of the LVIA. The updated Landscape Character Assessment will inform the baseline used for the LVIA.
Huntingdonshire District Council	15 October 2021	The new development, Winteringham Park, to the east of St Neots to be considered in relation to the potential cumulative impact of the Project and the A428 may have. The likely impact around Tempsford area needs to be considered.	The LVIA will assess the cumulative effects of the Winteringham Park development in relation to the Project and the A428. The landscape and visual impacts on the area in and around Tempsford will be assessed in the LVIA.

Consultee	Date	Summary of engagement	Response
Oxfordshire County Council and Oxford City Council (joint meeting)	16 February 2024	Uncertainties to do with the Project design around Oxford Station and rail corridor through Oxford remain. Visual impacts on the Port Meadow view cone should be addressed in the LVIA. A collaborative approach to design should be adopted across all partners. Oxford City Council has been working closely with Network Rail, developing proposals for the station and rail corridor over the last 10 years. Oxford Parkway is in the Cherwell area but Oxford City Council works closely with its neighbouring authorities and it would be beneficial to include Cherwell District Council in future meetings. EWR Co requested general feedback from the councils on any landscape and visual matters they would like to raise.	EWR Co to provide an update on the design including whether additional tracks and platforms are under consideration at Oxford Station and if there will be an intensification of train services. Visual impacts on the Port Meadow view cone will be assessed in the LVIA.
Milton Keynes City Council	15 February 2024	The Landscape Character Assessment for Milton Keynes has been recently updated. There has been much development in Bletchley in recent years and the Project design should take account of the design approach taken on local development proposals and improve connectivity between the High Street and the railway station. Milton Keynes City Council's urban design team should be included in future meetings. It is unlikely that there would be views of the Project from Bletchley Park but the Project could affect the Bletchley Conservation Area and a number of trees with tree protection orders. The area to the north of Fenny Stratford Station will be redeveloped with housing and commercial development. There are opportunities to improve the walking and cycling network linking the new development zone, the station and Caldecotte Lakes.	EWR Co considers there is a need for a holistic approach to the Project design and understanding of all impacts associated with the Project, not just landscape and visual. Matters relating to specific locations raised at the meeting will inform the ongoing Project design development.

Consultee	Date	Summary of engagement	Response
		The tree belt at Bow Brickhill provides a useful screen to the existing and proposed industrial development here. A well-lit new underpass at Brown's Wood Level Crossing, linking the future housing development south of the railway to the employment zone and residential areas to the north, would be preferable to an overbridge from a visual perspective. A well-lit new underpass at the Old Farm Park crossing would similarly be preferable to an overbridge. As a bridleway, it would have to have enough head height for horse riders and cyclists. All agreed virtual Teams meetings would be suitable format for future engagement. EWR Co to share slides and meeting minutes and would welcome any further feedback on information presented.	
Cherwell District Council	27 February 2024	The existing hedgerows around Oxford Parkway provide screening. What are the impacts of removal and the options for replacement and other screening mitigation? There is a general preference for native species. A new landscape sensitivity and character assessment is currently being undertaken and should be finalised in 2024. There was a previous relevant study relating to strategic sites within the Cherwell District. This was intended to support the Local Plan and should be consulted. It is acknowledged that the Project must proceed but the focus should be on ensuring that appropriate mitigation is provided. There should be consideration of off-site planting. There are no specific views of concern but the LVIA must assess the views of residential and recreational receptors in the area. Illustrative visual materials should include cross sections.	The LVIA will assess the landscape and visual effects of the Project, considering landscape and visual mitigation in year 15 of operation. EWR Co acknowledges the concern about mitigation and confirm that replacement planting and mitigation will be sympathetic to the existing surroundings. Details on the proposals are not available at this stage. The proposed representative viewpoints for the LVIA will be shared with the Council at a later date.

5. LVIA methodology

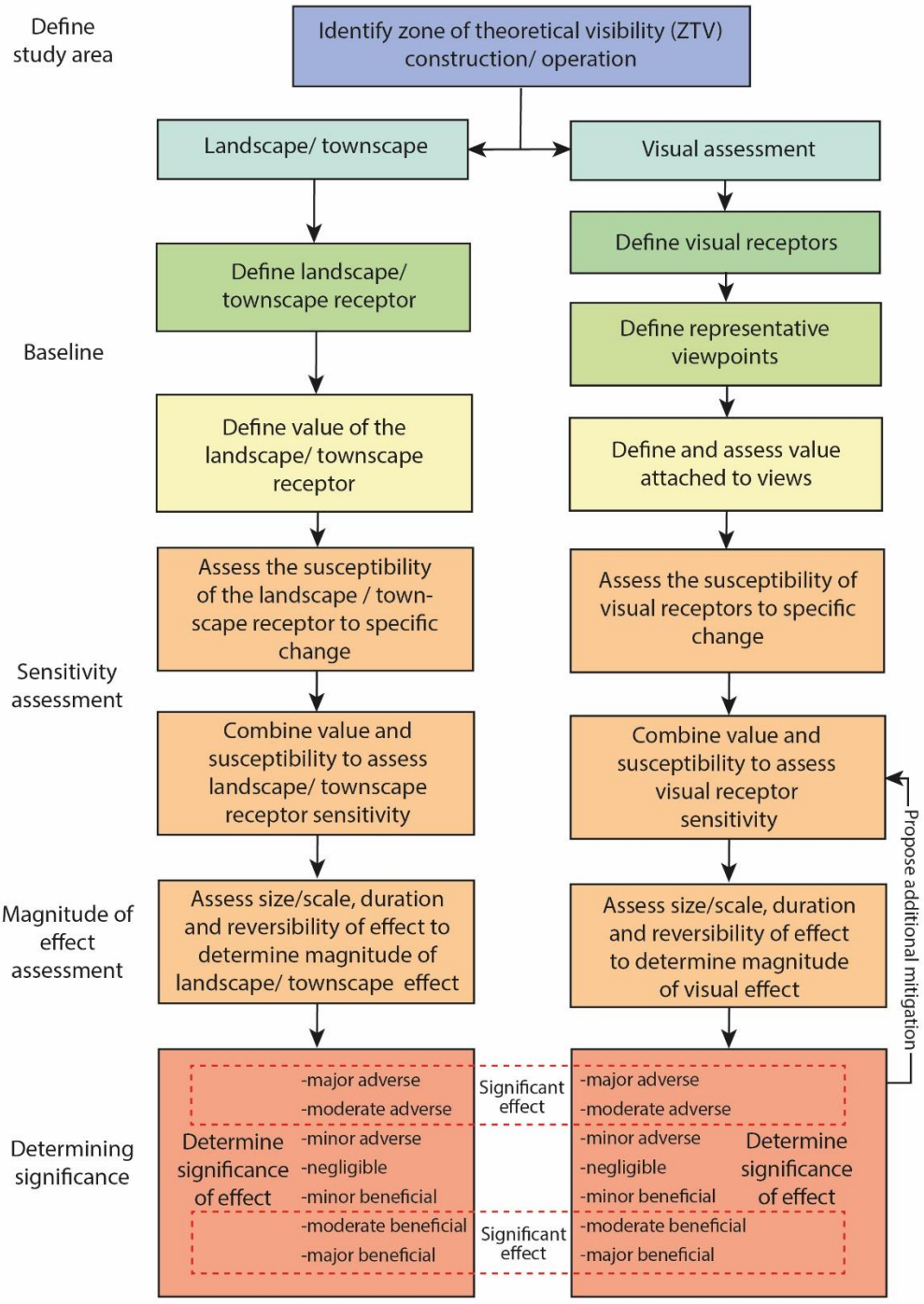
5.1.1. The LVIA will be carried out by chartered landscape architects experienced in EIA and their survey and assessment findings will be verified by landscape architects with the same level of qualification and experience.

5.1.2. Where the route passes through rural areas the LVIA will assess the effects of the Project using the methodology outlined below for landscape, and where it passes through urban areas it will use the methodology outlined below for townscape.

5.1.3. The LVIA will assess the effects of the Project on the views of receptors (people) in the study area. Receptors will include people living in residential properties, using the public rights of way (PRoW) network, taking part in outdoor recreational activities such as sport, staying in hotels and long-term healthcare institutions, at work, and travelling through the landscape.

5.1.4. The LVIA process is illustrated in Figure 1 of this document.

Figure 1 – Landscape, townscape and visual impact assessment.



5.2. Baseline assessment

5.2.1. The landscape, townscape and visual baseline assessment will establish the existing landscape, townscape and visual conditions against which the changes resulting from the Project will be described and evaluated in the LVIA. The findings of the survey will also inform the design of the Project and landscape mitigation by establishing the landscape or townscape context of the route corridor. This will enable designers to understand the character of the landscape or townscape, its evolution, how it is valued and how the introduction of the railway will affect its setting.

5.2.2. The landscape and townscape character of the study area and the nature of existing views will be established through desk-based research, field survey and consultation with local planning authorities and stakeholders.

5.2.3. The majority of locations selected for the field surveys will be on PRoW, footways and other publicly accessible places such as public roads, car parks and public open space. In inaccessible areas such as where access cannot be agreed with the landowner, the land or premises are private or there are no nearby suitable PRoW, professional judgement will be used to describe the likely landscape or townscape character of the area or the likely view from these locations. Where a representative viewpoint is selected to represent the view from a tall building, the likely elevated view will be described.

Landscape baseline

5.2.4. The landscape baseline will be evaluated based on the constituent elements, features and other factors that contribute to existing landscape character within the study area including:

- The physical influences on the landscape - including topography, geology, soils, microclimate, water bodies, and water courses;
- The influence of human activity – including land use, open space, transport routes, PRoW, land management, the character of settlement and buildings, the night-time environment, and the pattern and type of fields and enclosure;
- Local distinctiveness and identity;
- The aesthetic and perceptual aspects of the landscape – including scale, complexity, openness, tranquillity, and wildness; and
- Habitats and historic environment features – including nature reserves, sites of special scientific interest, conservation areas, listed buildings, registered parks and gardens and other elements contributing to historic landscape character.

5.2.5. For the baseline assessment, local landscape character areas (unique, discrete geographical areas of a particular landscape type) within the study area, will be identified. These will be based on Natural England's NCA profiles and

published local landscape character assessments and refined through desk study and site survey.

5.2.6. The study area includes parts of four NCA:

- NCA 108: Upper Thames Clay Vales;
- NCA 90: Bedfordshire Greensands Ridge;
- NCA 88: Bedfordshire and Cambridgeshire Claylands; and
- NCA 87: East Anglian Chalk.

5.2.7. Published local landscape character assessments which will inform the baseline landscape assessment and the identification of landscape character areas (LCA) include:

- A Character Assessment of Oxford in its Landscape Setting (LUC, updated 2022);
- Cherwell District Council Landscape Sensitivity and Character Assessment (Cobham Resource Consultants, 1995);
- Oxfordshire Wildlife and Landscape Study (Oxfordshire County Council, 2004);
- Aylesbury Vale Landscape Character Assessment (Jacobs, 2008);
- South Bucks District Landscape Character Assessment (LUC, 2011);
- Milton Keynes Landscape Character Assessment (Gillespies, 2016);
- Central Bedfordshire Landscape Character Assessment (LUC, 2016);
- Bedford Borough Landscape Character Assessment (LUC, 2020);
- Huntingdonshire Landscape and Townscape Supplementary Planning Document (Huntingdonshire District Council, 2022); and
- Greater Cambridge Landscape Character Assessment (Chris Blandford Associates, 2021).

5.2.8. The value of each LCA will be evaluated in accordance with the criteria set out in the table below:

Table 3 – Landscape value.

LCA value	Criteria for assessing landscape value
High	Designated landscape such as national park or national landscape (area of natural beauty (AONB)). Or an undesignated landscape of high scenic quality with a distinctive combination of features, elements and characteristics, outstanding views, and a strong sense of place. A scarce or fragile landscape with cultural, historic, or ecological elements which make a major contribution to landscape character. No or very few landscape detractors. Has components which are difficult to replace (such as mature trees). A tranquil landscape in good condition, largely intact, with an unspoilt character.
Medium	Landscape locally designated (such as conservation area, regional park) or locally valued (for its recreational facilities and footpath networks for instance). Some scenic quality and a moderate sense of place. A landscape with some distinctive features, elements, and characteristics. Some cultural, historic, or ecological elements which contribute to landscape character. Some high use areas, but overall medium tranquillity. Few landscape detractors.

LCA value	Criteria for assessing landscape value
Low	Undesignated landscape, not valued for its scenic quality, with a disparate combination of features, elements and characteristics and a weak sense of place. Mainly common features and few or no cultural, historic, or ecological elements that contribute to landscape character. Many landscape detractors. A landscape of low tranquillity, in poor condition.

Source: Informed by GLVIA3 (Swanwick, 2013)

Townscape baseline

5.2.9. The townscape baseline will be evaluated based on the constituent elements, features and other factors that contribute to existing townscape character within the study area including:

- Historical development and designated or non-designated heritage assets – the development of the settlement over time, historic street patterns, vernacular architectural styles, materials, design and detailing that provide local distinctiveness;
- Urban structure and built form – urban grain, scale, massing and density, block sizes and shapes, building heights, types, sizes, architectural style, period and materials, roof line and skyline;
- Movement and connectivity - gateways, nodes, legibility, permeability, severance, pedestrian, and cycle routes;
- Historic environment assets - local landmarks, memorable places, and important views;
- Green infrastructure and public realm – parks, open space, common land, gardens, trees, boundary treatments such as walls, hedges and hedgerows, and the relationship between buildings and open space; and
- Tranquillity and lighting – areas with a degree of tranquillity (in comparison with busy streets) and the extent to which areas are lit at night.

5.2.10. For the baseline assessment, local townscape character areas (unique and discrete geographical areas of a particular townscape type) within the study area, will be identified. These will be established through desk study and site survey and will be informed by conservation area appraisals where available.

5.2.11. The Cambridge Inner Green Belt Boundary Study (LDA Design, 2015) defined townscape character areas (TCA) for Cambridge. The city has seen much development since the study was published, but the assessment will be used to inform the identification of TCA. The Character Assessment of Oxford in its Landscape Setting (LUC, 2002) includes a description of the city's townscape and, while over twenty years old, will inform the assessment. There is currently no townscape character assessment for Bedford.

5.2.12. The value of each TCA will be evaluated in accordance with the criteria set out in the table below.

Table 4 – Townscape value.

TCA value	Criteria for assessing townscape value
High	Townscape with a distinctive combination of features, elements and characteristics that contribute to its unique character. It may be partly/wholly in the conservation area or be undesignated and is likely to have some of the following features: a historic core, buildings of high architectural quality, valued public realm, important views, extensive tree cover and green open spaces. The built form will exhibit local distinctiveness in terms of building styles and materials and the street pattern will be legible and permeable. A townscape with few detracting elements and components which are difficult to replace (such as historic buildings and mature trees), which is in good condition and has a strong sense of place. There may be secluded areas of high tranquillity (relative to the urban setting).
Medium	Townscape with some distinctive features, elements and characteristics which contribute to its character. It may be partly/wholly in the conservation area or be undesignated and is likely to have some of the following features: buildings of historic and/or architectural interest, valued public realm and green open space. There will be detracting elements such as busy roads which contribute to severance, or unsympathetic development which detracts from the area's historic character. Some scenic quality and a moderate sense of place. A townscape of medium tranquillity.
Low	Undesignated townscape, not valued for its appearance or historic character, with a disparate combination of features, elements and characteristics and a weak sense of place. Mainly common features including limited or poor-quality public realm and green open space, poor legibility and permeability and many detracting elements. A townscape of low tranquillity, in poor condition.

Source: Informed by GLVIA3 (Swanwick, 2013)

Visual baseline

5.2.13. The visual baseline study will identify visual receptors and important, designated, or protected views potentially affected by the Project.

5.2.14. Potential views from the railway corridor will also be identified to help understand how the Project design can protect these to enrich the view from the trains. These might contain features such as a church spire, a distinctive hedgerow pattern, a veteran tree or a long or framed view.

5.2.15. Viewpoints will represent the experience of individual visual receptors or groups of receptors if the change to their view is likely to be similar (for example views from a row of houses along a street or from PRoW passing through the same area).

5.2.16. Viewpoints will be selected to represent the visual receptor types in the study area. These could include residential, recreational, hotel, healthcare, educational, transport, active sports, and employment receptors. The selection of representative viewpoints will consider:

- The number of receptors likely to be affected;

- The viewing direction and distance from the construction boundary or elements of the proposals that could give rise to landscape and visual effects;
- The nature of the viewing experience; and
- Potential cumulative views, in conjunction with other developments.

5.2.17. Viewpoints will also be selected to represent specific views valued for their scenic quality, heritage importance or cultural associations or to demonstrate a specific issue. The selection of viewpoints will be based on the findings of the site survey, a review of planning policy documents and discussion with local planning authorities and other stakeholders.

5.2.18. Where possible, the viewpoints will be located outside the construction boundary to allow an assessment of effects in construction and operation. The value of the view will be determined in accordance with the criteria set out in Table 5.

Table 5 – View value.

View value	Criteria for assessing view value
High	A view in which attractive features are dominant or include attractive focal points and/or skyline features. Visual detractors may be present but are not strongly apparent in the composition of the view. A view in a high-quality landscape such as a National Landscape (AONB), designated or identified as of value in a guidebook or tourist literature. A view where the composition is a fundamental aspect of the design or function of a heritage asset and is integral to its setting.
Medium	An attractive view, typical of the area, but one which lacks a distinctive character and in which neither attractive or discordant elements are dominant or form a clearly apparent part of its composition. A view that is undesignated and undocumented.
Low	A view where discordant or unattractive features are dominant or prevalent and/or where such features are focal points and/or skyline features. These views may contain some attractive features, but these are not strongly apparent in the composition of the view. A view that is undesignated and undocumented.

Source: Informed by GLVIA3 (Swanwick, 2013)

Night-time baseline

5.2.19. The night-time baseline for landscape and visual amenity will be established through desk study and site survey. The surveys will focus on the stretches of the route where there will be permanent new lighting such as at new depots and at new stations. The baseline assessment will also refer to the Council for the Protection of Rural England's (CPRE) mapping: England's Light Pollution and Dark Skies.

5.2.20. The night-time baseline assessment will consider the visibility, brightness, and prominence of existing light sources in the landscape and views and comment on existing light spill (the spilling of light beyond the boundary of the area being lit), glare (the uncomfortable brightness of a light source when viewed against a

darker background) and skyglow (the brightening of the night sky). The baseline descriptions of the landscape and views at night will be qualitative and will not include a quantitative assessment of illumination levels. A Lighting Impact Assessment will inform the baseline descriptions.

Photography

5.2.21. Photographs will be taken, without a tripod, during winter and summer to represent the character of the landscape and existing views. A full-frame sensor digital single lens reflex camera with a fixed 50mm lens will be used to capture the photographs. The photographs will be stitched using PTGui software to create panoramic views with a horizontal field of view of 90 degrees, in line with the recommendations for Type 1 Visualisations (annotated viewpoint photography) in the *Landscape Institute's Technical Guidance Note 06/19: Visual Representation of Development Proposals*[3]. In urban areas single frame photographs may be used if, for example, the object of the view is too close for a panoramic view or the view is down a narrow street.

5.2.22. No night-time baseline photography will be provided due to the difficulty of taking night-time images that give an accurate representation of the night-time environment. Long exposures tend to accentuate sky glow impacts or apparent brightness of spill light areas, while short exposures may make areas appear to be darker than they appear to the naked eye.

5.2.23. It will not be possible to provide photography from representative viewpoint locations where land access has been refused or there is no publicly accessible location nearby.

Photomontage

5.2.24. To support the assessment, several photomontages will be prepared in accordance with the Landscape Institute's Technical Guidance Note 06/19: Visual Representation of Development Proposals.

5.2.25. The locations selected for the photomontages and the type of photomontage produced will be agreed in consultation with local planning authorities.

5.3. Assessment of effects

5.3.1. The LVIA will describe the effects likely to arise from the Project, taking into consideration potential mitigation measures and changes over time.

[3] Landscape Institute (2019) TNG 06/19 Visual Representation of development proposals. Available at: Visualisation of development - Landscape Institute

Landscape sensitivity

5.3.2. Landscape effects may be direct, where landscape elements are lost, damaged, or altered by the construction or operation of the Project, or indirect, where the setting or character of an LCA is altered by changes taking place in an adjoining area. The sensitivity of the landscape will be evaluated by considering the existing value of the landscape and its susceptibility to tolerate or accommodate the type of change arising from the Project.

5.3.3. In accordance with paragraph 5.42 of GLVIA 3, the assessment of susceptibility should be tailored to the Project and considered in the assessment of effects. The assessment of susceptibility will consider the characteristics of the landscape which are susceptible to change (including geology, landform, soils, vegetation, culture, heritage, associations and aesthetic, perceptual and experiential qualities) and will be guided by the criteria set out in the table below.

Table 6 – Landscape susceptibility.

Susceptibility	Criteria for assessing landscape susceptibility
High	One or more of the following apply: • There is no transport infrastructure in the area; • There is limited or no screening provided by existing woodland, trees, hedgerow, landform or built form; and • The overall character and the valued landscape characteristics, elements and features cannot tolerate the nature and scale of the change resulting from the Project without permanent serious adverse change to the baseline situation.
Medium	One or more of the following apply: • There is one or more major transport routes present in the landscape; • There is some screening provided by existing woodland, trees, hedgerow, landform or built form; and • The overall character and the valued landscape characteristics, elements and features can tolerate the nature and scale of the change resulting from the Project but there will be adverse changes to the baseline situation.
Low	One or more of the following apply: • There are several major transport routes present in the landscape; • There is screening provided by existing woodland, trees, hedgerow, landform or built form; and • The overall character and the valued landscape characteristics, elements and features can tolerate the nature and scale of the change resulting from the Project with few adverse changes to the baseline situation.

Source: Informed by GLVIA3 (Swanwick, 2013)

5.3.4. The evaluation of landscape sensitivity will be based on the typical criteria set out in the table below.

Table 7 – Landscape sensitivity

Landscape sensitivity	Typical description
High	A landscape valued at a national, regional, or local scale and with a distinctive and/or rare combination of features and elements, components that are difficult to replace (such as mature trees) and a strong sense of place. A landscape in or including a designated area or feature (such as a registered park and garden, a conservation area or a public open space), that is well maintained and has elevated tranquillity. An area with limited scope for mitigation in character with the existing landscape and a high susceptibility to change.
Medium	A landscape valued at a regional or local scale with distinctive features and elements that contribute to character and some sense of place. An area in moderate condition and which is moderately tranquil or tranquil in places. An area with scope for mitigation in character with the existing landscape and a medium susceptibility to change.
Low	An undesignated landscape of limited value with few distinctive features or elements that contribute to character, and which are easily replaced. An area that is not tranquil, has a weak sense of place and has scope for mitigation in character with the existing landscape and/or opportunities for enhancement. A landscape with a low susceptibility to change.

Source: Informed by GLVIA3 (Swanwick, 2013)

Townscape sensitivity

5.3.5. Townscape effects may be direct, where townscape components are lost, damaged, or altered by the construction or operation of the Project, or indirect, where the setting or character of a TCA is altered by changes taking place in an adjoining area. The sensitivity of the townscape will be assessed by considering the existing value of the landscape and its susceptibility to tolerate or accommodate the type of change arising from the Project.

5.3.6. In accordance with paragraph 5.42 of GLVIA 3, the assessment of susceptibility should be tailored to the Project and considered in the assessment of effects. The assessment of susceptibility will consider the characteristics of the townscape which are susceptible to change (including landform, built form, vegetation, culture, heritage, associations and aesthetic, perceptual and experiential qualities) and will be guided by the criteria and considered as part of the assessment of effects. The assessment of townscape susceptibility will be guided by the criteria set out in the table below.

Table 8 – Townscape susceptibility.

Susceptibility	Criteria for assessing townscape susceptibility
High	One or more of the following apply: • There are no major transport infrastructure routes (such as railways and main roads) in the area; • There is limited or no screening provided by existing vegetation, landform or built form; and • The overall character and valued townscape elements and features cannot tolerate the nature and scale of the change resulting from the Project without permanent serious adverse change to the baseline situation.
Medium	One or more of the following apply: • Major transport infrastructure routes (such as railways and main roads) are present in part of the area; • There is some screening provided by existing vegetation, landform or built form; and • The overall character and valued townscape elements and features can tolerate the nature and scale of the change resulting from the Project but this will result in adverse changes to the baseline situation.
Low	One or more of the following apply: • **Major transport infrastructure routes (such as railways and main roads) are a prominent feature of the area;** • **There is screening provided by existing vegetation, landform or built form; and** • **The overall character and the valued townscape elements and features can tolerate the nature and scale of the change resulting from the Project with few adverse changes to the baseline situation.**

Source: Informed by GLVIA3 (Swanwick, 2013)

5.3.7. The evaluation of townscape sensitivity will be based on the typical criteria set out in the table below.

Table 9 – Townscape sensitivity

Townscape sensitivity	Typical description
High	A designated or undesignated townscape with a unique character, a distinctive or rare combination of features that are difficult to replace, few detracting elements and a strong sense of place. An area with limited scope for mitigation in character with the existing townscape and a high susceptibility to change.
Medium	A designated or undesignated townscape, valued at a regional or local scale, with some features of that are difficult to replace, some detracting features and a moderate sense of place. An area with scope for mitigation in character with the existing landscape and a medium susceptibility to change.
Low	An undesignated townscape of limited value, with common features which are easily replaced and a weak sense of place. An area with scope for mitigation in character with the existing townscape a low susceptibility to change.

Source: Informed by GLVIA3 (Swanwick, 2013)

The magnitude of change to landscape and townscape

5.3.8. The magnitude of change to the landscape or townscape in construction, in year 1 of operation (opening year) and in year 15 of operation will be determined by considering:

- The nature of an impact – whether the introduction of the Project will be of benefit or detriment to the existing landscape or townscape character;
- The scale of the change – the extent of the loss of landscape or townscape elements, the degree to which aesthetic features or perceptual aspects of the landscape or townscape are altered (by the removal of trees, hedgerows or buildings or introduction of new structures for example) and whether a key characteristic of the landscape or townscape is altered;
- The extent to which replacement or mitigation planting restores the character of the landscape or townscape, provides landscape or townscape integration and/or screening;
- The geographical extent of the area affected; and
- The duration of the change and its reversibility.

5.3.9. The evaluation of the magnitude of change will be based on the criteria set out in the table below.

Table 10 – Magnitude of change to the landscape or townscape.

Magnitude of change	Adverse/ beneficial	Typical description
High	Adverse	Total loss or large-scale damage to existing landscape or townscape character or distinctive features or elements. Addition of new uncharacteristic, conspicuous features or elements (such as rail or road infrastructure). Widespread loss of an existing and noticeable sense of tranquillity. Changes that alter a substantial proportion of the LCA/TCA.
	Beneficial	Large-scale improvement of landscape or townscape character or to features and elements. Addition of new distinctive features or elements, or removal of conspicuous detracting features or elements. Changes that alter a substantial proportion of the LCA/TCA.
Medium	Adverse	Partial or noticeable damage to existing landscape or townscape character or distinctive features or elements. Addition of new features or elements that would be noticeable in the landscape or townscape and are largely uncharacteristic of the existing setting. Some areas experiencing a loss of an existing sense of tranquillity.
	Beneficial	Partial or noticeable improvement to existing landscape or townscape character by restoration of existing features or elements. Addition of new features or elements which strengthen character or removal of noticeable and detracting features or elements.
Low	Adverse	Slight loss or damage to existing landscape or townscape character of one (maybe more) key features and elements. Addition of new uncharacteristic features and elements but that would not be conspicuous in the landscape or townscape. Changes that will alter a small proportion

Magnitude of change	Adverse/ beneficial	Typical description
		of the LCA/TCA and its immediate setting. Very localised loss of an existing sense of tranquillity
	Beneficial	Slight improvement to existing landscape or townscape character by the restoration of one (maybe more) key existing features and elements, addition of new characteristic features and /or removal of detracting features. Changes that will alter a small proportion of the LCA/TCA and its immediate setting.
Negligible	Adverse	Almost indiscernible alteration to existing character and/or distinctive features or elements. Addition of new features or elements that would not be conspicuous in the landscape or townscape and that are characteristic of the existing landscape or townscape. Barely perceptible change to the sense of tranquillity.
	Beneficial	Very slight improvement to existing landscape or townscape character by the restoration of one or more existing features and elements.
No change	Not applicable	No perceptible alteration to existing landscape or townscape character or loss of existing features and elements. No perceptible change to the sense of tranquillity.

Source: Informed by GLVIA3 (Swanwick, 2013)

Sensitivity of visual receptors

5.3.10. Visual effects will arise from changes in the view resulting from the construction or operation of the Project. The sensitivity of visual receptors will be evaluated by considering the existing value of their views and their susceptibility to a change to their views and visual amenity arising from the Project.

5.3.11. In accordance with paragraph 6.3.2 of GLVIA 3, the evaluation of susceptibility is a function of the occupation or activity of the receptor experiencing the view, the extent to which their attention or interest is focused on the view and the visual amenity they experience at particular locations.

5.3.12. The most susceptible visual receptors include:

- Residents at home;
- People engaged in outdoor recreation where their attention is focused on the view (such as users on the river, canal, PRoW and long distance trails);
- Visitors to heritage assets where views are important to the experience; and
- People travelling on rural roads.

Those less susceptible to a change in the view include:

- People engaged in outdoor sports or recreation where their attention is focused on the activity rather than the view;
- People at places of work where their attention is focused on their work rather than the view; and
- Users of main roads and other transport routes (apart from rural roads).

5.3.13. The assessment of visual receptor sensitivity will be based on the criteria set out in the table below.

Table 11 – Visual receptor sensitivity

Sensitivity	Criteria for assessing visual receptor sensitivity
High	Occupiers of residential properties, PRoW users and visitors to places whose attention is focussed on the landscape. Views with few detracting features. High value views which may be designated or undocumented.
Medium	People working outdoors in or travelling through rural areas, people walking or cycling through urban areas and visiting outdoor publicly accessible open space. Views in which neither attractive nor discordant elements are dominant. Medium value views which may be undesignated and undocumented.
Low	People at work, at school, engaging in formal sport, commuting in urban areas, and travelling at high speed on main roads or railways. Typically, views may include predominantly discordant or unattractive features. Low value views which are undesignated and undocumented.

Source: Informed by GLVIA3 (Swanwick, 2013)

5.3.14. The magnitude of change to views in construction and operation will be determined by considering the scale and nature of the change, the distance of the change from the visual receptor, the receptor's direction of view, the extent of screening and filtering of the view provided by existing, replacement or mitigation planting and whether the receptor is static or moving.

5.3.15. The magnitude of change to views will be assessed in accordance with the criteria set out in the table below.

Table 12 – Magnitude of change to visual amenity

Magnitude of change	Adverse/beneficial	Typical description
High	Adverse	The Project or part of it will become the dominant feature or focal point of the view. Addition uncharacteristic or incongruous of new features across the majority of the view. Total loss or substantial adverse alteration to key characteristics of the view. Substantial changes in proximity to the visual receptor, within the direct frame of view.
	Beneficial	Substantial beneficial change to the view in proximity to the receptor. Removal or replacement of detracting elements in the existing view.
Medium	Adverse	The Project or part of it will form a noticeable feature or element of the view, readily apparent to the receptor, but which are largely characteristic of the existing view. Partial loss of key characteristics of the view. Substantial change partially filtered by intervening vegetation and/or built form or viewed obliquely.

Magnitude of change	Adverse/beneficial	Typical description
	Beneficial	Noticeable beneficial change to the view. Partial removal or replacement of detracting elements in the existing view.
Low	Adverse	The Project or part of it will be perceptible but seen as one of a series of components in the wider panoramic view, affecting a small proportion of the view and not altering the balance of features in the view. Adverse changes within the background of the view or viewed obliquely and largely filtered/screened by intervening vegetation or built form.
	Beneficial	Beneficial change affecting a small proportion of the view or in the background of the view.
Negligible	Adverse	Only a small part of the Project will be discernible or being at such a distance it will form a barely noticeable feature or element of the view. Adverse changes almost entirely obscured by intervening vegetation and/or built form.
	Beneficial	Small beneficial change largely obscured by intervening vegetation and/or built form.
No change	Not applicable	No part of the Project will be discernible.

Source: Informed by GLVIA3 (Swanwick, 2013)

5.3.16. The levels of significance of effect will be evaluated by combining the sensitivity of the landscape, townscape or visual receptor with the magnitude of change that has been determined in the assessment. This is described in more detail in section 10.

Evaluation of effects on the landscape or townscape and views at night

5.3.17. The effects of lighting on the night-time landscape or townscape character and views will be evaluated in construction and operation using the criteria set out for assessing the magnitude of change in the methodology above. The assessment will be descriptive rather than a quantitative lighting impact assessment.

5.3.18. Effects on night-time views of the following visual receptors will be assessed:

- People occupying residential properties, residential healthcare institutions and residential boats;
- People travelling along rural roads through dark landscapes;
- People staying in hotels and camp sites; and
- People visiting recreational attractions which are open at night.

5.3.19. Other receptors will not be considered on the basis that they would not be present at night (such as PRoW users) or their immediate context would be brightly lit (such as people using sports pitches).

6. Preliminary baseline description

6.1. General description

6.1.1. The Project will affect a corridor of land between Oxford and Cambridge. The route will pass through the rural landscape of Oxfordshire, Buckinghamshire, Bedfordshire, and Cambridgeshire and through the cities or towns of Oxford, Bicester, Milton Keynes, Bedford, and Cambridge.

6.1.2. In Oxford, Bicester, Bletchley, Bedford, and Cambridge the existing railway line has shaped the urban form with associated industrial, commercial and residential development along the line, severance of the urban areas and a requirement for frequent overbridges and underpasses. In the rural sections of the existing line, the railway and associated road and rail overbridges are well integrated into the landscape, with vegetation lining much the route, but the line has reduced connectivity across the landscape and tranquillity locally.

6.1.3. Between Oxford and Bedford, the Project will be within or adjacent to an existing railway corridor. The proposed new railway line between Bedford and Cambridge would pass through a largely rural landscape.

6.1.4. The area north-east of Bedford has an undulating topography of fluted valleys, formed by the numerous watercourses running north to south. The many small villages here are surrounded by woodland and the area feels tranquil.

6.1.5. The landscape becomes flatter, more open and less tranquil nearer St Neots and in the Great Ouse valley due to the presence of major roads, extraction industries along the river and a greater extent of development. Between St Neots and Cambridge, the landscape is initially predominantly rural, with open, arable farmland on a slightly raised plateau and small settlements. It starts to become more urbanised and less tranquil approaching Cambourne, where the A428 on dual carriageway passes to the north of the settlement.

6.1.6. The landscape of the study area changes again as the Project route goes south, leaving the plateau and passing through chalk hills north of Wimpole and at Haslingfield. It then descends into the shallow River Cam and River Rhee valley. Here the village settlements are larger and are located closer together but are well integrated in the rural landscape by surrounding vegetation. The area is less tranquil, due to the proximity of Cambridge, the presence of two railway lines and traffic on main roads such as the A10 and M11.The motorway and railways sever the landscape.

6.2. Landscape, townscape and visual elements

6.2.1. For the Scoping Report, the Project has been divided into eight route sections and the description of the existing landscape or townscape character and visual amenity of the study area uses this structure. The route sections are:

- Oxford to Bletchley;
- Fenny Stratford to Kempston (the Marston Vale Line);
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

Landscape

6.2.2. The study area (the area within 2.0km of the draft Order Limits) includes parts of four NCA. The NCA profiles provided the basis of the landscape baseline description in this report, along with additional information derived from published landscape character assessments, desk study and site survey. The NCA, designated landscape, historic environment, and ecological features relevant to the landscape baseline and national trails and public rights of way are shown on Figure 78 in EIA Scoping – Figures. The topography of the study area is shown on Figure 81-86 in EIA Scoping – Figures. The elements and features that contribute to the landscape character of the study area for the Project are described in the table below.

Table 13 – Landscape baseline.

Route section	Description of landscape character
Oxford to Bletchley	Between Oxford and Winslow, the Project route passes through the Upper Thames Clay Vales NCA. The landscape here is characterised by a broad belt of open, gently undulating lowland farmland on predominantly Jurassic and Cretaceous clays. The area has been shaped by watercourses, including the Rivers Thames and Cherwell. The wet ground conditions and heavy clay soils favour livestock farming and enclosed pasture in the valley bottoms. On higher land, the farmland is more open and arable cultivation is possible. Woodland cover is scarce but hedges, hedgerow trees and field trees are a common sight. Settlement is sparse in the flood plains except where rivers meet such as at Bicester. Mineral extraction is a feature of the river network and the resulting lakes and open water have become important for wildlife and recreation. Major transport infrastructure crossing the landscape includes mainline railway lines and roads including the M40, A40 and A34 which reduce tranquillity locally. A short section of the Project route between Winslow and Bletchley passes through the Bedfordshire and Cambridgeshire Claylands NCA. The character of the landscape here is described in the Fenny Stratford to Kempston Route section below.

Route section	Description of landscape character
	At night the area is brightly lit in Oxford, Bicester, and Winslow, but the night sky is fairly dark in the rural landscape between the settlements.
Fenny Stratford to Kempston (the Marston Vale Line)	Much of the Project route between Fenny Stratford and Kempston passes through the Bedfordshire and Cambridgeshire Claylands NCA. The landscape here is open, with a gently undulating lowland plateau, divided by shallow river valleys. The underlying clay geology is overlain by boulder clay, with sand and gravel deposits within the river valleys. Intensive arable crop production is the predominant land use but business and technology parks and new housing development forms an abrupt interface with the open countryside. Occasional landmark features include water towers and village churches. The Project route in this section also passes partly through a small area on the north-western edge of the Bedfordshire Greensand Ridge NCA between Fenny Stratford and Lidlington. The landscape is formed of a narrow ridge running north-east, south-west, rising out of the Bedfordshire and Cambridgeshire Claylands NCA to the north. The north-west-facing scarp slope and its underlying sandstone geology has shaped the landscape and industry of the ridge. Its historic landscapes, including Woburn Abbey and Ampthill Park, small settlements and extensive woodland give parts of the NCA a timeless feel. The north-west-facing scarp slope, covered by coniferous and deciduous woodland, pasture, arable and heathland, overlooks Milton Keynes and the Marston Vale. The ridge is nationally important for recreation with Woburn Abbey and its safari park, the Greensand Ridge Walk, the John Bunyan Trail National Trail and an extensive PRoW network. The darkness of the night sky is reduced by streetlighting in Milton Keynes and around M1 junction 13 and the logistics depot at Brogborough. It is relatively dark further south, and above Woburn Abbey and grounds.
Clapham Green to Colesden	The section of the route between Clapham Green and Colesden passes through the Bedfordshire and Cambridgeshire Claylands NCA. However, the characteristic features of the landscape here differ from those of the wider NCA in some respects. The underlying geology around Clapham is limestone overlain by boulder clay and gravels. The landscape here is of a smaller scale, with significant woodland cover and enclosure provided by dense hedgerows with hedgerow trees. Rural roads link settlements but large areas of the landscape are only accessible by tracks and footpaths. East of Clapham, the landscape rises out of the River Great Ouse Valley to a plateau. The underlying geology is clay and the landscape becomes more open, with large, geometric fields in arable production and sparse or gappy hedgerows. Scattered woodland frame distant views. Settlement is dispersed and linked by a network of rural roads. Street lighting in urban areas reduces the darkness of the night sky near Bedford but it is relatively dark along the Project route east of Clapham.
Roxton to east of St Neots	The section of the route between Roxton and east of St Neots passes through the Bedfordshire and Cambridgeshire Claylands NCA. However, the characteristic features of the landscape here differ from those of the wider NCA in some respects. South of St Neots, the landscape is characterised by the shallow, wide valley of the River Great Ouse. The river is lined by willow and restored sand and gravel workings along the valley are a recreational and ecological resource. Historic parks at Tempsford, Roxton and Little Barford contain parkland trees, ridge and furrow and medieval earthworks. The A1 and East Coast Main Line have an urbanising influence on the area and detract from tranquillity locally. East of St Neots the land rises up to a clay plateau landscape, shaped by tributaries flowing west towards the River Great Ouse. Tall hedgerows with

Route section	Description of landscape character
	frequent hedgerow trees are a distinctive feature in the sparsely settled landscape. Green lanes, moated sites and deserted villages suggest that the landscape was once more densely populated than it is today. Heavy clay soils support cereal crops and arable production. The area is more tranquil away from main roads. Street lighting in St Neots and along the A1 corridor reduce the darkness of the night sky but it is relatively dark along the Project route east of St Neots.
Croxton to Toft	The section of the route between Croxton and Toft passes through the Bedfordshire and Cambridgeshire Claylands NCA. The landscape here is characteristic of the NCA, comprising a gently undulating, lowland plateau, divided by shallow river valleys. The underlying clay geology is overlain by chalky boulder clay, with sand and gravel deposits within the river valleys. Soils are lime-rich, loamy and clayey on higher ground and lighter and more fertile in the river valleys. The landscape is predominantly open with planned and regular arable fields bound by deep, ditches and managed hedgerows. Scattered woodland cover includes plantations, secondary woodland and pollarded willows and poplar along river valleys. Designed and designated landscapes and country houses include Croxton Park and Childerley Hall. Cambourne and the A428 which is a dual carriageway east of Caxton Gibbet have an urbanising influence of the area and reduce tranquillity locally. Street lighting above Cambourne and in the villages of Highfields Caldecote, Hardwick and Toft lighten the night sky, but the surrounding farmland is relatively dark.
Comberton to Shelford	The section of the route between Comberton and Shelford passes mainly through East Anglian Chalk NCA and a small part of the Bedfordshire and Cambridgeshire Claylands NCA. The route runs across the shallow, open valley of Bourne Brook, south of Comberton where the telescopes of the Mullard Radio Astronomy Observatory are a local landmark. The landscape changes as the route passes through a narrow chalk ridge immediately south of Haslingfield. This is a continuation of the ridge that crosses southern England and there are expansive views across the rolling hills towards Cambridge. Here the large fields, mainly in arable production, are enclosed by low hawthorn hedges. The A603 Roman Road crosses the area. Tree cover is sparse but trees on hill tops are a distinctive feature. South-east of Haslingfield, the character of the landscape changes with the two shallow and tree-lined valleys of the Rivers Granta and Rhee, which converge to form the River Cam just south of Cambridge. The landscape has a more intimate, sheltered scale and the villages, including Harlton, Haslingfield, Hauxton and Little Shelford are screened from the landscape and each other by woodland and tree belts on the village boundaries. The farmland is mainly used for growing cereals but historically, sheep rearing also shaped the area, leading to the creation of botanically rich grasslands, which are now often small and fragmented. The large village of Great Shelford, the M11 and the convergence of two railway lines just north of Great Shelford have an urbanising influence of the landscape and detract from its tranquillity. The night sky is relatively dark along the Project route up to Harston. Between Harston and Great Shelford, the night sky is not dark due to street lighting in the larger villages and Cambridge.

Townscape

6.2.3. The study area (the area within 0.75km of the draft Order Limits) includes five urban areas. The elements and features that contribute to the townscape of the areas are described in the table below, for the relevant route sections.

Table 14 – Townscape character.

Route section	Description of townscape character
Oxford to Bletchley	The character of the Oxford townscape in the Project study area is strongly influenced by the existing railway and bordered by vegetation and green open space along much of its route. The railway is mainly at ground level and follows the course of the River Thames as it flows through the centre of Oxford. Towards the centre of the city, 19th and 20th century residential development predominates but around Oxford Station, there are academic and commercial uses and car parks. Here buildings are more substantial in scale than elsewhere in the study area. The historic centre of the city is separated from the railway by intervening buildings. Noise and activity generated by the railway and road network results in low levels of tranquillity. The Bicester townscape of the study area is strongly influenced by the railway, Bicester Village station, car parks, the level crossing and roads. The land uses around the station are mainly commercial but there is residential development along London Road. Noise and activity generated by the railway and road network results in low levels of tranquillity. In Bletchley, the railway station, railway lines, including the elevated Bletchley Flyover which towers over the streetscape, and the B4034 dual carriageway are the dominant influences on the townscape in the study area. Development along the transport corridors is mainly commercial with one and two storey retail units surrounded by car parking. East of the B4034 there is mainly two storey housing and the B4034, lined with trees for much of its length as it passes through Bletchley, forms a green edge to the residential areas. Noise and activity generated by the railway and road network results in low levels of tranquillity.
Bedford	The Midland Main Line and Marston Vale Line cross on the southern outskirts of Bedford and join a shared railway corridor just north of the River Great Ouse. The railway has influenced the townscape character of Bedford, with multiple bridge crossings and severance of the town into two parts, east and west of the route. However large areas of vacant railway land, particularly south of Bedford Station, provide a green corridor through the town. The railway is mainly screened from the town by vegetation or development but is evident where it crosses the river. Bedford Hospital occupies a large area of the town centre and extensive car parks around Bedford Station but for the rest of the railway corridor the surrounding land use in residential with 19th and early 20th century terraced houses and more recent apartment blocks. Noise and activity generated by the railway and road network results in low levels of tranquillity.
Cambridge	The existing railway, at grade as it enters and passes through Cambridge, has limited influence of the character of the city as it is mainly screened by vegetation or development bordering the railway corridor. It is more apparent south of the city, where the landscape is more open. Here the large-scale buildings of the Cambridge Biomedical Campus and Hobson's Park frame the approaches to the city. Towards the centre of the city, 19th and 20th century residential development predominates but around Cambridge Station, the more recent buildings are more substantial in scale than elsewhere in the study area and are occupied by offices and hotels. The historic centre of the city is some distance from the station. Noise and activity generated by the railway

Route section	Description of townscape character
	and functioning of the city's research institutions and businesses results in low levels of tranquillity.

Visual amenity

6.2.4. Viewpoints representing the views of people living, engaged in recreation, working, on holiday or travelling in the area and likely to be affected by the Project, have been identified. The existing visual amenity of the study area, divided into eight separate route sections, is summarised in the table below.

Table 15 – Visual amenity.

Route section	Description of visual amenity
Oxford to Bletchley	Near Oxford Station, there are clear views of the railway from nearby residential properties, the Said Business School and commercial buildings but the railway is well screened from the historic centre by intervening buildings. The corridor widens north of the station and there are uninterrupted views of the tracks and trains from flats east of the line but vegetation screens views from the residential area to the west and north. On the northern outskirts of the city, urban fringe uses such as a golf club, hotels, car parks, major road junctions and Oxford Parkway Station detract from views. Between Oxford Parkway and Bicester, the Project route passes through open farmland and past small settlements. The area is fairly flat, with relatively little tree cover and few elevated viewpoints. There are long views over the rural landscape from the extensive PRoW network in the area. The existing railway and small stations in villages have a fairly discreet presence in the landscape, being mainly at ground level or cutting, and vegetation lines much of the route. In Bicester, the railway at grade passes through an area of mixed residential and commercial development including Bicester Village Station, the surrounding car parks and the London Road level crossing which can be seen from around the station and nearby residential properties. Between Bicester and Bletchley, the landscape becomes more undulating, fields are smaller and bordered by hedgerows and roads are frequently tree-lined. The existing railway line is well integrated into the landscape and views from the PRoW network and isolated farmhouses are less open. The railway line passes along the northern boundary of Winslow, but it is screened from residential properties nearby by vegetation bordering the railway corridor. The south-western outskirts of Bletchley are mainly residential or open space, but the Project route, though on viaduct and embankment, is largely screened from these locations by lineside vegetation. The line is prominent in the view as it passes Bletchley Station on high viaduct, with little screening vegetation. Receptors include residents in flats, people working in commercial premises and road users. There is extensive rail and road infrastructure in the area which detracts from the view. Between Bletchley Station and Fenny Stratford Station, the line descends to ground level and is screened form the surrounding area by lineside vegetation. Where the new East West Rail and High Speed 2 (HS2) lines are under construction, the construction works and compounds are clearly visible from the landscape and settlements where lineside vegetation has been removed.

Route section	Description of visual amenity
	Streetlighting in Oxford and Bicester means that the night sky above is rarely dark. Night-time views over farmland between the urban areas and larger settlements such as Winslow and Steeple Claydon, which are lit at night, is generally fairly dark.
Fenny Stratford to Kempston (Marston Vale Line)	Between Fenny Stratford and Woburn Sands, the Project route passes between large, open fields and wooded ridge to the south and the outskirts of Milton Keynes to the north. The existing railway line is well integrated in the landscape and is not generally noticeable in views from the countryside or Milton Keynes. It is clearly visible from residential properties in Woburn Sands, however. There are distant views of the existing railway line from the northern boundary of the Woburn Abbey Registered Park and Garden, just before the route crosses under the M1 and passes a large logistics deport at Brogborough. Between Brogborough and Kempston, the landscape is mainly low-lying farmland interspersed with large bodies of open water surrounded by vegetation. The existing railway is lined with trees and consequently largely screened from the wider landscape. Streetlighting in Bletchley means that the night sky above is rarely dark but night-time views over farmland away from Woburn Sands and M1 junction 13, which are both lit at night, are generally fairly dark.
Bedford	In Bedford, the Project route passes mainly through residential areas which back on to the existing rail corridor. Towards the centre of the town, large areas of vacant, but well vegetated, railway land screen trains, tracks and sidings from the wider area but around Bedford Station there are clear views of the Midland Main Line and Bedford Station from the River Great Ouse and towpath and from flats east and west of the station. The Marston Vale Line and Bedford St John Station are screened by vegetation and the Ampthill Road Bridge. Large areas of car parking and industrial and commercial buildings detract from views in the around the two stations. North of the town, transport infrastructure, including the A6 and the Midland Main Line, detracts from views over the floodplain of the Great Ouse. The night sky above Bedford is not dark.
Clapham Green to Colesden	Views from farmhouses and narrow country lanes along the stretch of the Project route between Clapham Green and Colesden are over an undulating and elevated plateau landscape. There are few detracting features and views are framed by woodland belts and trees growing along roads and field boundaries. Night-time views over farmland and from the mainly unlit villages are generally fairly dark but lighting along the A1 and in Bedford and St Neots, in adjacent route sections, contributes to skyglow in the east.
Roxton to east of St Neots	The River Great Ouse floodplain is flat and the views here are influenced by pylons, powerlines and major roads, including the A1 and A421. Views over open farmland from Tempsford, Little Barford and nearby PRoW and rural roads are more rural in character, but the London North East Railway, wind turbines and overhead powerlines are detracting features. East of Tempsford, the land along the route of the Project rises gently up, out of the Great Ouse floodplain to an open plateau of large arable fields and there are expansive views, framed by woodland belts, from PRoW and isolated houses. The A428 is tree-lined for much of its route and is not a dominating feature in views. Night-time views over farmland east of the Project route are generally dark but street lighting along the A1, in Roxton and in St Neots are a source of skyglow.

Route section	Description of visual amenity
Croxton to Toft	Views over the open landscape between Croxton and Caxton Gibbet are rural in character and the A428 is well screened by roadside vegetation. Views of the wider landscape from Croxton Park and Childerley Hall are screened by estate planting. East of the Caxton Gibbet roundabout, the A428 widens into a dual carriageway and becomes a prominent and detracting feature in the view but the road is mainly screened from Cambourne by intervening buildings and roadside vegetation. The route of the Project between Bourn Airfield and Toft weaves between small villages through a flat valley landscape dotted with woodland belts. Open views from the PRoW and rural roads are framed by woodland belts but from the villages views to the surrounding landscape are generally screened by garden vegetation or woodland on settlement boundaries. Night-time views over farmland and the smaller villages are generally dark but street lighting in the larger villages such as Comberton are a source of light and skyglow.
Comberton to Shelford	South of Comberton, there are open views over farmland across the shallow Bourne Brook valley. The Project route passes through Chapel Hill, a narrow chalk ridge south of Haslingfield, and there are long and elevated views from the ridge towards Cambridge. Southeast of Haslingfield, the route crosses the shallow, tree-lined valley of the River Cam and its tributaries. Views from PRoW and rural roads in the area are largely enclosed and framed by trees, hedgerow and woodland. Views out across the surrounding landscape from the villages of Harston, Newton, Hauxton and Little Shelford are largely contained by garden vegetation and woodland at the village boundaries. Near Harston and Little Shelford, the Shepreth Branch Line is at grade or in slight cutting and largely screened from view by the layering effect of field boundary, roadside and lineside vegetation and intermittent woodland. The line is apparent only at level crossings within or on the edge of the villages. As the route approaches Great Shelford, the character of views changes, becoming more suburban and nearer Cambridge, the tall buildings of Biomedical Campus and Papworth Hospital are dominant on the skyline. Night-time views over farmland are affected by streetlighting in the villages and the sky above Cambridge is rarely dark.
Cambridge	In the city, the West Anglian Main Line corridor is visible from the residential development and sports fields that line the tracks. Cambridge Station and sidings are overlooked by flats and houses but screened from the historic centre of the city by intervening residential development and vegetation within the commons and open green spaces. Coldham's Common, in the Green Belt and Common Land, is one of the many commons that provide a green setting to the city, open space and cycling and pedestrian routes. A single-track railway line passes through the common but it is well screened from the surrounding area. Views of the railway corridor north of Cambridge Station are limited to housing and places of work lining the rail corridor. The route of the Project will be visible from two more commons, Stourbridge Common and Ditton Meadows, where it crosses on embankment and overbridge. Streetlighting throughout the urban area means that the night sky is not dark above Cambridge.

6.3. Future baseline

6.3.1. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the Project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

6.3.2. Refer to section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

7. Sources of impact

7.1. Construction

7.1.1. The sources of impact on landscape and visual amenity during construction will include:

- Construction activity and vehicle movements;
- Construction compounds, fencing, hoardings, hard surfacing, office accommodation and construction machinery;
- Soil stripping, earthworks associated with the excavation of tunnels and cuttings and the construction of embankments;
- Materials stockpiles;
- Construction lighting;
- Temporary PRoW diversion or introduction of gated crossings; and
- Temporary structures such as bridges and access roads.

7.2. Operation

7.2.1. The sources of impact on landscape and visual amenity during operation will include:

- Loss of woodland, trees, hedgerows, and farmland;
- The introduction of large scale transport infrastructure including stations, depots, sidings, bridges, viaducts, embankments, cuttings, and new roads into the rural landscape;
- The introduction of landscape planting and earthworks;
- Changes to existing transport infrastructure such as redesign of stations, new track within the railway corridor, bridge widening, road realignment, new highways crossings such as bridge or underpasses;
- level crossing closures;
- Lighting associated with new stations, depots, and sidings; and
- The presence of trains moving through the landscape and road traffic on new road infrastructure.

8. Potential impacts and effects

8.1. Overview

8.1.1. Potential impacts and effects include:

- Diminishing of rural landscape and townscape character and changes to views due to the presence of construction activity, machinery, construction compounds and large scale earthworks in the rural landscape or urban area. Reduction in tranquillity resulting from activity and noise generated during construction. Reduction of PRoW connectivity due to temporary PRoW diversions or closures;
- Diminishing of rural landscape character and changes to rural views due to loss of vegetation and the introduction of a new railway line and associated embankments, viaducts, bridges, underpasses, cuttings, stations, sidings and rail depots into the countryside;
- Diminishing of townscape character and changes to urban views due to loss of vegetation, the introduction of new stations, widening of tracks and changes to the road network including road realignment, bridge widening and the replacement of level crossings with overbridges;
- Reduction in tranquillity due to the activity and noise generated by road traffic and trains in operation; and
- Introduction of or changes to lighting on stations, roads, depots, and sidings reducing the darkness of night skies and the landscape in rural areas and increasing light levels in night-time views in rural and urban areas.

8.2. Potential permanent and operational effects

8.2.1. Changing climate conditions into the future, together with the impacts of the Project on landscape and visual amenity may exacerbate (or occasionally ameliorate) the significance of the project effects. For example, increased summer temperatures and drought risk may reduce plant growth rates, increasing the time it will take for mitigation planting to become effective in integrating the Project into the landscape or screening it from visual receptors. Significant effects may in this case persist for a longer time than would be the case with cooler, wetter summers. The influence of climate change in exacerbating or ameliorating the significance of effects will be incorporated within the evaluation stage.

8.2.2. Between Oxford and Bedford, the effects of the Project will affect discrete locations where, for example, there will be a new station or road bridge, or a level crossing will be closed. Between these locations, the changes will be limited to an increase in the number of trains passing affecting the tranquillity of the landscape. If overhead electrification is required, effects will be experienced through much of the study area. Where overhead line equipment is introduced

along the route, existing lineside vegetation will be removed, potentially opening up views of the existing line which is currently well integrated into the landscape.

8.2.3. Between Bedford and Cambridge, where a completely new railway line will be constructed, effects will be more widespread, with the introduction of large scale infrastructure including embankments, viaducts, bridges, cuttings, stations at Tempsford and Cambourne, roads and passing trains into a predominantly rural environment. Passing trains will reduce the tranquillity of the landscape. Landscape and visual effects will be experienced throughout the study area.

8.3. Potential temporary construction effects

8.3.1. Between Oxford and Bedford, the temporary effects resulting from the construction of the Project will affect discrete locations where, for example, a new station or bridge will be built or where utilities will be diverted. Between these locations, there will be little change to the existing landscape or views unless overhead line equipment for electrification is installed along the route. In this case, effects will be experienced through much of the study area as the area required during construction will be increased and the removal of lineside vegetation will open up views of construction along the whole route.

8.3.2. Between Bedford and Cambridge, where a completely new railway line will be constructed, temporary effects will be more widespread, due to the presence of large scale earthworks, construction compounds, materials stockpiles, and machinery in the predominantly rural landscape. Construction activity, construction traffic, temporary haul routes and temporary traffic diversions will reduce the tranquillity of the landscape. Temporary landscape and visual effects will be experienced throughout the study area.

9. Assumed mitigation

9.1. Mitigation principles

9.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

9.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project proposals will therefore have embedded within them various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

9.1.3. The draft Order Limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

9.1.4. For the assessment of impacts on landscape and visual amenity, embedded mitigation might include:

- Woodland, tree and hedgerow planting for screening and landscape integration;
- Landscape earthworks for screening and landscape integration;
- Meadows and grassland in rural and urban areas for landscape integration;
- Design of high quality public realm around stations and in urban areas; and
- Careful location and design of fencing and noise barriers for the Project in operation.

9.1.5. It is possible that future climate conditions may impede the effectiveness of assumed mitigations. For example, increased risk of drought conditions may reduce the effectiveness of mitigation planting and its ability to mitigate the effects of the project upon visual amenity. There is further detail on this in Table 16.

9.1.6. It is assumed that mitigations are designed which take climate change into account, for example through the mitigation design and timing. Any effects on mitigations will be identified and recorded within the ES.

Table 16 – Future climate conditions and impact on embedded mitigation.

Climate Variable	East West Rail element and users affected	Potential impact	Embedded mitigation	Assurance mechanism
Plant pests and diseases	Mitigation planting	Planting will not thrive or will fail	Woodland, trees and hedgerows	Select a wide variety of woodland, tree and hedgerow species which are resilient to plant pests and diseases.
Lower rainfall in the growing season	Mitigation planting	Planting will not thrive or will fail	Woodland, trees and hedgerows	Select woodland, tree and hedgerow species tolerant of drier growing conditions.
Increased temperature	Mitigation planting	Planting will not thrive or will fail	Woodland, trees and hedgerows	Select woodland, tree and hedgerow species tolerant of warmer growing conditions.
Extended growing season	Mitigation planting	Planting may grow faster than predicted	Woodland, trees and hedgerows	None required.

9.2. Design principles

9.2.1. The approach to the design of the Project will include the following measures:

- Minimising the loss of existing features such as trees, woodland or built structures which are key elements of the character of the landscape, townscape, or views;
- Respecting the existing local character of the landscape or townscape in the design of mitigation;
- Looking for opportunities to strengthen local landscape or townscape character in the design of mitigation;
- Considering the existing nature of views in the design of screen planting; and
- Designing new stations, public realm, and structures such as bridges and viaducts to respect the local landscape and townscape character.

9.3. Code of construction practice

9.3.1. Construction work can be one of the chief causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

9.3.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to

avoid or reduce likely significant adverse effects on landscape, townscape and visual amenity. The assessment will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a Project of this nature.

9.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on landscape and visual may include the following generic categories:

- Storage of topsoil and subsoil, treatment of soils during construction to maintain health, quality and structure;
- Reinstatement of land and soils;
- Timing of construction works and working hours;
- Construction site layout and good 'housekeeping';
- Construction traffic routes;
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Hoarding, fencing, screening, and lighting;
- Site access;
- Pollution prevention measures;
- On-site and off-site protection;
- Extreme weather events;
- Pre-emptive environmental surveys to guide on-site activities;
- Demolition;
- Selection and management of materials;
- Tree protection and excavation within tree protection areas;
- Site specific measures; and
- Monitoring requirements.

9.3.4. A register of environmental actions and commitments will also be developed alongside the ES and the CoCP.

10. Evaluating significance

10.1.1. The levels of significance of effect will be evaluated by combining the sensitivity of the landscape, townscape or visual sensitivity receptor with the magnitude of change that has been determined in the assessment. Major and moderate effects will be considered significant (effects which should be considered by the decision makers in granting development consent).

10.1.2. The matrix in Table 17 will be used to assist in the evaluation of the levels of significance of effect. Where the matrix offers two potential outcomes, decisions on the significance of effect will be determined using professional judgement.

Table 17 – Evaluating the level of significance of landscape, townscape and visual effects.

Receptor sensitivity	Magnitude of change			
	High	Medium	Low	Negligible
High	Major	Major or Moderate	Moderate or Minor	Minor or Negligible
Medium	Major or Moderate	Moderate	Minor	Negligible
Low	Moderate or Minor	Minor	Minor or Negligible	Negligible

10.1.3. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigations which are pertinent to addressing the repercussions of climate change will be identified and reported within the landscape and visual chapter of the ES.

11. Proposed scope

11.1.1. The table below summarises the aspects relevant to landscape, townscape and visual amenity to be scoped in or scoped out for the assessment.

Table 18 – Items scoped in or out.

Assessment Item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Landscape/ townscape	✓	✓	✓	✓	✓	✓	✓	✓
Visual amenity	✓	✓	✓	✓	✓	✓	✓	✓

12. Assumptions and risks

12.1. Assumptions

The assumptions are:

- All vegetation within the construction boundary will be removed;
- All woodland, trees and hedgerows removed on land occupied temporarily during construction will be replaced;
- The visual assessment will be carried out from publicly accessible viewpoints and no direct access will be sought to private land such as residential properties or private business premises;
- A residential visual amenity assessment will not be carried out;
- All stated distances from viewpoints to the draft Order Limits will be approximate; and
- Year 1 effects will be assessed on the basis that mitigation planting will have no effect on landscape or visual amenity. Year 15 effects will be assessed assuming that mitigation or replacement planting will have reached a level of maturity to mitigate the impacts of the Project on landscape and visual amenity and /or restore the character, scale, and pattern of the landscape. At year 15, managed hedgerows will be assumed to have reached 1.5m high and unmanaged woody vegetation approximately 6-8m in height.

12.2. Risks

The risks are:

- Locations for the sidings, passing loops, new stations and depots are yet to be confirmed;
- The design for Tempsford Station and East Coast Main Line logistics hub is still under consideration;
- Design options are still being explored at Hauxton Junction, Chapel Hill, London Road, Bicester, and many other locations;
- No information is available for construction compounds or 24 hour working/lighting;
- Limited information is available for utilities diversions and requirement for new electrical telecommunications infrastructure; and
- It has not yet been determined whether overhead line equipment will be required.

12.3. Opportunities

The opportunities are:

- Enhance green infrastructure and connectivity for recreational users in the countryside by creating new recreational routes or linking up fragmented PRoW for walkers, riders, and cyclists;
- Design sustainable drainage to create wetlands and watercourses to enhance landscape character and biodiversity;
- Use wetlands to filter surface water runoff, allowing it to recharge aquifer in chalklands areas. Explore opportunities to improve flows to Nine Wells and the historic watercourse Hobson's Conduit;
- Strengthen the pattern of the landscape by restoring hedgerows and linking fragmented woodland;
- Improve the public realm and approach to the stations along the route of East West Rail; and
- Design a pedestrian/cycle overbridge that could be used along the route where level crossings or roads are closed and pedestrian/cycle access must be retained that will be an asset to the townscape or landscape rather than a detracting feature.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping Method Statement – Land Quality

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as a part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)1 sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken, a scoping exercise has been carried out. An overarching EIA scoping report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on land quality. Land quality considers two sub-disciplines, namely land

[1] *National policy statement for national networks* (2024) *GOV.UK*. Available at: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf (Accessed: 29 October 2024).

contamination, which is concerned by the presence of contamination in the subsurface (either in soils or groundwater), and geoconservation, which considers designated geological sites as receptors.

1.1.6. The land quality Method Statement and water resources Method Statement closely linked, with both Method Statements considering potential contamination impacts to surface water and groundwater bodies. For clarity, this land quality Method Statement considers the potential impacts to surface water and groundwater bodies associated with pre-existing land contamination that may be present on-site, whilst the water resources Method Statement considers potential impacts to surface water and groundwater bodies arising from new materials or contaminants that may be introduced during both the construction stage and completed development stage of the proposed development.

1.1.7. Soils as an agricultural resource are considered in the agriculture and soils Method Statement.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
CoCP	Code of construction practice
DCO	Development consent order
DMRB	Design manual for roads and bridges
DQRA	Detailed quantitative risk assessment
EIA	Environmental impact assessment
EPA	Environmental Protection Act 1990
ES	Environmental statement
EWR Co	East West Railway Company Limited
GCR	Geological conservation review
GWDTE	Groundwater dependent terrestrial ecosystem
LCRM	Land contamination risk management
LGS	Local geological sites
MAGIC	Multi-agency geographic information for the countryside
NNNPS	National networks national policy statement
SPZ	Source protection zone
SSSI	Sites of special scientific interest
UNESCO	United Nations Educational, Scientific, Cultural Organisation
WFD	Water Framework Directive

3. Relevant standards and guidance

3.1. Overview

3.1.1. The assessment of land quality effects will be informed by legislation and guidance set out in Table 2.

Table 2 – Relevant legislation and guidance for the land quality assessment.

Name	Description	Relevance to the proposed assessment
Design manual for roads and bridges (DMRB) LA 109 Geology and soils[2]	LA 109 sets out the requirements for assessing and reporting the effects on geology and soils for highways projects.	The assessment of potential effects on geology and land quality receptors will be broadly based on the DMRB guidance document LA 109 as well as professional judgement and experience informed by baseline information. However, the sensitivity and magnitude criteria adopted in this section have been modified to adequately address geology and land quality impacts in recognition of limitations of DMRB in this respect, and that the Project is not bound to the requirements of National Highways.
DMRB LA 113 Road drainage and the water environment[3]	LA 113 sets out the requirements for assessment and reporting the effects on the water environment for highways projects.	The assessment of potential effects on the water environment will be broadly based on the DMRB guidance LA 113 document as well as professional judgement and experience informed by baseline information. However, the sensitivity and magnitude criteria adopted in this section have been modified to adequately address geology and land quality impacts in recognition of limitations of DMRB in this respect, and that the Project is not bound to the requirements of National Highways.
The Construction (Design and Management) Regulations 2015	The main Regulations for managing health, safety and welfare in construction projects.	Sets out the Regulations governing protection of construction workers (including risks associated with pre-existing land contamination) during the construction of the Project.

[2] Highways England, Transport for Scotland, Welsh Government and Department for Infrastructure (2019). *Design manual for roads and bridges LA 109 Geology and soils*. [online] Available at: https://www.standardsforhighways.co.uk/tses/attachments/adca4c7d-4037-4907-b633-76eaed30b9c0?inline=true [Accessed 14 May 2024]

[3] Highways England, Transport for Scotland, Welsh Government and Department for Infrastructure (2019). *Design manual for roads and bridges LA 113 Road drainage and the water environment*. [online] Available at: https://www.standardsforhighways.co.uk/tses/attachments/d6388f5f-2694-4986-ac46-b17b62c21727?inline=true [Accessed 14 May 2024]

Name	Description	Relevance to the proposed assessment
Land contamination risk management (LCRM)[4]	This guidance sets out arisk-based approach for the management of land contamination.	The LCRM approach will be used to inform the land quality assessment and contamination risk assessment. The potential contamination sources, pathways and receptors outlined in the preliminary conceptual models in this section will be developed into a preliminary risk assessment when further information is available. The potential risks identified will inform the magnitude of impact on the potential receptors in the assessment of potential significant effects with respect to land contamination.
BS 8576: Guidance on investigations for ground gas – permanent gases and volatile organic compounds[5]	The standard provides guidance on the monitoring and sampling of ground has and volatile organic compounds with particular reference to development sites.	Used in the scoping of ground investigations for land contamination purposes as part of standard risk management procedures for the design and construction of the Project.
BS 10175 (2011+A2:2017), Investigation of Potentially Contaminated Sites - Code of Practice[6]	The standard provides guidance on the assessment of potentially contaminated sites	Used in the scoping of ground investigations for land contamination purposes as part of standard risk management procedures for the design and construction of the Project.
The Definition of Waste: Development Industry Code of Practice (DoW: CoP)[7]	The guidance provides a framework for the sustainable reuse of excavated materials in construction and land development projects.	The DoWCoP sets out good practice on whether excavated materials are a waste or not and provides an auditable framework for decision making. Forms part of the mitigation of the Permanent construction effects of the Project.
Environment Act 1995 (as amended)	Introduces Part 2A of EPA 1990 via Section	Part 2A is primarily concerned with the assessment of historically contaminated sites and the definition of

[4] Environment Agency (2023). *Land contamination risk management (LCRM)*. [online] Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm [Accessed 14 May 2024]

[5] British Standards Institute (2013). BS 8575:2013 *Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs).*

[6] British Standards Institute (2017). BS 10175:20111+A2:2017 *Investigation of potentially contaminated sites – Code of practice.*

[7] Contaminated Land: Applications in Real Environments (CL:AIRE), (2011). *The Definition of Waste: Development Industry Code of Practice (DoW: CoP).* Available at https://claire.co.uk/projects-and-initiatives/dow-cop/28-framework-and-guidance/111-dow-cop-main-document [Accessed 05 12 24]

Name	Description	Relevance to the proposed assessment
	57 of the Environment Act	Contaminated Land in the statutory sense rather than for development sites. Where sites enter the development process, suitable assessment will be undertaken in accordance with LCRM and associated guidance, and, when complete, these sites should not be capable of being designated as 'Contaminated Land' under Part 2A. However, there are tools developed for Part 2A assessment (such as Category 4 screening Levels) that may be utilised in land contamination assessment for development purposes.
Environmental Protection Act (EPA) 1990: Part 2A	Legislation defining contaminated land	
Environmental Protection Act (EPA) 1990: Part 2A Contaminated Land Statutory Guidance[8]	This statutory guidance is issued by the Secretary of State for Environment, Food and Rural Affairs in accordance with section 78YA of the EPA 1990. Section 57 of the Environment Act 1995 created Part 2A of the EPA 1990 which establishes a legal framework for dealing with contaminated land in England.	
Planning practice guidance for land affected by contamination[9]	This guidance provides guiding principles on how planning can deal with land affected by contamination.	The approach set out in the guidance on determining whether land could be contaminated, and contamination risk assessment, will be used to inform the geology and land quality assessment.

[8] Department for Environment, Food and Rural Affairs (2012). *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. [online] Available at: https://assets.publishing.service.gov.uk/media/5a757dfa40f0b6360e47489d/pb13735cont-land-guidance.pdf [Accessed 14 May 2024]

[9] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2019). *Land affected by contamination*. [online] Available at: https://www.gov.uk/guidance/land-affected-by-contamination [Accessed 14 May 2024]

4. Establishing the baseline

4.1. Documentary records

4.1.1. The following sources will be used to establish the baseline for the purpose of the land quality assessment and have informed the description of the baseline environment.

Table 3 – Sources of information.

Report title	Geographical area
British Geological Survey of England and Wales 1:50,000 geological map series	Project wide
Multi-agency geographic information for the countryside (MAGIC) online data resource (Natural England, 2021)	Project wide
Environment Agency's Catchment Data Explorer (Environment Agency, no date)	Project wide
Natural England data on designated geological sites (via MAGIC)	Project wide
Joint Nature Conversation Committee data for basic site information on geological conservation review (GCR)	Project wide
Bedfordshire Geology Group – local geological sites (LGS)	Bedfordshire
Cambridgeshire Geological Society – LGS	Cambourne/Cambridge
Oxfordshire City Council – Part 2A contaminated land designations	Oxford
Buckinghamshire County Council – Part 2A contaminated land designations	Oxford to Bletchley
Milton Keynes Council – Part 2A contaminated land designations	Bletchley
Central Bedfordshire Council – Part 2A contaminated land designations	Bedford
Bedford Borough Council - Part 2A contaminated land designations	Denbigh to Tempsford
Huntingdon District Council - Part 2A contaminated land designations	St Neots to Cambourne
Cambridge City Council - Part 2A contaminated land designations	Cambridge

Report title	Geographical area
Environment Agency and local authority information searches and consultation data on waste management sites, industrial sites, potentially contaminative land uses and potentially infilled land.	Project wide
Previous desk studies:	
Section 2D – GRIP 4 (Phase 1) Ground Investigation Report, EWR Alliance dated June 2019 (1133735-EWR-REP-EGE-000036 Rev P01)	Bletchley to Bedford
Early Ground Investigation Scope Bedford to Cambridge Route, ARUP, April 2020 (EWR_CS3-ARU-GE-XX-RP-C-000003)	Bedford to Cambridge
Geotechnical and Geo-environmental Desk Study, ARUP dated March 2021 (EWR-CS3-ARU-GE-XX-RP-C-000005)	Marston Vale Line (Bedford to Cambridge)
Detailed Unexploded Ordnance Risk Assessment, Safeline Global dated August 2021 (8971 RA)	Marston Vale Line (Bletchley to Bedford)
Vale Sidings Development Geo-environmental desk study, Atkins dated October 2021 (5206210-SNC-EWR-RPT_ECV-000001)	Vale Sidings (Bletchley to Bedford)
Geotechnical and Geo-environmental Desk Study, ARUP dated November 2021 (EWR_CS2-ARU-GE-BBM-RP-C-000001)	Marston Vale Line (Bletchley to Bedford)
Bletchley Vale Sidings Geotechnical Study and Drainage Considerations, Atkins July 2022 (EWRCS1-ATK-GE-00013T-TN-Z-000001)	Bletchley Sidings

4.2. Surveys

4.2.1. Environmental site walkovers will be undertaken at key locations across the Project. The walkovers will include visual, non-intrusive inspections within and surrounding the draft Order Limits targeting areas of higher risk based on desk study data. The aim will be to aid the generation of (or update to) conceptual site models as well as providing information for targeted ground investigations. Features of interest will include hazardous substance use and storage (such as fuel tanks) and waste storage or disposal areas.

4.2.2. A review of existing information will be undertaken and desk studies in areas not yet covered will be completed. The desk studies will include a review of previous information and conceptual site models to assess whether there are

unacceptable risks to sensitive receptors (human health, controlled waters and geological sites).

4.2.3. The conceptual site models will be developed as the basis to inform the assessment of likely significant effects from contamination.

4.3. Modelling

4.3.1. There are no modelling works anticipated as part of the assessment required for the ES. However, some detailed quantitative risk assessment (DQRA), for instance fate and transport modelling for groundwater contamination risks, may be required as part of the overall LCRM requirements.

4.4. Study area

4.4.1. The following study areas will be considered for land quality. These study areas will be used and developed during the EIA for both construction and operation phases:

- Potential land contamination sources (e.g., landfills) have been considered within 250m of the draft Order Limits which is considered appropriate for the assessment of contamination risks to human health. This aligns with established industry practice and professional judgement for defining land contamination study areas;
- Designated geological sites potentially at risk of impact from the Project have been considered within 250m of the draft Order Limits;
- Surface waters have been considered within 250m of the draft Order Limits; and
- Groundwater dependent terrestrial ecosystems (GWDTE) and groundwater source protection zones (SPZ) have been considered within 1km of the draft Order Limits with professional judgement applied.

4.4.2. The extent of the study area has been developed using professional judgement on the basis that contamination migration beyond this distance is likely to be negligible.

4.5. Consultation

4.5.1. Consultation will be ongoing to inform the assessment of land quality as the DCO application progresses. A non-statutory consultation commenced in November 2024.

5. Preliminary baseline description

5.1. Land quality baseline

5.1.1. The following section sets out the key baseline information for each of the route sections.

5.2. Oxford to Bletchley

Geology and hydrogeology

5.2.1. The geological strata that are anticipated beneath this section of the Project are summarised in Table 4 along with their Environment Agency aquifer classifications.

5.2.2. In addition to Table 4, localised deposits of made ground may be present across the previously developed land in the study area.

Table 4 – Geology and aquifers Oxford to Bletchley.

Type	Geological strata	Aquifer status	Location
Superficial	Alluvium - Clay and Silt	Secondary A	Oxford; around Gosford; the River Cherwell; east of Islip to Bicester; near Steeple Claydon; Verney Junction Winslow; and south of Bletchley
	Head	Secondary undifferentiated	Isolated pockets around Oxford; Islip; south of Bicester; Steeple Claydon and south of Bletchley
	Glacial Till	Secondary undifferentiated	Isolated pockets west of Verney Junction; and then almost entirely from Winslow to Bletchley
Bedrock	Oxford Clay Formation	Unproductive Strata	Oxford to Islip, Winslow to Bletchley
	Kellaway Sand Member, Kellaway Clay Member, Cornbrash Formation, Forest Marble Formation, White Limestone Formation,	Secondary A or Principal (Forest Marble)	Islip

Type	Geological strata	Aquifer status	Location
	Peterborough Member	Unproductive Strata	Islip to Bicester; Bicester to Poundon and Poundon to Winslow
	Kellaway Sand Member, Kellaway Clay Member	Secondary A	Bicester
		Unproductive Strata	Bicester
	Stewartby Member	Unproductive Strata	Poundon to Winslow; Winslow to Bletchley
	Weymouth Member	Unproductive Strata	Winslow to Bletchley
	West Walton Formation	Unproductive Strata	Winslow to Bletchley

5.2.3. There are no SPZ within 1km of the Project in this section.

5.2.4. A GWDTE is present near Oxford.

Hydrology

5.2.5. With reference to the water resources Method Statement, the following key surface water features within approximately 250m of this part of the Project are listed in Table 5. In addition, isolated ponds, lakes and land drains, and minor watercourses are located adjacent or crossing the Project.

Table 5 – Surface water features Oxford to Bletchley.

Surface water feature	Location
Oxford Canal	Crossing the Project in proximity to Bicester station
River Thames	In proximity to Oxford station, which crosses the Project in Oxford

People and property receptors

5.2.6. Land within the draft Order Limits principally comprises the recently upgraded railway. The study area around Oxford is typically residential in nature although some light industrial/commercial premises are present locally around Osney Mead. The route becomes rural with occasional farms to the north-east of Oxford. Some trunk roads, including the A40 and M40, are crossed.

5.2.7. Further residential, light industrial/commercial and educational land uses are present adjacent to draft Order Limits around Bicester and Bletchley.

5.2.8. Alchester Roman site, a scheduled monument, and two Grade II listed buildings are located in the study area. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.2.9. There are no geological sites of special scientific interest (SSSI) or LGS within the study area for this route section.

Potential sources of land contamination

5.2.10. Potential land contamination sources identified within the study area along this part of the Project include light industrial/commercial units to the west of the Project at Osney Mead and existing railway infrastructure around Oxford. There are several former landfill sites located adjacent to the draft Order Limits in this area extending from Cold Harbour up to Wolvercote Common. A further linear landfill feature is also present to the south of Oxford Parkway station.

5.2.11. To the north of Oxford, the Project is within a largely rural area and passes close to several farms with very limited potential land contamination sources present until Bicester. At Bicester there are several potential contamination sources adjacent to the draft Order Limits, notably a sewage treatment works, rail infrastructure, former goods and coal depot around Bicester station and a former small gas works immediately to the north of the station.

5.2.12. At the north-eastern side of Bicester, the Project passes though areas of light industrial/commercial land use. To the east of Bicester, the study area is largely rural until Bletchley. Several former landfill sites are located around Calvert, the closet being located approximately 30m to the south of the draft Order Limits.

5.2.13. To the west of Bletchley, several former landfill sites are located adjacent to the draft Order Limits. Areas of light industrial/commercial land use are also present to the south of Bletchley station.

5.2.14. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] within the draft Order Limits. There are two designated sites recorded within 250m of the draft Order Limits listed on the Milton Keynes Council register. One site relates to 10, 12 and 14-20 (Chiltern House Garage) George Street, Bletchley, approximately 250m south of the Project. The site was contaminated by a diesel fuel leak. The other site relates to Buckingham

House, Buckingham Road, Bletchley, approximately 60m south-west of the draft Order Limits. The site was contaminated by a heating fuel leak. Both have been recorded as remediated and fit for use.

5.3. Fenny Stratford to Kempston

Geology and hydrogeology

5.3.1. The geological strata that are anticipated beneath this section of the Project are summarised in Table 6 along with their Environment Agency aquifer classifications.

5.3.2. In addition to Table 6, localised deposits of made ground may be present across the previously developed land in the study area.

Table 6 – Geology and aquifers Fenny Stratford to Kempston.

Type	Geological strata	Hydrogeology/ aquifer status	Location
Superficial	Superficial Deposits – Sand and gravel	Secondary A	Fenny Stratford to Denbigh Way; east of Grand Union Canal
	Oadby Member – Diamicton	Secondary Undifferentiated	Grand Union Canal to Fenny Stratford; at Brogborough
	Alluvium – Clay, silt, sand and gravel	Secondary A	Near Millward Drive; South of M1; east of Apley Guise
	River Terrace Deposits 1 – Sand and gravel	Secondary A	South of Caldecotte Lake
	Head – Clay, silt, sand and gravel	Secondary Undifferentiated	Near Old Farm Park; near Berryland Farm; South of Ridgemont station/M1; Lidlington; Stewartby station to Millbrook station; near Marsh Leys Business Park; South of Ampthill Road/West End roundabout
	Head – Clay, silt and gravel	Secondary Undifferentiated	Woburn Sands station
	Alluvium – Clay and silt	Secondary A	At Broadmead Farm; at Kempston Hardwick station; near

Type	Geological strata	Hydrogeology/ aquifer status	Location
			Interchange retail park to A421; north of Elstow Park and Ride
	Stoke Goldington Member – sand and gravel	Secondary A	At Ridgemont station; near Ampthill Road / West End roundabout
Bedrock	Oxford Clay Formation - Mudstone	Unproductive Strata	Bletchley to Brogborough
	Stewartby Member and Weymouth Member (Undifferentiated) - Mudstone	Unproductive Strata	Brogborough to Lidlington
	Peterborough Member - Mudstone	Unproductive Strata	Lidlington to Kempston

5.3.3. The area to the south of Aspley Guise station within 1km of the Project is located within a SPZ III total catchment for potable groundwater abstraction. There are no further SPZ within 1km of the draft Order Limits.

5.3.4. The entire area for this part of the Project is located within a drinking water safeguard zone.

5.3.5. Millbrook Marsh/Bramble Meadow GWDTE is located in the study area.

Hydrology

5.3.6. With reference to the water resources Method Statement, the key surface water features within 250m of this part of the Project are listed in Table 7. In addition, isolated ponds, lakes, land drains and minor watercourses are located adjacent or crossing the Project.

Table 7 – Surface water features Fenny Stratford to Kempston.

Surface water feature	Location
River Ouzel	Crossing the Project north to south, east of Fenny Stratford station
Grand Union Canal	Crossing the Project north to south, east of Fenny Stratford station

Human health and property receptors

5.3.7. The Project is largely confined to within the current Marston Vale Railway. A small area of commercial units associated with the railway/station are located within the draft Order Limits at both Bletchley and Fenny Stratford stations.

5.3.8. Surrounding areas to the north of the draft Order Limits from Bletchley to Woburn Sands and around Kempston are typically developed areas with a mix of residential/commercial land use. The remainder comprises a mix of agricultural land with sparse residential/commercial properties.

5.3.9. There are two Grade II listed buildings located in the draft Order Limits. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method.

Geoconservation

5.3.10. There are no geological SSSI or LGS within the study area for this route section.

Potential sources of land contamination

5.3.11. There are limited potential contamination sources in the draft Order Limits which principally comprise the recently upgraded railway. Potential land contamination sources identified within the study area include several historical landfills encroaching into the draft Order Limits around Fenny Stratford and from Lidlington to Kempston Hardwick station.

5.3.12. Numerous historical industrial features surround the draft Order Limits include a gas works located within Bletchley and also at Aspley Guise. Brickworks, and clay and gravel pits are adjacent and within 250m of the Project. Sewage works are also present to the north of Stewartby.

5.3.13. Millbrook Power Plant is located adjacent to the draft Order Limits at Millbrook station. Petrol filling stations are noted including Tesco, Bletchley approximately 90m north of the draft Order Limits.

5.3.14. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] located in the study area.

5.4. Bedford

Geology and hydrogeology

5.4.1. The geological strata that are anticipated beneath this section of the Project along with their Environment Agency aquifer classifications are summarised in Table 8.

5.4.2. In addition to Table 8, localised deposits of made ground may be present across the previously developed land in the study area.

Table 8 – Geology and aquifers Bedford.

Type	Geological strata	Aquifer status	Location
Superficial	Stoke Goldington Member and Felmersham Member – Sand and gravel	Secondary A	Clapham Road/Bedford Road; Cauldwell to Camestone; Queens Park to River Great Ouse
	Alluvium – Clay and silt	Secondary A	Around the River Great Ouse
Bedrock	Peterborough Member – Mudstone	Unproductive	Kempston to South End
	Kellaways Sand Member – Sandstone and siltstone, interbedded	Secondary A	Between South End and Fenlake; Near Fairhill; near Clapham
	Kellaways Clay Member - Mudstone	Secondary A	Near Cauldwell; between Queen's Park and River Great Ouse
	Great Oolite Group – Limestone and argillaceous rocks, interbedded	Principal	Bedford St John's to Bedford; River Great Ouse to Clapham

5.4.3. The area from Bedford to Clapham Green is located within Zone I - Inner Protection Zone, Zone II - Outer Protection Zone and Zone III - Total Catchment for potable water abstraction. There are no other SPZ noted within this area of the Project.

Hydrology

5.4.4. With reference to the water resources Method, the following key surface water features within 250m of this part of the Project are listed in Table 9. In addition, isolated ponds, land drains, lakes, a reservoir and minor watercourses are located adjacent or crossing the Project.

Table 9 – Surface water features Bedford.

Surface water feature	Location
River Great Ouse	Crosses the Project at two locations; between Bedford St Johns and Bedford stations and in north Bedford, north of the A6. North of Tempsford.

5.4.5. This entire area of the Project is located within a drinking water safeguard zone for surface water.

Human health and property receptors

5.4.6. As well as the considerable existing railway infrastructure in the Bedford area, the area of the Project includes car parking areas and commercial properties as well as part of an existing playing field. The route section becomes less developed to the north of central Bedford where it is semi-rural with a number of highways present in the draft Order Limits.

5.4.7. Adjacent land use comprises predominantly residential with occasional light industrial /commercial land uses in the southern section. Cauldwell Primary School is located adjacent to the Project to the east of the existing Cauldwell Walk Train Maintenance Depot. Centrally, surrounding land uses become more commercial or light industrial with further residential properties adjacent to the Project through northern Bedford. Open fields and a golf course are present at the northern end of the section.

5.4.8. There are no scheduled monuments or listed buildings in the draft Order Limits. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.4.9. There are no geological SSSI or LGS within the study area for this route section.

Potential sources of land contamination

5.4.10. Areas within the draft Order Limits comprise existing railway infrastructure including Bedford station, numerous train stabling areas, and Cauldwell Walk Train Maintenance Depot. To the west of the maintenance depot is Cauldwell Walk Industrial Estate which includes a number of commercial/light industrial premises including a scrap metal dealer, vehicle maintenance garages and a timber supply company.

5.4.11. Numerous industrial features surrounding the draft Order Limits are predominantly located around the Bedford station area. The features are noted to include engineering works, gas works and petrol filling station. Additionally, there are former clay pits and brick works now infilled around to the south of Clapham which are marked as historical landfill sites.

5.4.12. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] located in the study area.

5.5. Clapham Green to Colesden

Geology and hydrogeology

5.5.1. The geological strata that are anticipated beneath this section of the Project along with their Environment Agency aquifer classifications are summarised in Table 10.

5.5.2. In addition to Table 10, localised deposits of made ground may be present across the previously developed land in the study area.

Table 10 – Geology and aquifers Clapham Green to Colesden.

Type	Geological strata	Aquifer status	Location
Superficial	River Terrace Deposits	Secondary A	Clapham Road
	Oadby Member - Diamicton	Secondary Undifferentiated	Crabtree Spinney to Gray's Farm; near Gray's Hill Farm; between Grange Farm and Rectory Farm; between Rectory Farm to Colesden Lodge Farm

Type	Geological strata	Aquifer status	Location
	Head – Clay, silt, sand and gravel	Secondary Undifferentiated	South of Gray's Hill Farm; near Thurleigh Road; near Rectory Farm; east of Ravensden Brook
	Alluvium	Secondary A	Ravensden Brook
Bedrock	Peterborough Member - Mudstone	Unproductive Stratum	Clapham Green to Colesden

5.5.3. There are two outer SPZ crossing the Project around Clapham Green which are associated with groundwater abstractions in north Bedford.

Hydrology

5.5.4. With reference to the water resources Method Statement, the following key surface water features within 250m of this part of the Project are listed in Table 11. In addition, isolated ponds, land drains, and minor watercourses are located adjacent or crossing the Project.

Table 11 – Surface water features Clapham Green to Colesden.

Surface water feature	Location
Ravensden Brook	Crosses the Project at Ravensden

5.5.5. This entire area of the Project is located within a drinking water safeguard zone for surface water.

Human health and property receptors

5.5.6. The Project is in undeveloped agricultural land crossed by several highways.

5.5.7. Surrounding areas comprise a mix of agricultural land with sparse farms/residential/commercial properties.

5.5.8. There are no scheduled monuments or listed buildings in the draft Order Limits for the Clapham Green to Colesden route section. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.5.9. There are no geological SSSI or LGS within the study area for this route section.

Potential sources of land contamination

5.5.10. There are relatively few potential land contamination sources in this section of the Project. The principal land contamination source in the Project comprises an active licensed waste site/biomass recycling facility at Sunderland Hill.

5.5.11. Potential land contamination sources in the wider study area include light industrial/commercial units at Dacca Farm and Bryher Farm, both to the south of Ducks Cross. This includes a licensed waste metal recycling site, vehicle repair, spraying and sales. Other potential sources comprise adjacent farms.

5.5.12. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] present within the study area.

5.6. Roxton to east of St Neots

Geology and hydrogeology

5.6.1. The geological strata that are anticipated beneath this section of the Project are summarised in Table 12 along with their Environment Agency aquifer classifications.

5.6.2. In addition to Table 12, localised deposits of made ground may be present across the previously developed land in the study area.

Table 12 – Geology and aquifers Roxton to east of St Neots.

Type	Geological strata	Aquifer status	Location
Superficial	Head – Clay, silt and gravel	Secondary (undifferentiated)	Near Colesden Lodge Farm; near Rectory Farm; at Rockham Ditch
	Oadby Member - Diamicton	Secondary Undifferentiated	Colesden to Chawston; South Brook to Poplar Spinney; North of Rectory Farm; between Sir John's Wood and Rectory Farm; Rectory Farm to Rectory Farm Cottages; Hen Brook to Cambridge Road

Type	Geological strata	Aquifer status	Location
	River Terrace Deposits 3 – Sand and gravel	Secondary A	Chawston to Green Acres
	Alluvium	Secondary A	Green Acres to South Brook; at South Brook; at Hen Brook
Bedrock	Peterborough Member – Mudstone	Unproductive	Roxton to east of St Neots

5.6.3. There are no SPZ within 1km of this section of the Project.

Hydrology

5.6.4. With reference to the water resources Method, the following key surface water features within 250m of this part of the Project are listed in Table 13. In addition, isolated ponds, land drains, and minor watercourses are located adjacent or crossing the Project.

Table 13 – Surface water features Roxton to east of St Neots.

Surface water feature	Location
Hen Brook	Intercepts Project from east of St Neots, running north-west to south-east.
River Great Ouse	Crosses the study south of St Neots.

5.6.5. This entire area of the Project is located within a drinking water safeguard zone for surface water.

Human health and property receptors

5.6.6. The draft Order Limits are typically within agricultural land with occasional roadways and the A428 trunk road. Farms and associated yards/outbuildings and a garden centre are also present within the draft Order Limits.

5.6.7. Surrounding areas predominantly comprises agricultural land with sparse residential /commercial on the outskirts of St Neots.

5.6.8. Designated heritage assets which sit within the study area comprise a Grade II listed bridge and Tempsford Bridge Scheduled Monument. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.6.9. There are no geological SSSI or LGS within the study area for this route section.

Potential sources of land contamination

5.6.10. Potential land contamination sources identified in the draft Order Limits include a garden centre, a sewage treatment works, farm outbuildings, railway and highways, including the A428 which is crossed twice in the route section.

5.6.11. Potential land contamination sources identified within the study area along this part of the Project are relatively limited and comprise several adjacent farms with associated yards/outhouses. Current and former petrol filling stations and a motor vehicle dealer are present adjacent to the draft Order Limits in the vicinity of the Black Cat roundabout.

5.6.12. Historical landfills are noted at the study area around Chawston, Wyboston and south of Eynesbury. Several gravel pits are present within the area at Roxton, now infilled with water.

5.6.13. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] located within the study area.

5.7. Croxton to Toft

Geology and hydrogeology

5.7.1. The geological strata that are anticipated beneath this section of the Project are summarised in Table 14 along with their Environment Agency aquifer classifications.

5.7.2. In addition to Table 14, localised deposits of made ground may be present across the previously developed land in the study area.

Table 14 – Geology and aquifers Croxton to Toft.

Type	Geological strata	Aquifer status	Location
Superficial	Oadby Member – Diamicton	Secondary (undifferentiated)	Wintringham to Comberton
	River Terrace Deposits	Secondary A	Comberton
Bedrock	Oxford Clay Formation - Mudstone	Unproductive	St Neots to Weald

Type	Geological strata	Aquifer status	Location
	West Walton Formation and Ampthill Clay Formation - Mudstone	Unproductive	Croxton to West Cambourne
	Kimmeridge Clay Formation - Mudstone	Unproductive	Cambourne
	Woburn Sands Formation	Principal	Upper Cambourne to Childerley Gate
	Gault Formation - Mudstone	Unproductive	Highfields Caldecote to Toft

5.7.3. An outer protection zone is located approximately 390m to the south-west of the draft Order Limits around Highfield Caldecote.

Hydrology

5.7.4. With reference to the water resources Method Statement, the following key surface water features within 250m of the draft Order Limits are listed in Table 15. In addition, isolated ponds and land drains are located adjacent or crossing the Project.

Table 15 – Surface water features Croxton to Toft.

Surface water feature	Location
Fen Drayton Drain	Crossing the Project south of Elsworth Wood.
West Brook	Crossing the Project south of Elsworth Wood.

5.7.5. The Project is located within a drinking water safeguard zone for surface water from St Neots to Eltisley.

People and property receptors

5.7.6. The Project is rural in the west and then crosses the A428 clipping the edge of Bourn Airfield. The reminder of the route section is almost entirely within agricultural land with several roads intersecting the draft Order Limits.

5.7.7. The surrounding area comprises further farmland as well as developed areas comprising a mix of residential and commercial properties adjacent to the south of the Project associated with Cambourne and High Caldecote.

5.7.8. Designated heritage assets which sit within the draft Order Limits comprise two Grade II listed buildings. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.7.9. There are no geological SSSI or LGS within the study area for this route section.

Potential sources of land contamination

5.7.10. An agricultural contractor is located within the draft Order Limits to north of the A428 and the route crosses the north-eastern corner of Bourn Airfield. The airfield is a former Ministry of Defence site and contains light industrial/commercial premises including an automotive specialist.

5.7.11. A BP petrol filling station is located adjacent to the draft Order Limits on the St Neots Road. Further former and current filling stations are located in the study area along the A428 to the west. Eversden landfill is also located approximately 100m south-east of the draft Order Limits. This is listed as a landfill taking other wastes.

5.7.12. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] located in the study area.

5.8. Comberton to Shelford

Geology and hydrogeology

5.8.1. The geological strata that are anticipated beneath this section of the Project are summarised in Table 16 along with their Environment Agency aquifer classifications.

5.8.2. In addition to Table 16, localised deposits of made ground may be present across the previously developed land in the study area.

Table 16 – Geology and aquifers Comberton to Shelford.

Type	Geological strata	Aquifer status	Location
Superficial	Oadby Member – Diamicton	Secondary (undifferentiated)	Near Comberton Village College; Haslingfield to Chapel Hill

Type	Geological strata	Aquifer status	Location
	River Terrace Deposits	Secondary A	West of Westfield Farm; near Charity Farm, at Harston, Little Shelford and Great Shelford
	Alluvium	Secondary A	South-east of Westfield Farm; west of Harston; between Little Shelford and Great Shelford.
Bedrock	Gault Formation – Mudstone	Unproductive	Comberton to Haslingfield
	West Melbury Marly Chalk Formation – Chalk	Principal	At Haslingfield; between Harston and Shelford
	Totternhoe Stone Member – Chalk	Principal	Chapel Hill
	Zig Zag Chalk Formation – Chalk	Principal	Present south of Haslingfield and south of Harston.

5.8.3. A SPZ1 and SPZ2 associated with a public water supply are located east of the A603 Cambridge Road.

Hydrology

5.8.4. With reference to the water resources Method, the key surface water features within 250m of this part of the Project are listed in Table 17. In addition, isolated ponds and land drains are located adjacent or crossing the Project.

Table 17 – Surface water features Comberton to Shelford.

Surface water feature	Location
Bourn Brook	West of Westfield Farm
Hobson's Brook	Crosses the Project north of Great Shelford
River Granta	Crosses the Project at Great Shelford

Surface water feature	Location
River Cam	Intersects the proposed alignment between Hauxton and Great Shelford flowing in a north-westerly direction.

People and property receptors

5.8.5. The land within the draft Order Limits mostly comprises agricultural land. There are occasional highways and farm tracks as well as a farm comprising a number of buildings and a single commercial unit. South of Harston the Project joins the existing Cambridge Line railway.

5.8.6. Adjacent residential receptors and a golf club are present on the edges of Comberton and Toft and further residences on the outskirts of Harlton and Haslingfield. A large cement works and waste recovery operation is present south of Haslingfield adjacent to the draft Order Limits.

5.8.7. The surrounding land use in the remainder of the study area is principally agricultural.

5.8.8. Designated heritage assets within the draft Order Limits comprise four scheduled monuments and a Grade II listed milestone. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.8.9. Barrington Chalk Pit SSSI is located adjacent to the draft Order Limits to the south-west of Haslingfield. It is designated as a SSSI due to its stratigraphical importance as a rare outcrop of Cambridge Greensand and associated fossils.

5.8.10. Information obtained from the Cambridgeshire Geology Group indicates that there is one LGS, named Nine Wells, immediately to the east of the draft Order Limits between Great Shelford and Addenbrookes.

Potential sources of land contamination

5.8.11. Potential land contamination sources identified within this section of the Project are sparse in the western part, comprising a farm within the draft Order Limits, a disused railway south of Toft and other nearby farming operations.

5.8.12. A former Ministry of Defence site, Lords Bridge Forward Ammunition Depot, is located partially within the draft Order Limits to the east of the A603 Cambridge Road. It was used as mustard gas storage facility in World War I and then as an

ammunition depot in World War II. The site currently comprises the Mullard Radio Astronomy Observatory.

5.8.13. Three landfill sites are located around Haslingfield. Haslingfield landfill site is a former unlicensed domestic waste landfill which is located partially within the draft Order Limits. The larger Barrington Works inert landfill is located adjacent to the draft Order Limits to the south of the proposed East West Rail route and is associated with a cement works at this location. Chapel landfill is located to the south of the proposed East West Rail route.

5.8.14. The Project then joins the existing Cambridge Line (Shepreth Branch Royston Line) south of Harston.

5.8.15. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8] located in the study area.

5.9. Cambridge

Geology and hydrogeology

5.9.1. The geological strata that are anticipated beneath this section of the Project are summarised in Table 18 along with their Environment Agency aquifer classifications.

5.9.2. In addition to Table 18, localised deposits of made ground may be present across the previously developed land in the study area.

Table 18 – Geology and aquifers Cambridge.

Type	Geological strata	Aquifer status	Location
Superficial	River Terrace Deposits	Secondary A	Trumpington to Romsey
	Alluvium	Secondary A	Fen Ditton
	River Terrace Deposits	Secondary A	Chesterton to Milton
Bedrock	West Melbury Marly Chalk – Chalk	Principal aquifer	Trumpington to Chesterton
	Gault Formation - Mudstone	Unproductive	Chesterton to Milton

5.9.3. There is an outer SPZ approximately 1km west of Cambridge station.

5.9.4. Coldham's Common GWDTE described as a chalk grassland is present in the study area.

Hydrology

5.9.5. With reference to the water resources Method Statement, the following key surface water features within 250m of this part of the Project are listed in Table 19. In addition, isolated ponds and land drains are located adjacent or crossing the Project.

Table 19 – Surface water features Cambridge.

Surface water feature	Location
River Cam	Intersects the proposed alignment between Hauxton and Great Shelford flowing in a north-westerly direction.
Cherry Hinton Brook	Flows northwards through Stourbridge Common to the River Cam.

People and property receptors

5.9.6. The area within the draft Order Limits principally comprises the existing railway, land immediately adjacent to railway and several highway crossings. Through central Cambridge, land within the draft Order Limits includes the existing Cambridge station and associated rail lines, sidings and a rail maintenance depot. To the south of the station land within the draft Order Limits includes an existing car park and an office building.

5.9.7. To the east of Cambridge, the draft Order Limits are located within the boundary of existing rail infrastructure. To the north of Cambridge, the Project continues in rail land, and in the far north, includes an adjacent field.

5.9.8. Between Trumpington and Cambridge the surrounding land use is typically residential and commercial and light industrial activities around Cambridge station and Cambridge North.

5.9.9. To the east the surrounding land is typically light industrial for a short stretch near the main Cambridge line before becoming open recreational land and allotments, and then a mix of commercial and educational land uses before then becoming residential around Cherry Hinton.

5.9.10. To the north of Cambridge, the surrounding land is residential before becoming light industrial commercial around Cambridge North station. A sewage treatment works is adjacent to the draft Order Limits at its northern most extent at the A14 trunk road.

5.9.11. Designated heritage assets which sit within the draft Order Limits comprise a Grade II listed railway station, Cambridge. For a full list of sensitive heritage assets/receptors reference should be made to the historic environment Method Statement.

Geoconservation

5.9.12. There are no geological SSSI or LGS within the study area for this route section.

Potential sources of land contamination

5.9.13. Cambridge station, numerous sidings, lines, a rail maintenance depot, south of which are a number of suspected fuel tanks, and a light industrial commercial area to the east around Clifton Road Industrial Estate are the main potential land contamination sources in the central part of the Project area. The area to the south of Cambridge station was formerly in wider rail usage (including depots, goods shed sidings and associated industry). These have since been redeveloped for leisure and housing use.

5.9.14. The eastern extent of the Project comprises the existing Cambridge Branch Line of the Ipswich to Ely Railway. Here, the Project passes through three former landfill sites with Cambridge City Airport immediately to the north before finishing at Cherry Hinton.

5.9.15. Several light industrial and commercial areas are located around the junction between the Cambridge Line and Ipswich to Ely Railway. The northern extent of the Project up to Cambridge North station is adjacent to an existing waste recycling centre. Historical sidings are present to the east of the station as well as Cambridge Commercial Park and Cambridge Wastewater Treatment Works.

5.9.16. There are no sites designated as Contaminated Land under Part 2A of the EPA 1990[8], although one site has been designated just outside the study area. This designation relates to four properties on Newmarket Road, Cambridge, CB5 8PA, approximately 280m north-east of the draft Order Limits. The properties have been remediated and are suitable for use.

5.10. Source pathway receptor - high level review

5.10.1. Preliminary conceptual site models for land contamination have been produced for higher risk areas within the existing land contamination desk study reports. Table 20 provides a high-level route-wide overview of potential pollutant linkages to inform this Method Statement.

Table 20 – Potential pollutant linkages.

Possible sources	Potential pathways	Receptors
• Historical landfills; • Made ground including that associated with existing or historical land use and railway infrastructure; • Unrecorded landfills and animal burials; • Contaminative land uses associated with pits, farmland and farming activities; • Bourn Airfield and the former Lords Bridge Ammunition Depot; • Light industrial and commercial works; and • Former gas works.	• Dermal contact and ingestion by humans; • Inhalation of vapours and windblown contaminated dusts by humans; • Mobilisation of contaminants in shallow soils and groundwater into surface waters and aquifers; • Migration and build-up of ground gases in enclosed spaces; • Uptake by plants or animals; and • Direct contact with buildings or property.	• Construction workers, maintenance workers, current and future passengers, adjacent land users, including allotments, farms, leisure activities, commercial land users and residents; • Property including crops or livestock; and infrastructure; • Secondary A and Secondary Undifferentiated superficial aquifers; • Secondary A and Principal bedrock aquifers; • Groundwater SPZ; • Nine Wells chalk springs; • GWDTE; • Surface watercourses including main rivers; and • Ecologically sensitive areas, e.g., local nature reserves.

5.11. Future baseline

5.11.1. Future baseline for land quality could be affected by the following:

- Remediation and improvement of soil or groundwater quality where sites located in or adjacent to the Project are developed under the planning process, or where remediation enforcement action is taken on a Part 2A contaminated land site;
- Pollution incidents from a land contamination source, e.g., escape of fuels from a filling station;
- Introduction of new receptors to contamination associated with committed developments on or adjacent to the Project (e.g., new housing); and
- New LGS or geological SSSI being established.

5.11.2. The physical impacts of climate change may impact East West Rail assets and operations, and the setting of environmental and social receptors affected by East West Rail. Climate change is manifesting as a variety of climate hazards which may change weather related risks to East West Rail and associated

environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.11.3. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

6. Sources of impact

6.1.1. Sources of impact in relation to land contamination could relate to the following:

- The potential for the disturbance of potentially contaminated ground or groundwater;
- The introduction of new receptors onto previously developed sites; or
- Where a new pollutant linkage may become present.

6.1.2. Specific examples may include:

- Excavation of cuttings for new railway;
- Dewatering of deep excavations such as cuttings or tunnels;
- Construction of infrastructure – foundations for structures including deep foundations such as retaining or piles;
- Construction of temporary construction compounds;
- Construction of stations and enclosed occupied spaces which may be receptors to volatile contamination or ground gases;
- Reuse of material – made/artificial ground and natural soils across the Project; and
- Effects relating to impacts from train operations, maintenance or stabling.

6.1.3. Sources of impact in relation to geological sites relate to where these are either lost, partially lost or the setting or accessibility is changed by the presence of the Project.

7. Potential impacts and effects

7.1. Potential permanent and operational effects

7.1.1. Table 21 summarises the effects during construction which are permanent and effects during operation which will continue for the life of the Project.

Table 21 – Summary of potential permanent and operational effects.

Impact/Activity	Effect and type	Receptor
Operational railway/stations may have areas where concentrations of pollutants are introduced, such as oils/lubricants/heavy metals and anti-freezing agents leading to pollution of shallow soils and aquifers	Reduction in groundwater quality or health effects on people (adverse effects)	Controlled waters receptors (groundwater and surface waters)
		Human health receptors (maintenance workers)
Presence of significant quantities of artificial ground left in situ or reused as part of new permanent infrastructure. Re-profiling/reuse of site won materials.	Damage to below ground infrastructure from aggressive contaminants (adverse)	Human health, property and infrastructure
	Damage to property and railway infrastructure from the build-up of hazardous gases in confined spaces leading to explosion (adverse)	Human health (residential, commercial/industrial and land and property)
	Pollution of shallow groundwater from disturbance and exposure of ground, leading to a reduction in water quality and adverse effects on ecological systems (adverse)	Controlled water receptors (groundwater and surface waters)
	Change in soil quality profile from use of naturally occurring materials in areas with lesser concentrations of naturally occurring background contaminants (adverse)	Soil quality
Remediation of unacceptable soil and groundwater contamination	Improvement in soils and groundwater quality (beneficial)	Controlled waters receptors (groundwater and surface waters)
		Human health receptors (maintenance workers, and existing or future land users)

Impact/Activity	Effect and type	Receptor
Geological sites – permanent impact on the setting of the Barrington Geological SSSI or Nine Wells LGS either through setting or via pollution of springs	Degradation of the amenity value of the site, changes to site setting (adverse)	Barrington Quarry SSSI, Nine Wells LGS

7.1.2. The influence of climate change is not anticipated to exacerbate or ameliorate the Project effects to the extent that significant effects will occur.

7.2. Potential temporary construction effects

7.2.1. Table 22 summarises the potential effects during construction which are temporary during the construction phase only and which will be reversed or stopped at the end of the construction phase.

Table 22 – Summary of potential temporary construction effects.

Impact/Activity	Effect and type	Receptor
Construction activities located on or adjacent to artificial ground/made ground and/or landfills and other potentially contaminative sites	Health effects from direct contact with contaminants, inhalation of windblown contaminated dust and vapours, asphyxiation risk from exposure of hazardous ground gasses (adverse)	Construction and maintenance workers Current passengers Property and adjacent users
Dewatering of excavations, e.g., Deep cuttings or mined tunnels	Promotion of migration of pollution in aquifers towards dewatering points causing general deterioration of groundwater quality (adverse)	Controlled waters Ecological receptors - GWDTE
Groundwater exposed for cuttings/excavation which requires treatment prior to discharge.	Pollution of nearby surface waters, shallow and deep groundwater aquifers, leading to potential reduction in quality of groundwater for abstraction (adverse)	Controlled waters Ecological receptors - GWDTE
Construction of infrastructure such as piled foundations/cuttings leading to exposure or pollutant pathway creation	Contaminant migration via the potential to introduce preferential pathways which would otherwise not be present resulting in contamination of controlled waters (adverse)	Controlled waters

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. Proposed mitigation measures for the Project in relation to land quality are detailed in the following sections and consider best practice, legislation and guidance.

8.1.2. In addition, during design development, the position and selection of route elements would look at the prioritisation of development to avoid or reduce interaction with areas identified as a potential contamination sources (such as landfills) or avoid designated geological sites.

8.1.3. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA scoping report.

8.1.4. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project will therefore have embedded within it various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.5. The Project limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.2. Design principles

Operational effects

8.2.1. The operation of the Project will include various electrical equipment such as transformer stations and substations. Transformer stations and substations can, in principle, be a source of contamination through accidental discharge or leaks

of coolant oils. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk will be included in the design of the Project.

8.2.2. The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small, can be controlled by robust maintenance and operating procedures and is therefore unlikely to result in significant contamination.

8.2.3. The water resources Method Statement covers the impacts to water receptors from the operation of the Project.

Permanent construction effects

8.2.4. As part of the Project design it will be necessary to consider the ground conditions, as is normal in any construction project. Ground risks, including geotechnical risks, will be managed in accordance with the requirements of the relevant British Standards. This includes adherence to Eurocode 7 for geotechnical aspects and will encompass the presence of aggressive substances in the ground, either as a result of contamination or those that occur naturally in the ground, for instance sulphates from naturally occurring minerals such as gypsum.

8.2.5. The Environment Agency's LCRM[4] provides a framework for managing land contamination risks in England. This refers to other national guidance that may be used to manage risk including guidance on standards, risk assessment, remediation and verification. The guidance includes references to British Standards for the assessment and remediation from ground gases and volatile contaminants that may be used in the design of station buildings or other occupied buildings as part of the Project.

8.2.6. The guidance also requires that risks to groundwater and surface water from pre-existing contamination, if present, are also managed during the construction phase and into operation.

8.2.7. The overall principle of LCRM is that no unacceptable risks from land contamination should remain following completion of a development. Further detail related to this aspect is given in Appendix A.

8.3. Code of construction practice

8.3.1. Construction work can be one of the chief causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

8.3.2. The draft CoCP will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic environment assets. The environmental assessment of land quality impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a Project of this nature.

8.3.3. The requirements in the draft CoCP relating to work in contaminated areas will ensure the effective management and control of the work. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on land quality may include the following generic categories:

- Site specific measures;
- Procedures and statutory guidance will be followed to undertake ground investigation and risk assessment work where necessary, and to identify and implement remediation measures where required;
- Monitoring and record keeping requirements for remediation works;
- Methods to control noise, waste, dust, odour, gases and vapours;
- Methods to control spillage and prevent contamination of adjacent areas;
- The management of human exposure for people living and working nearby;
- Methods for the storage and handling of excavated materials (both contaminated and uncontaminated);
- Management of any unexpected contamination found during construction;
- Storage requirements for hazardous substances such as oil;
- Traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils;
- Methods to monitor and manage flood risk which may affect land quality during construction; and
- The excavation and restoration of borrow pits.

8.3.4. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

8.4. Climate Change

8.4.1. It is assumed that mitigations are designed which take climate change into account, for example through the mitigation design and timing. Any effects on mitigations will be identified and recorded within the ES.

9. Evaluating significance

9.1. Overview

9.1.1. A methodology for assessing effects related to both geodiversity and land contamination for the purposes of this EIA is given in the following sections, although not all elements may be scoped in. Refer to Section 10 and Appendix A on the extent of assessments for ES purposes.

9.1.2. The methodology for assessing land quality effects is based around the change in land contamination risks between the situation at baseline and those estimated to exist in the temporary, permanent, or operational state. The stages involved in this assessment are discussed in more detail in the following sections.

9.1.3. The methodology includes the prediction of both adverse and beneficial effects associated with land contamination and utilises recognised land contamination risk assessment guidance.

9.1.4. The prediction of significance is based on the magnitude of the impact and the sensitivity of the receptors. The significance of the potential effects is identified using the matrix presented in Table 25.

9.1.5. Typically, the greater the environmental sensitivity or value of the receptor, and the greater the magnitude of impact, the greater the resulting effect. Therefore, consequences of a highly valued environmental resource suffering a major detrimental impact would be a Very Large Adverse effect.

9.1.6. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the land quality section of the Environmental Statement.

9.2. Receptor sensitivity

9.2.1. The sensitivity of potential receptors can be described according to the categories shown in Table 23. The categories are based on widely used land contamination risk assessment guidance, namely Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66 (‘R&D66’), as well as the DMRB standard for geology and soils which was considered appropriate due to the linear nature of the Project.

9.2.2. Construction workers are scoped out of the assessment as any risks to construction workers will be mitigated as per the requirements of the Construction Design and Management (CDM) Regulations 2015.

Table 23 – Sensitivity of receptors.

Sensitivity	Criteria
Very High	**Human health**: Current and future passengers, adjacent land users such as schools, allotments and residents. **Surface water**: Site protected under European Union wildlife legislation (Special Area of Conservation, Special Protected Area, Ramsar site); water framework directive (WFD) High status. **Groundwater**: Principal aquifer providing a regionally important resource or Groundwater SPZ. **Built environment and property:** Sites with international importance (e.g., World Heritage site). **Geology** – very rare and of international importance (e.g., United Nations Educational, Scientific, Cultural Organisation (UNESCO) World Heritage Sites, UNESCO Global Geoparks, SSSI and GCR where citations indicate features of international importance). **Environment**: Internationally designated areas such as Ramsar sites.
High	**Human health**: Construction workers, maintenance workers, future railway workers, adjacent commercial premises. **Surface water**: Site protected under UK wildlife legislation (SSSI), WFD Good status. **Groundwater:** Principal aquifer which provides locally important resource. **Built environment and property**: Sites with national importance e.g., Scheduled Monuments. **Geology:** rare and of national importance (e.g., geological SSSI). **Environment**: Nationally designated areas e.g., SSSI.
Medium	**Surface water:** Site protected under local wildlife legislation (Site of Nature Conservation Interest, Local Nature Reserve, Local Wildlife Site), WFD status Moderate **Groundwater:** Secondary A or B aquifer. **Built environment and property:** Sites with a local or district value or interest for education or locally listed buildings. Residential and commercial developments. Crops and livestock. **Geology:** designated of local or regional importance (e.g., LGS). **Environment**: Regionally designated areas e.g., local nature reserves.
Low	**Surface water:** WFD Poor status, or waterbody is not classified under the WFD. **Groundwater:** Secondary undifferentiated aquifer. **Built environment and property**: Infrastructure (e.g., roads and railways)

9.3. Magnitude of impact

9.3.1. The magnitude of change or impact on a receptor is independent of its sensitivity and will be determined based on a nine-point scale presented in Table 24. The categories are based on widely used land contamination risk assessment guidance, namely R&D66, as well as the DMRB standard for geology and soils.

9.3.2. For land contamination elements, where there is no change between land contamination risks between baseline and either temporary or permanent construction stages, the impact significance is deemed to be neutral even if the risk itself is deemed to be high. For example, this will be the case where the construction of the Project does not alter the risks from an existing potentially contaminated site that is off-site (i.e., outside the draft Order Limits). The typical examples given in Table 24 are related to change caused by the Project (i.e., comparison with baseline) and not absolute descriptors of land condition.

Table 24 – Magnitude of impact.

Magnitude and type	Typical examples
Major adverse	Actions leading to an acute impact on human health from land contamination, likely to result in 'significant harm' to human health as defined by the EPA 1990, Part 2A[8], if exposure occurs. Major contamination of an aquifer or surface water course (e.g., Category 1 pollution incident) leading to persistent and extensive effects on water quality, leading to closure of a potable abstraction point; major impact on amenity value; or major damage to agriculture or commerce. Catastrophic damage to crops, buildings or property, for example explosion, causing building collapse. Loss of geological feature/designation and/or quality and integrity, severe damage to key characteristics, features or elements.
Moderate adverse	Actions creating a chronic impact on human health from land contamination which could result in 'significant harm' to human health as defined by the EPA 1990, Part 2A[8] if exposure occurs. Moderate contamination of an aquifer or surface water course (e.g., Category 2 pollution incident as defined by the Environment Agency). Widespread damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Moderate damage to crops, buildings or property, for example damage to building rendering it unsafe to occupy e.g., foundation damage resulting in instability.

Magnitude and type	Typical examples
	Partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
Minor adverse	Actions leading to minor non-permanent health impacts on humans from land contamination, e.g., skin rash. Minor contamination of an aquifer or water course (e.g., Category 3 pollution incident). Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning. Minor damage to crops, buildings, or property, e.g., surface spalling of concrete. Minor measurable change in geological feature/designation attributes, quality or vulnerability; minor loss of, or alteration to one or more key characteristics, features or elements.
Negligible adverse	Actions leading to mild, very short-lived health impacts on humans from land contamination. Marginal and short-lived detrimental impact on surface water or groundwater quality. Easily repairable damage to buildings, structures, and services. Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature/designation. Overall integrity of resource not affected.
No change	No change in soil or groundwater quality and impacts on associated receptors. No change to geological sites.
Negligible beneficial	Remediation or redevelopment of site to remove the likelihood of mild very short-lived health impacts on humans from land contamination. Marginal and short-lived beneficial impact on surface water or groundwater quality. Remediation of site to remove ongoing easily repairable damage to buildings, structures, and services.
Minor beneficial	Remediation or redevelopment of site to remove non-permanent health impacts on humans from land contamination. Remediation of minor contamination of an aquifer or water course and corresponding improvement to dependent ecosystems. Remediation of site to remove ongoing minor damage to crops, buildings, or property.
Moderate beneficial	Remediation or redevelopment of site to remove chronic impact on human health. Remediation of moderate contamination of an aquifer or water course and corresponding improvement to dependent ecosystems. Remediation of site to remove ongoing moderate damage to crops, buildings, or property.

Magnitude and type	Typical examples
Major beneficial	Remediation or redevelopment of site to remove acute impact on human health. Remediation of major contamination of an aquifer or surface water course (e.g., Category 1 pollution incident) with extensive beneficial effects on water quality. Remediation of site to remove ongoing catastrophic damage to crops, buildings, or property.

9.4. Significance of effect

9.4.1. Significant effects for the geology and land quality assessment will be determined by the matrix set out in Table 25.

Table 25 – Significance of effects.

Sensitivity	Magnitude of impact				
	No change	Negligible	Minor	Moderate	Major
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

9.4.2. For the purpose of the geology and land quality assessment, effects of a moderate or greater significance will be considered to be significant.

9.4.3. A significant effect is an effect that the assessment team believe should be considered by the decision maker in determining the application for development consent.

10. Proposed scope

10.1. Overview

10.1.1. The following section summarises the elements that will be scoped in or out of the land quality aspect.

10.2. Land contamination

10.2.1. It is proposed that the land contamination element of the land quality discipline is scoped out of the ES. This is based on the following:

- The Project will include various electrical equipment. Fuel and oil storage tanks, transformer stations, and substations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk will be included in the installed design.
- The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage can be controlled by robust maintenance and operating procedures, is expected to be very small and is unlikely to result in significant contamination.
- Based on the station operations and infrastructure design, the likelihood of significant contamination from the operation of the Project is not considered to be significant and will be scoped out of the assessment.
- Given the application of the embedded design principles summarised in section 8.2, such as design of infrastructure or stations to account for substances that may be present in the ground (including aggressive ground conditions or ground gases), it is judged that there would be no significant permanent construction effects. There may, however, be some slight beneficial effects where treatment of land contamination takes place. Permanent construction effects of the Project are therefore proposed to be scoped out of the assessment.
- For temporary construction effects, measures outlined in the CoCP and assessments required as part of LCRM (including risk assessments and remediation where necessary) will be expected to reduce impacts to negligible or at worst slight adverse. Additionally, the requirements of CDM

2015 will mitigate effects on construction workers. No significant effects are therefore anticipated, and temporary effect construction effects are also proposed to be scoped out.

10.2.2. Further detail on scoping out of land contamination and the measures that will still be required through the Contaminated Land Regime as part of the development of the Project is presented in Appendix A.

10.3. Geodiversity

10.3.1. Due to the presence of Barrington Quarry SSSI and nine wells LGS site in the Comberton to Shelford area, geodiversity will be scoped in for this section of the route only.

10.4. Summary

10.4.1. Table 26 provides a summary of the items scoped in or out of the assessment.

Table 26 – Assessment items scoped in or out.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Comberton to Shelford	Cambridge
Geodiversity – temporary construction effects	×	×	×	×	×	×	×
Geodiversity – permanent and operational effects	×	×	×	×	×	✓	×
Land contamination – temporary construction effects	×	×	×	×	×	×	×
Land contamination - permanent and operational effects	×	×	×	×	×	×	×

11. Assumptions and risks

11.1. Overview

11.1.1. Data contained in this Method Statement is based on previous desk study work and publicly available sources available at the time of writing.

11.2. Risks

11.2.1. The embedded mitigation measures include the need to undertake extensive ground investigation and risk assessments. Access constraints mean that this information is unlikely to be fully available for the DCO submission date. However, as is common in the planning process, data can continue to be collected post submission and may be secured as a DCO requirement.

11.3. Opportunities

11.3.1. Where the Project interacts with potential land contamination there may be the opportunity for non-significant beneficial effects and improvement in soil, groundwater, or surface water quality where remediation takes place.

12. APPENDIX A – Aspects and matters proposed to be scoped out

12.1. Land contamination

12.1.1. The Project will include traction power substations and auto-transformer stations. Fuel and oil storage tanks, auto-transformer stations, feeder stations and substations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk will be included in the installed design. The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage can be manged by robust maintenance and operating procedures, is expected to be very small and is unlikely to result in significant contamination. Spillage or leakage would be cleaned up in accordance with operational procedures.

12.1.2. Based on the station operations and infrastructure design, the likelihood of significant contamination from the operation of stations or other infrastructure is not considered to be significant therefore, in line with other rail Projects, operational effects are proposed to be scoped out of the assessment.

12.2. Permanent construction effects – contaminated land regime and design

12.2.1. The following mitigation measures will be undertaken prior to construction of the proposed development to ensure that any contamination risks, including those to human health, property, surface water and groundwater are mitigated in accordance with LCRM guidance.

- Where not already completed, further preliminary risk assessments (desk studies) would be undertaken for the Project to provide an initial conceptualisation of sources, pathways and receptors which would be used to inform the scope of ground investigations;
- A written Project of investigation would be produced for the targeted geo-environmental site investigation; a Phase 1 ground investigation is currently underway;

- The site investigation would include contamination testing of soils, groundwater and surface water to seek to confirm the ground conditions, groundwater regime and any surface water groundwater interaction;
- Where necessary ground gas or vapour monitoring would be completed;
- Findings of the investigations would be reported in generic quantitative risk assessment or DQRA in line with LCRM guidance and other relevant standards and guidance e.g., BS10175, CIRIA C665, CIRIA C552, BS8576 and Environment Agency groundwater protection guidance;
- Should contamination be identified by the ground investigation and subsequent risk assessments that poses an unacceptable risk, a remediation strategy would be produced, and remediation undertaken to mitigate the risk;
- An options appraisal in line with LCRM and Sustainable Remediation Forum (SURF-UK) is usually undertaken as part of the pre-construction works to identify and evaluate the option or options that would be most appropriate; and
- Contamination remediation methodologies for soil and groundwater will be chosen and will generally be expected to follow the hierarchy given below:
    - Monitored natural attenuation of groundwater;
    - On-site treatment of soils or groundwater and subsequent reuse of soils on site;
    - Nearby off-site treatment of soils and re-importation to site and reuse (e.g., use of a hub and cluster approach or a soil treatment centre);
    - Off-site soils treatment (possibly at a treatment hub or cluster) and reuse on other projects; and
    - Off-site disposal of soils or groundwater (with or without treatment).

12.2.2. A procedure would be put in place for dealing with unexpected contamination that may also impact on surface water quality, groundwater quality and adjacent land users or property.

12.2.3. In terms of soils management, excavated soils would be managed in accordance with the definition of waste code of practice (DoWCoP) which will determine the appropriate re-use or disposal routes for soils produced during the excavation works phase of the proposed development. This is documented by a materials management plan (MMP). The MMP or series of MMP will consider naturally occurring background contaminants to ensure that uncontaminated natural soils

from a particular domain are not used in areas with a lesser background contaminant levels.

12.2.4. These measures are standard requirements in any development and the level of detail and work required will be commensurate with the complexity of the project and the nature of the contamination identified.

12.2.5. In each case the end point is the same, i.e., that no unacceptable risk should remain at the completion of the project. Therefore, significant permanent effects from the Project in respect of the land contamination element of the land quality aspect are not anticipated.

12.2.6. It is noted that it is common for land contamination to be scoped in for projects on a precautionary basis, however, significant effects are commonly not identified when these measures are incorporated into the Project. Therefore, East West Rail Co. considers it is a proportionate approach to scope out land contamination as an ES section. However, it is emphasised that considerable work related to land contamination will take into account regulatory requirements and consultation and engagement with stakeholders. This work will be appended to the ES to provide sufficient information to the examining authority, interested parties and the decision maker and to inform the development of any appropriate DCO requirements.

EWR-MWJV Technical Partner

Routewide – Environmental – EIA Scoping Method Statement – Material Resources and Waste

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1. East West Rail

1.1. Introduction

1.1.1 East West Rail Company (EWR Co) are proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation and maintenance of a new railway line between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2 EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3 The national networks national policy statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4 To plan how the EIA for the Project should be undertaken, a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including a more detailed description of the proposals that make up the Project.

1.1.5 This EIA Method Statement sets out the proposed scope of the assessment of impacts on material resources and waste and should be read in conjunction with the Method Statements prepared for other aspects. In this Method Statement, material resources will be referred as 'materials'.

[1] *National policy statement for national networks* (2014) *GOV.UK*. Available at: National Networks - National Policy Statement (Accessed: November 2024).

1.1.6 The assessment of materials and waste considers the potential effects for both the construction and operational phase.

1.1.7 This Method Statement for materials and waste discusses:

- The provision and use of materials, including primary, secondary, recycled, and manufactured materials; and
- The generation and management of waste.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
C&D	Construction and demolition
CDEW	Construction demolition and excavation waste
C&I	Commercial and industrial
CL:AIRE DoWCoP	Contaminated Land: Applications in Real Environments Definition of Waste: Development Industry Code of Practice
CoCP	Code of Construction Practice
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EIA	Environmental impact assessment
ES	Environmental statement
EU	European Union
EWR Co	East West Railway Company Limited
LA	Local authority
MPA	Mineral planning authorities
MSA	Mineral safeguarding areas
MSW	Municipal solid waste
UK	United Kingdom

2.1.1 The definitions used for materials and waste in this Method Statement are as per terms and definitions given in Design Manual for Roads and Bridges (DMRB) Local Authority (LA) 110[2].

[2] *Highways England* (2019) *DMRB Volume 11 Section 3 Part 13 LA 110 Sustainability and environment. Appraisal. Material assets and waste [online].* Available at: LA 110 - Material assets and waste (standardsforhighways.co.uk). (Accessed October 2023).

3. Relevant legislation, policies and guidance

3.1.1 The relevant legislation, policies and guidance are listed in this section.

3.1.2 The overarching European Directives that are applicable to the assessment of use of materials and waste generation are listed. Whilst it is acknowledged that the United Kingdom (UK) has left the European Union (EU)[3] it should be noted that existing legislation which transpose these Directives remains in force.

3.1.3 The following legislation has been considered:

- Waste Framework Directive (2008/98/EC)[4];
- Landfill Directive (1999/31/EC)[5];
- Environmental Protection Act 1990[6]
- The Environment Act 2021[7];
- Waste (Circular Economy) (Amendment) Regulations 2020[8];
- The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020[9];
- The Waste (England and Wales) Regulations (2011) as amended[10];
- The Hazardous Waste (England and Wales) Regulations (2005) as amended[11];
- The Environmental Permitting (England and Wales) Regulations (2016), as amended[12]; and

[3] *His Majesty's Government* (2018) *European Union (Withdrawal) Act 2018 [online]*. Available at: European Union (Withdrawal) Act 2018 (legislation.gov.uk) (Accessed November 2023).
[4] *European Union Directive*. (2008) *Waste Framework Directive (2008/98/EC) [online]*. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098 (Accessed November 2023).
[5] *European Union Council Directive* (1999). *Landfill Directive (1999/31/EC) [online]*. Available at: EUR-Lex - 31999L0031 - EN - EUR-Lex (europa.eu) (Accessed November 2023).
[6] *His Majesty's Government* (1990). *Environmental Protection Act [online].* Available at: Environmental Protection Act 1990 (legislation.gov.uk). (Accessed April 2024).
[7] *His Majesty's Government* (2021) *The Environment Act 2021 [online].* Available at: Environment Act 2021 (legislation.gov.uk). (Accessed November 2023).
[8] *His Majesty's Government* (2020) *The Waste (Circular Economy) (Amendment) Regulations 2020 [online]*. Available at: Legislation.gov.uk. (Accessed November 2023).
[9] *His Majesty's Government* (2020) *The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 [online].* Available at The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 (legislation.gov.uk). (Accessed November 2023).
[10] *His Majesty's Government* (2011) *The Waste (England and Wales) Regulations 2011, No.988 [online].* Available at: https://www.legislation.gov.uk/uksi/2011/988/contents. (Accessed November 2023).
[11] *His Majesty's Government* (2005) *The Hazardous Waste (England and Wales) Regulations 2005, No. 894 [online].* Available at: https://www.legislation.gov.uk/uksi/2005/894/contents/made. (Accessed November 2023).
[12] *His Majesty's Government* (2016) *The Environmental Permitting (England and Wales) Regulations 2016 No. 1154 [online].* Available at: https://www.legislation.gov.uk/uksi/2016/1154/contents/made. (Accessed November 2023).

- Controlled Waste (England and Wales) Regulations 2012 (SI 2012/811)[13].

3.1.4 The following national policy has been considered:

- National Policy Statement for National Networks[14];
- National Networks National Policy Statement[15];
- National Planning Policy Framework[16];
- The Waste Management Plan for England, (2021)[17];
- The Waste prevention programme for England: Maximising Resources, Minimising waste (2023)[18];
- A Green Future: Our 25-Year Plan to Improve the Environment (2018)[19];
- Our Waste, Our Resources: A Strategy for England (2018)[20];
- Environmental Improvement Plan 2023[21];
- Net Zero Strategy: Build Back Greener 2021[22]; and
- The Clean Growth Strategy 2017[23].

3.1.5 The following guidance and standards have been considered:

- Design Manual for Roads and Bridges (DMRB) Local Authority (LA) 110[2];
- Site Waste Management Plans – Guidance for Construction Contractors and Clients Voluntary Code of Practice[24];

[13] *His Majesty's Government* (2012) *Controlled Waste (England and Wales) Regulations 2012 [online].* Available at: www.legislation.gov.uk/uksi/2012/811/contents/made. (Accessed November 2023).
[14] *Department of Transport* (2014). *National Policy Statement for National Networks [online].* Available at: National policy statement for national networks - GOV.UK (www.gov.uk) (Accessed October 2023).
[15] *Department of Transport* (2024) *National Networks National Policy Statement [online].* Available at: National Networks National Policy Statement - GOV.UK (www.gov.uk). (Accessed April 2024).
[16] *Department for Levelling Up, Housing and Communities* (2012). *National Planning Policy Framework [online].* Available at: National Planning Policy Framework - Guidance - GOV.UK (www.gov.uk). (Accessed April 2024).
[17] *Department for Environment Food &Rural Affairs* (2021) *Waste Management Plan for England [online].* Available at: Waste Management Plan for England (publishing.service.gov.uk). (Accessed November 2023).
[18] *Department for Environment, Food & Rural Affairs* (2023). *The waste prevention programme for England: Maximising Resources, Minimising Waste [online].* Available at: The waste prevention programme for England: Maximising Resources, Minimising Waste - GOV.UK (www.gov.uk). (Accessed November 2023).
[19] *His Majesty's Government* (2018) *A Green Future: Our 25 Year Plan to Improve the Environment [online].* Available at: 25 Year Environment Plan - GOV.UK (www.gov.uk). (Accessed November 2023).
[20] *Department for Environment Food and Rural Affairs* (2018) *Resources and waste strategy: at a glance [online].* Available at: Resources and waste strategy: at a glance - GOV.UK (www.gov.uk). (Accessed November 2023).
[21] *His Majesty's Government* (2023) *Environmental Improvement Plan 2023 [online].* Available at: Environmental Improvement Plan 2023 - GOV.UK (www.gov.uk). (Accessed November 2023).
[22] *His Majesty's Government* (2021) *Net Zero Strategy: Build Back Greener [online].* Available at Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk). (Accessed November 2023).
[23] *Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy* (2018). *Clean Growth Strategy [online].* Available at: Clean Growth Strategy - GOV.UK (www.gov.uk). (Accessed November 2023).
[24] *Department of Trade and Industry* (2004). *Site Waste Management Plans - Guidance for Construction Contractors and Clients [online].* Available at: https://www.bathnes.gov.uk/sites/default/files/sitewastemanagement.pdf. (Accessed October 2023).

- Construction Code of Practice for Sustainable Use of Soils on Construction Sites[25];
- Contaminated Land: Applications in Real Environments Definition of Waste: Development Industry Code of Practice (CL:AIRE DoWCoP)[26]; and
- Waste duty of care code of practice[27].

[25] *Code of practice for the sustainable use of soils on construction sites. [online].* Available at: Code of practice for the sustainable use of soils on construction sites - GOV.UK (www.gov.uk). (Accessed October 2023).
[26] *Definition of Waste: Code of Practice [online].* Available at: DoW:CoP (claire.co.uk). (Accessed October 2023).
[27] *Department of Environment, Food & Rural Affairs* (2016). *Waste duty of care code of practice [online].* Available at: Waste duty of care code of practice - GOV.UK (www.gov.uk). (Accessed April 2024).

4. Establishing the baseline

4.1. Documentary records

4.1.1 The approach set out in DMRB Volume 11, Section 3, Part 13 LA 110 Sustainability and Environment Appraisal - Material Assets and Waste has been followed to establish the baseline condition for materials and waste.

4.1.2 For use of materials, the most recent information available from the following sources has been used:

- British Geological Society[28];
- World Steel Association[29];
- Mineral Product Association[30];
- Aggregates working parties: annual reports[31];
- Oxfordshire Minerals and Waste Local Plan, Part – Core Strategy, Adopted Version September 2017[32];
- Buckinghamshire Minerals and Waste Local Plan 2016-2036[33];
- Central Bedfordshire Minerals and Waste Local Plans: Strategic Sites and Policies[34]; and
- Cambridgeshire and Peterborough Minerals and Waste Local Plan Adopted July 2021[35].

4.1.3 Sources for Mineral Safeguarding Areas (MSA) will be added at the ES stage. This information will be sourced from Minerals Local Plans for local authorities (LAs) within 500m of the Project's draft Order limits.

[28] *British Geological Society* (2023). *United Kingdom Minerals Yearbook 2022. [online]* Available at:OR23001.pdf (nerc.ac.uk). (Accessed October 2023).
[29] *World Steel Association* (2023), *2021 World Steel in Figures. [online].* Available at: https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2022/. (Accessed October 2023).
[30] *Mineral Products Association* (2022) The *Contribution of Recycled and Secondary Materials to Total Aggregates Supply in Great Britain – 2020 Estimates [online].* Available at: Contribution_of_Recycled_and_Secondary_Materials_to_Total_Aggs_Supply_in_GB_2022.pdf (mineralproducts.org). (Accessed October 2023).
[31] *Department for Levelling UP, Housing and Communities and Ministry of Housing, Communities & Local Government* (2023). *Aggregates working parties: annual reports [online].* Available at: Aggregates working parties: annual reports - GOV.UK (www.gov.uk). (Accessed October 2023).
[32] *Oxfordshire Minerals and Waste Local Plan, Part – Core Strategy, Adopted Version September 2017* (2017) *[online].* Available at: Minerals and waste core strategy | Oxfordshire County Council. (Accessed October 2023).
[33] *Buckinghamshire Minerals and Waste Local Plan 2016-2036 (2019)* [online]. Available at: Buckinghamshire Minerals and Waste Local Plan (buckinghamshire-gov-uk.s3.amazonaws.com). (Accessed October 2023).
[34] *Central Bedfordshire Minerals and Waste Local Plans: Strategic Sites and Policies (MWLP: SSP) (2014) [online].* Available at: Development framework | Central Bedfordshire Council. (Accessed October 2023).
[35] *Cambridgeshire and Peterborough Minerals and Waste Local Plan Adopted July 2021 (2021). [online].* Available at: Cambridgeshire and Peterborough Minerals and Waste Local Plan - Cambridgeshire County Council. (Accessed October 2023).

4.1.4 Information on the current waste arisings, and the waste management infrastructure have been determined through a desk-top study, using a number of readily available resources, in particular data from the:

- Environment Agency - Waste Data Interrogator[36];
- Department for Environment Food and Rural Affairs (2023) UK statistics on waste[37];
- Environment Agency - Historic Landfill Sites[38];
- Environment Agency - Permitted Waste Sites[39];
- Environment Agency - Remaining Landfill Capacity[40];
- Environment Agency - Environmental Permitting Regulations - Waste Operations[41]; and
- Environment Agency - Waste Exemptions Register[42].

4.2. Surveys

4.2.1 No surveys were undertaken to establish the baseline for materials and waste at the time of preparing this Method Statement.

4.3. Modelling

4.3.1 No modelling was undertaken to establish the current baseline for materials and waste or to establish the future baseline for materials at the time of preparing this Method Statement.

4.3.2 To establish the future baseline for generation and management of waste arisings for East West Rail, construction demolition and excavation waste (CDEW) data, commercial and industrial (C&I) data from relevant LAs and the Environment Agency (EA) data was used to project the total CDEW arisings, and the quantity of waste to be diverted from landfill for:

- The baseline year (2022);

[36] *Environment Agency (2023) Waste Data Interrogator [online].* Available at: 2022 Waste Data Interrogator - data.gov.uk. (Accessed October 2023).
[37] *Department for Environment Food and Rural Affairs* (2023) *UK statistics on waste [online].* Available at: UK statistics on waste - GOV.UK (www.gov.uk). (Accessed October 2023).
[38] *Department for Environment Food and Rural Affairs (2023). [online].* Available at: Historic Landfill Sites - data.gov.uk. (Accessed October 2023).
[39] *Department for Environment Food and Rural Affairs* (2023). *[online].* Available at: Permitted Waste Sites - Authorised Landfill Site Boundaries - data.gov.uk. (Accessed October 2023).
[40] *Environment Agency* (2023) *2022 Remaining Landfill Capacity – Version 1 [online].* Available at: Remaining Landfill Capacity - data.gov.uk. (Accessed October 2023).
[41] *Environment Agency* (2023) *Environmental Permitting Regulations - Waste Operations [online].* Available at: Public Registers Online (data.gov.uk). (Accessed October 2023).
[42] *Environment Agency* (2023) *Register of Waste Exemptions [online].* Available at: Waste Exemptions (data.gov.uk). (Accessed October 2023).

- The proposed construction period (2028 to 2034); and
- The first full year of operation for materials and waste (assumed to be 2035).

4.3.3 The annual projections based on average annual growth rate for each year for both the CDEW and C&I wastes within the proposed construction period of 2028 to 2034, is undertaken for the region in which the East West Rail will pass. It is assumed that construction will be completed, and first full year of operation will be in 2035.

4.3.4 Waste management performance (shown as overall diversion from landfill and disposal to landfill) is also based on data for each year within the period 2022 to 2035 (future baseline).

4.4. Study area

4.4.1 The assessment will use professional judgement and DMRB LA 110 guidance for materials and waste. It will use two geographically different study areas, one to examine the materials use and generation of waste (as shown in Figures 64 - 71 in the EIA Scoping - Figures) and one to examine the management of waste for the construction and operational phases (as shown in Figure 63 in EIA Scoping – Figures). The figures showing the two geographical study areas over the eight route sections currently do not include information for MSA. Information for MSA will be provided at the ES stage.

4.4.2 The first study area is the area within which key construction materials will be consumed (used/deployed), and waste will be generated (including temporary compounds and storage areas).

4.4.3 For the Project, the first study area for materials and generation of waste, is within the draft Order limits and all temporary compounds and storage areas. A study area of 500m from the Project draft Order limits is used to identify potential constraints to MSA and peat resources. and 250m from draft Order limits for potential sources of land contamination.

4.4.4 The Project is within two regions, east of England and south-east of England. The second study areas have been considered for materials, and separately for management of waste. These consist of:

- Feasible sources and availability of primary key construction materials required to construct the main elements of the Project. For the purpose of the assessment, the second study area is the east of England and south-east of England regions for materials sourced locally and UK for materials sourced nationally (e.g. steel, concrete and cement); and

- Suitable recovery and waste management infrastructure that could accept arisings and/or waste generated by the Project. For the purpose of the assessment, the second study area is the east of England and south-east of England regions. Suitable waste infrastructure including landfills, has been identified within close proximity to the Project to promote the proximity principle and reduce transport distances. An initial search area of 10km from the Project draft Order limits has been assessed to support the proximity principle by highlighting appropriate waste management and disposal sites within a reasonable proximity to the of the Project.

4.5. Consultation

4.5.1 Consultation will be ongoing to inform the assessment of materials and waste as the DCO application progresses. A non-statutory consultation commenced in 2024.

5. Preliminary baseline description

5.1. General description

5.1.1 The baseline conditions for materials use and generation and management of waste for the Project has been considered on a route-wide basis as materials will be consumed and waste will be generated within the draft Order limits of the Project. As the Project is within two regions, separate baselines have been developed for the east of England and south-east of England and that the Project will be assessed against both baselines separately.

5.1.2 The baseline conditions for the use of materials identifies:

- Regional or national availability of the main materials required for the construction and operation of the Project, including for the site preparation and construction;
- MSA, peat resources, allocated minerals sites and the areas of search for minerals within or adjacent to the Project; and
- Future baseline information for use of materials up to 2035, the first full year when the Project is likely to become operational, including general maintenance.

5.1.3 The baseline conditions for waste identify the following:

- The availability and capacity of regional and (where appropriate) national landfill facilities. Landfill void data has been collated for both inert and non-inert (non-hazardous and hazardous) landfill types, where available;
- Historical and future trends in waste processing, recovery and/or landfill void capacity (especially where increases can be forecast or otherwise ascertained) to provide a useful insight as to the capability of these facilities; and
- Future baseline information for waste generation up to 2035 (the first full year of operation) and regional waste infrastructure capacity that will be required.

5.1.4 The information in this Method Statement is determined through a desk-based study, using a range of online resources. Baseline data is provided in the Resources and Waste Technical Appendices Document (Technical Appendices Document).

6. Resources and waste elements

6.1. Materials

6.1.1 Most of the primary key construction materials that will be required for the construction and operation of the Project will be sourced from quarries. The consumption of materials affects their immediate and (in the case of primary materials) long-term availability, which in turn can adversely impact the environment. The receptors for materials are the quarries used for extraction of primary raw materials, and the type and availability of materials.

6.1.2 Existing or potential peat extraction sites and MSA or sites that have been identified with strategic planning documents for the extraction of minerals can be sterilised (i.e. impacted to become inoperable) if they are within the draft Order limits of the Project. Hence receptors for materials are also MSA and peat resources that may be located in close proximity of the Project.

6.1.3 The baseline information for materials is provided within the Technical Appendices Document.

6.1.4 Table 2 and Table 3 of the Technical Appendices Document provides the information for production of mineral, mineral products and steel in UK that are used for the production of key construction materials. Table 4 of the Technical Appendices Document provides information on the availability of aggregates within east of England and south-east of England regions.

6.1.5 The Project will be constructed within east of England and south-east of England regions covering the following LAs:

- Oxfordshire County Council;
- Vale of White Horse District Council;
- Oxford City Council;
- South Oxfordshire District Council;
- West Oxfordshire District Council;
- Cherwell District Council;
- Buckinghamshire Council;
- Milton Keynes City Council;
- Central Bedfordshire District Council;
- Bedford Borough Council;

- Cambridgeshire County Council;
- Huntingdonshire District Council;
- Cambridge City Council;
- South Cambridgeshire District Council; and
- East Cambridgeshire District Council.

6.1.6 Key conclusions for the use of materials from the current baseline study as given in the Technical Appendices Document indicate that:

- The apparent use of steel in UK in 2022 was 9.2 million tonnes;
- East of England and south-east of England have landbank of sand and gravel and crushed rocks as required by National Planning Policy Framework; and
- For MSA and peat resources, Project information will indicate at the ES stage if East West Rail is in close proximity of MSA and peat resources.

6.2. Waste

6.2.1 The availability of waste management facilities and the void space capacities for inert, non-hazardous and hazardous landfill sites will be required for the management of waste from the Project. The receptors for waste generation are the waste management facilities and landfill sites. This is because management of waste from the Project can cause a temporary reduction of capacities of waste management facilities and permanent reduction in the void space capacities of landfill sites.

6.2.2 The Technical Appendices Document provides the baseline data to support this section of the Method Statement.

6.2.3 The waste generation in the east of England and south-east of England is stated in Table 5 of Technical Appendices Document.

6.2.4 Reuse, recycling and recovery of wastes will be prioritised within the Project, following the local policies on sustainable development. However, if diversion of waste from landfill is not feasible, waste will be transferred to landfills with suitable permits and capacity to receive the waste. Table 6 in the Technical Appendices Document identifies permitted landfills with remaining capacities that are within the east of England and south-east of England regions. Table 7 in the Technical Appendices Document identifies waste management facilities that are suitable for C&D activities within 10km from the Project. The waste exemption facilities that are available are given in Table 8 of Technical

Appendices Document. Waste management infrastructure and landfills are included as part of the second study area for this assessment.

6.2.5 Key conclusions for the generation and management of waste baseline study indicate that:

- There are numerous waste management facilities along the proposed route of the Project for the treatment of CDEW;
- East of England and south-east of England have remaining landfill capacities to accept inert and non-hazardous waste; and
- There are hazardous landfill sites in the south-east of England permitted to accept hazardous waste.

7. Future baseline

7.1. Overview

7.1.1 Future baseline information for use of materials and for management of waste from the construction phase up to the first full year of operation is considered up to 2035, when the Project is likely to be operational.

7.2. Materials

7.2.1 The assessment for materials will be undertaken against separate baselines for the east of England and south-east of England, when evaluating significance, as discussed in Section 13. Hence the future baseline for key construction materials has been considered separately.

7.2.2 Future baseline data provided in Technical Appendices Document, Table 3, indicates that east of England and south-east of England regions have numerous mineral working sites, and thus the availability of aggregates within the UK.

7.2.3 Mineral Planning Authorities (MPAs) are required to maintain seven-year landbank for sand and gravel and 10 years for crushed rock. At the end of 2022, for crushed rock, east of England have a landbank for 14.4 years and south-east of England have a landbank for 11 years, available to source crushed rocks from the region during the construction period and first full year of operation, up to 2035.

7.2.4 At the end of 2022, although the landbank for sand and gravel for both east of England and south-east of England regions is in excess of the seven years threshold, it does not cover the entire construction period and first full year of operation up to 2035. The sand and gravel that may be available beyond its seventh year is dependent upon the regional sales, availability of the materials in existing quarries and new quarries that may have received planning permissions. Hence projection of the existing data to estimate the future baseline for sand and gravel is inappropriate and has not been undertaken.

7.2.5 Long term aggregate supply as provided by MPA[43] states that a key factor influencing the future, long term supply of aggregates, and therefore other mineral products manufactured using aggregates, is the operation of the mineral planning system. A complementary indicator, the replenishment rate of permitted reserves, provides a useful insight into the long-term availability of supply. Currently the replenishment rates in Great Britain for sand and gravel is

[43] *Profile of the UK Mineral Products Industry* (2023) *[online].* Available at: Profile_of_the_UK_Mineral_Products_Industry_2023.pdf (mineralproducts.org). (Accessed March 2024).

63% and 52% for rocks. This replenishment rate for rocks, sand and gravel can be considered for assessing the availability of aggregates beyond the landbank years.

7.2.6 Climate change may increase the likelihood of flooding, impacting the extraction of raw materials from quarries. In turn, this may reduce the availability of raw materials, such as aggregates, below the landbank estimates provided by MPAs. DMRB LA110 requires environmental assessment for materials assets and waste on the construction phase and first year of operational activities (opening year). As effects from climate change may occur in the longer term, climate change is unlikely to affect the future baseline for the availability of materials for the construction phase and first year of operation.

7.3. Waste

7.3.1 The construction and operation of the Project will generate waste which will need to be managed by the regional waste treatment facilities and landfill sites.

7.3.2 Publicly available waste data, for the LA areas through which the route passes, for the east of England and south-east of England, have been used to project the future available waste treatment capacities and landfill void space.

7.3.3 Future Baseline Data is provided in Technical Appendices Document - Appendix C. The desk study indicates that the LAs within east of England and south-east of England regions in which the Project is being constructed have waste management facilities for the treatment and management of waste arising from the construction of the Project.

7.3.4 The major committed developments based on publicly available information were screened based on:

- Completion of the construction of the project;
- Potential use of primary raw materials greater than 2% of regional availability; and
- Potential generation of construction waste that can reduce the regional landfill void capacity by > 1%.

7.3.5 It is likely that some of these committed developments will be constructed prior to start of the Project and will therefore affect the future baseline. The materials and the waste anticipated to be used or generated by the committed development, or the timescales over which materials will be required and waste will be generated, are not known at this time. Thus, it has not been possible to assess the effects on the future baseline due to the lack of materials and waste arisings information. Good practice will result in other developers seeking to

reuse material on the development sites, where possible, to reduce waste arisings as far as practicable. It is also likely that all major projects will have mitigation measures in place to reduce the impact on materials use and generation of waste. Thus, none of the committed developments are likely to impact the future baseline for materials and waste.

7.3.6 The future baseline does not take into account the effects of climate change on weather patterns including flooding. If climate changes are considered, it is possible to affect the operation of waste management facilities for treatment of waste and availability of void capacities in landfill sites for deposition of waste in future, causing reduced availability of these facilities for the management of waste generated. As the effects from climate change may occur in the longer term, climate change is unlikely to affect the construction phase, as this relates to the availability of waste management facilities and landfill void spaces. For the operational phase, it is unlikely that all waste management facilities and landfill sites will have reduced availability at the same time due to climate change. Therefore, it is unlikely that climate change will impact the operational phase for waste management.

7.3.7 Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

8. Sources of impact

8.1. Materials

8.1.1 The following sources of impacts from the Project have been identified for both the construction and operational stages.

8.1.2 The construction phase considers site preparation, demolition and construction of the Project. The Project includes works to existing stations, new stations, new railway lines, works to existing railway lines and works to road crossings.

8.1.3 Due to the nature of the Project, large quantities of raw materials and manufactured products are required for construction. The raw materials would include aggregates and minerals from primary, secondary or recycled sources and manufactured products such as pre-cast concrete and steel. Many materials may originate off-site, purchased as construction products required for the construction of railway tracks, pre-cast elements for the construction of structures such as bridges, gantries and signage, barriers, lighting, and fencing. Some materials may arise on-site, for example excavated soils and sub-strata.

8.1.4 The receptors likely to be subjected to impacts, as a result of the use of materials, are quarries and other sources of minerals, other finite raw materials, and the type and availability of materials. The impacts and effects associated with the use of materials include:

- Materials will need to be imported to the site, as it is assumed that the Project is likely to recover/reuse little site-won materials. Due to the nature of the Project, as large quantities of raw materials and manufactured products are required, this will affect the availability and demand for certain materials;
- The majority of materials needed on the Project comprise primary materials as the Project is unlikely to be able to source all required materials from recycled/secondary materials. The effect will be depletion of non-renewable resources; and
- Potential sterilisation of MSA and/or peat resources.

8.1.5 The operation of the Project will require some materials like steel, aggregate materials, cement, concrete, wood, plastic for its general maintenance works. The receptors impacted for materials will be quarries, and the type and availability of the materials, and the effects will be similar to that stated above for the construction phase.

8.2. Waste

8.2.1 For the construction phase, waste is likely to be generated mainly from site preparation works and could result in the following waste arisings (although the list is not exhaustive):

- Biodegradable waste from vegetation clearance;
- Inert waste from demolition and site preparation works;
- Excavated materials (natural and made ground) requiring treatment prior to reuse, or disposal;
- Non-hazardous materials, such as timber, tarmac, signage;
- Surplus materials from the site preparations, excavations, and construction;
- Damaged stocks or off-cuts;
- Debris and rubbish lying on the ground;
- Fly-tipped waste or litter within the draft Order limits of the Project; and
- Hazardous wastes - common examples include asbestos, coal tar, oils and fuels.

8.2.2 A site remediation strategy will be developed as part of the design, and this will be informed by a ground investigation. The outcome of this will be the identification of any contaminated land and whether this requires excavation. Any excavated materials that require treatment prior to reuse or disposal will be considered waste.

8.2.3 The receptors that are likely to be subject to impacts as a result of waste generation and waste management are landfills and other waste management infrastructure. This applies to construction and operational phases. The potential impacts from the generation and management of waste on these receptors, without mitigation measures, are likely to effect:

- Temporary occupation of waste management infrastructure capacity (from treatment of waste);
- Temporary occupation of land for the storage of waste awaiting transfer off-site; and
- Permanent reduction in landfill capacity (from disposal of waste).

8.2.4 The operation of the Project will generate waste from:

- General maintenance works associated with the station buildings and railway tracks; and

- Municipal Solid Waste (MSW) from increased passenger usage to existing stations and additional passenger usage in new stations.

8.2.5 The receptors impacted from waste generation for the operation phase will be waste infrastructures and landfill sites and the impacts will be similar to that stated above for the construction phase.

9. Potential impacts and effects

9.1. Materials

9.1.1 The potential impacts and their effects for materials from the Project have been considered route-wide.

9.1.2 Quantities of materials that will be required for the construction phase will be confirmed for the ES once the design has been further developed. An initial cut and fill balance for the Project, indicates that the Project will generate excavated material, and the design will seek to reuse excavated material within the Project.

9.1.3 The type and quantities of materials that will be required for the construction and operational phases of the Project will be confirmed for the ES once the design has been further developed.

9.1.4 The potential impacts from use of materials during construction and operation of the Project is given in Table 2.

Table 2 – Potential impact and effects from use of materials.

Project activity	Potential impacts	Potential effects
Site preparation, excavation and demolition activities	Major use of materials is not anticipated for demolition activities. The Project is likely to import raw materials (aggregates) for site preparation and excavation activities. The type of materials that will be used by the Project will be confirmed for the ES once the design has been further developed. Due to the nature of the Project, and quantities of key construction materials required, it is likely that a large proportion would be primary materials.	Direct: 1. The availability of materials and the subsequent effect on the demand for materials due to the consumption of raw resources. 2. Depletion of non-renewable resources. 3. Potential sterilisation of MSA or peat resources. 4. Emission associated with the transportation of materials to site, however it is not within the scope of this section. Indirect: 1. Future projects in the area may require sourcing of materials from further afield. Cumulative: 1. Depletion of local material reserves, including strategic aggregate reserves.
Construction activities	Fill materials required for the construction of the Project will be available from site-won materials. The Project will require large quantities of raw materials for the construction of tracks, railway station buildings, new level crossings, bridges, roads, viaducts, signalling system, signage, lighting, drainage, communications infrastructure, lineside equipment, overhead power cable and landscaping works. However, not all materials required for the construction of the Project will be available from site-won materials. The key construction materials likely to be required for construction include (and are not limited to):	

Project activity	Potential impacts	Potential effects
	• Steel; • Aggregate; • Cement; • Concrete; • Bitumen; • Wood; • Plastic; and • Other metal. Due to the nature of the Project and quantity of key construction materials required, it is likely that a large proportion would be primary materials and would need to be imported for the Project. The potential extent of sterilisation of MSA and/or peat resources or the constraint of existing or potential future use of MSA and/or peat resources by the Project will be determined as part of the EIA for ES.	Beneficial: 1. Reuse of site-won materials to reduce the need for imported materials.
Operational activities	Some quantities of materials will be required for the general maintenance of the Project during the operational lifetime in comparison to the construction phase. This includes: • Track renewals and/or maintenance; • Railway station maintenance/ improvement works; and • Signalling equipment. These maintenance works may require aggregates, steel, concrete and other materials consistent with construction works. The Project is likely to import primary materials as site-won materials are unlikely to be required for the operational activities. The type of materials that will be used by the Project will be confirmed for the ES once the design has been further developed. It is assumed that majority of the materials imported for the operation of the Project will comprise of primary materials.	Direct: 1. The availability of materials and the subsequent effect on the demand for materials due to the consumption of raw resources. 2. Depletion of non-renewable resources.

9.2. Waste

9.2.1 The potential impacts and their effects for the generation and management of waste from the Project have been considered route-wide.

9.2.2 Identification of the type and quantities of waste likely to arise from the construction phase will be developed as the design progresses and will be presented in the Environment Statement. Construction and Demolition (C&D) waste is likely to arise from activities stated in paragraph 8.2.1. This will include consideration of cumulative impacts with other committed development as discussed in the future baseline section 7.3.

9.2.3 For the operational phase, waste is likely to arise from the general maintenance works and general everyday operation of the Project. The type and quantities of waste that is likely to arise from the operation of the Project, waste arising from the passenger usage of the new stations that will be built by the Project and any change in passenger usage to existing stations that will be refurbished by the Project will be confirmed for the ES once the design has been further developed.

9.2.4 The potential impacts from the generation and management of waste during construction and operation of the Project is given in Table 3.

Table 3 – Potential impact and effects from generation and management of waste.

Project activity	Potential impacts	Potential effects
Site preparation, excavation and demolition activities	Vegetation waste is likely to be generated from site clearance activities. An initial assessment has identified that a proportion of excavated material may be surplus and the quantity will be determined as the design is further developed. Demolition waste will arise, but the magnitude of this will be confirmed for the ES once the design has been further developed.	Direct: 1. Reduction in regional landfill capacity. 2. Potential temporary adverse effect on the ability of waste infrastructure within the region to continue to accommodate waste from other sources. 3. Emissions associated with the transport and management of wastes that will require disposal off-site, however it is not within the scope of this section. Cumulative: Effects are similar to that stated for direct effects. Beneficial: 1. Use of excavated materials and wastes on-site. For example, in backfilling and earthworks.
Construction activities	Type and volume of waste arising from construction phase has not been identified at this stage. Based on professional judgement, waste is likely to arise from the construction activities.	

Project activity	Potential impacts	Potential effects
Operational activities	Some quantities of waste will be generated from the general maintenance of the Project during the operational lifetime in comparison to the construction phase. This includes waste arising from: ● Excavation waste arising from maintenance works; ● Track ballast that may become contaminated or degraded over time and will require to be replaced; ● Railway sleepers and rail beams (wooden or concrete) and metal bars that support the railway tracks; ● Scrap metal; ● Chemicals; ● Railway station maintenance/ improvement works; ● Waste from signalling equipment; and ● In addition to general maintenance, general waste similar to MSW is likely to arise from everyday operation of the Project from the new station buildings and increase in MSW from existing station buildings undergoing refurbishment works due to increased passenger usage.	Direct: 1. The ability of waste infrastructure within the region to continue to accommodate waste from other sources. 2. Reduction in the regional landfill capacity.

10. Potential permanent and operational effects

10.1. Materials

10.1.1 Primary key construction materials used on the Project such as aggregates is likely to cause a permanent adverse effect on:

- The availability of primary materials (aggregates) and the subsequent effect on the demand for such materials due to the consumption of raw materials; and
- Depletion of non-renewable materials.

10.1.2 The baseline information for MSA, peat resources and the Project boundaries and its effects on MSA and peat resources will be confirmed for the ES once the design has been further developed. So, it is assumed that the Project has the potential to cause sterilisation or constrain the current and potential future use of MSA and/or peat resources.

10.1.3 Based on professional judgement, as small quantities of materials will be required for operational phase when compared to the construction phase, the effects for the operational phase are likely to be not significant.

10.1.4 Changing climate conditions into the future, is unlikely to affect the availability of materials for the construction phase and first year of operation as stated in paragraph 7.3.6.

10.2. Waste

10.2.1 The total quantities and types of waste that are likely to arise from the construction of the Project, general maintenance activities and general operation of the Project will be confirmed for the ES once the design has been further developed. The Project is likely to have a potential permanent reduction in regional landfill capacity.

10.2.2 Changing climate conditions into the future is unlikely to affect the management of waste for the construction and operational phase as stated in paragraph 7.3.6.

11. Potential temporary construction effects

11.1. Materials

11.1.1 Use of secondary and recycled materials on the Project such as recycled aggregates is likely to cause a temporary adverse effect on the availability of secondary and recycled materials and the subsequent effect on the demand for such materials.

11.2. Waste

11.1.2 For both construction and operational phase, the Project is likely to have temporary adverse effect on the ability of waste infrastructure within the region to continue to accommodate Inert, non-hazardous and hazardous waste from other sources.

12. Assumed mitigation

12.1. Mitigation principles

12.1.1 The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

12.1.2 The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on cultural and heritage assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce or otherwise mitigate potentially likely significant effects. The Project will, therefore, have embedded within it, various mitigation measures. The environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

12.1.3 The draft Order limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

12.1.4 For the assessment of impacts on materials and waste, embedded mitigation may include:

- Implementation of the waste hierarchy to re-use, recycle or recover site-won materials;
- The implementation of circular economy and resource efficiency principles, to maximise the use of materials and avoid generation of waste as a first instance; and
- Cut and fill balance of excavated material.

12.1.5 The influence of climate change is not anticipated to impede the effectiveness of mitigations as the mitigations will be based on design principles and code of construction practice (CoCP).

12.2. Design principles

12.2.1 The design principles include mitigation measures such as:

- Reuse of suitable site-won excavated and demolition materials to achieve a balanced cut and fill across the project where technically feasible and economically viable;
- Implementation of circular economy principles to design out waste, to reduce the generation of waste and reduce the material demand of the detailed design;
- Use of secondary and/or recycled materials where these are locally available and suitable for use;
- Local and responsible sourcing of materials;
- Take back schemes, procurement of waste efficient materials or technology and the use of minimal packaging; and
- A sustainable procurement plan.

12.3. Code of construction practice

12.3.1 Construction work can be one of the chief causes of environmental impact. A draft CoCP will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

12.3.2 The draft CoCP will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and cultural assets. The environmental assessment of materials and waste impacts will assume that these measures may, as a minimum, be implemented. The measures may represent a best practice approach and are generic to most construction activity for a project of this nature.

12.3.3 The measures likely to be addressed within the CoCP that pertain to mitigation of construction impacts on materials and waste may include the following generic categories:

- Site specific measures;
- Selection and management of materials;
- Demolition;
- Protection of land and soil;
- Monitoring requirements;

- Minerals and contamination;
- Protection of environment;
- Management of hazardous waste; and
- Duty of care.

12.3.4 Site assessment and remediation works for land quality that includes land contamination and designated mineral and mining resources is addressed in the land quality Method Statement.

12.3.5 A register of environmental actions and commitments will also be developed alongside the ES and the CoCP.

12.3.6 The CoCP may set out the measures to be implemented to use materials efficiently, reduce waste at source, re-use resources, recycle and reduce the quantity of waste that requires disposal to landfill, in accordance with the waste hierarchy.

12.3.7 The CoCP may outline the requirements for site waste management plans including segregation and storage of waste.

12.3.8 The CoCP may set out the monitoring requirements and records to be kept prior to and during construction including a register of all waste loads leaving site.

13. Evaluating significance

13.1. Overview

13.1.1 When evaluating significance, consideration will be given to the information on availability, types and quantities of key construction materials. For the assessment of availability of key construction materials, the region for assessment will be based on the second study area as set out in Section 4.4.3. The assessment for waste will be based on the availability of suitable waste management infrastructure and capacity in east of England and south-east of England regions.

13.1.2 The following approach will be assumed to assess the availability of aggregates and steel for the construction phase and the first full year of operation (2035):

- Assessment for aggregates will be undertaken separately for east of England and south-east of England;
- The availability of aggregates will be based on the annual sales of the baseline year until the landbank years (10.2 years for east of England and eight (8) years for south-east of England);
- Beyond the landbank years, up to 2035, when the Project is likely to be fully operational, the availability of aggregates will be based on the GB's replenishment rates for sand and gravel (63%) and 52% for rocks[30]. This will be applied to the availability of aggregates for the baseline year (2022) for east of England and south-east of England);
- As the landbank for rocks is currently 14.4 years for east of England and 11 years for south-east of England, the availability of rocks from east of England covers the construction phase and first full year of operation (2035). As a result, a replenishment rate will not be required for this matter; and
- For steel, assessment will be based on an average of the apparent steel use data available for 2018 to 2022, for the construction phase and first full year of operation (2035).

13.1.3 As landfill capacity for hazardous waste is only available in the south-east, the assessment for construction and operational phases will not consider the east of England region.

13.1.4 For the operational phase, for the use of materials and management of waste generation, the first full year of operation (2035) will be assumed to be the baseline for use of materials and management of waste as it is not realistic to assess beyond that point for materials and waste.

13.1.5 Specific information to identify the type and quantity of materials, for the evaluation of significance will be obtained from the design team, where available.

13.1.6 There is currently no industry specific guidance for the assessment of resources and waste for railway projects. Therefore, the assessment will follow the approach set out in the DMRB Volume 11 LA 110, Section 3, Part 13 Sustainability and Environment Appraisal - Material Assets and Waste, August 2019[2] to identify significance criteria. This standard is primarily intended for motorway and all-purpose trunk road projects and provides more focused guidance for assessing the significance of potential effects resulting from material resource use and waste generation. As the Project is a linear project, the significance criteria set out in LA 110 (balanced with professional judgement) is considered the most appropriate for this assessment. Based on guidance provided in DMRB LA110, construction activities have the potential to have significant environmental effects whereas the operational activities are unlikely to result in a significant effect. As per DMRB LA 110, the assessment shall report on use of materials and waste generation for the first year of operational activities.

13.1.7 For materials, the assessment will consider the following for construction and operational phases:

- Types and quantities of materials required to construct and operate the Project;
- Information on materials that contain secondary/recycled content;
- Information on any known sustainability credentials of materials to be consumed;
- The type and volume of materials that will be recovered from off-site sources for use on the Project;
- The cut and fill balance for construction phase;
- Details of on-site storage and stockpiling arrangements, and any supporting logistical details; and
- Presence of MSA and/or peat resources.

13.1.8 For waste, the assessment will identify the following for the construction and operational phases:

- The amount of waste (by weight) that will be recovered and diverted from landfill either on-site or off-site (i.e. for use on other schemes);

- Types and quantities of waste arising from the project (demolition, excavation arisings and remediation) requiring disposal to landfill;
- Forecast of non-hazardous, hazardous, and inert waste arisings;
- Surplus materials and waste falling under regulatory controls;
- Details of on-site storage and segregation arrangements for waste and any supporting logistical arrangements prior to reuse, recycling and disposal;
- Waste requiring treatment or disposal off-site; and
- Potential for generation of hazardous waste (type and quantity).

13.1.9 The assessment criteria used to assess the potential effects on materials and generation and management of waste arising from the Project is set out in Table 4 and Table 5 and based on DMRB Volume 11 LA110.

13.1.10 For both these tables “Region” comprises the second study area, in this case the east of England and south-east of England region. “Primary materials” describes materials that are from a non-renewable source.

13.1.11 The assessment of waste will not include assessment of contaminated land as this is addressed in the land quality Method Statement.

Table 4 – Significance category description.

Significance category	Description
Very Large	Materials: 1. no criteria: use criteria for large categories. Waste generation: 1. >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2. construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Materials: 1. Project achieves <70% overall material recovery/recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials; and 2. Aggregates required to be imported to site comprise <1% reused/recycled content; and 3. Project sterilises ≥1 mineral safeguarding site and/or peat resource. Waste generation: **1.** >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2. ≥50% of project waste for disposal outside of the region.

Significance category	Description
Moderate	Materials: 1. Project achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials; and 2. Aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target. Waste generation: 1. >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2. 1-50% of project waste for disposal outside of the region.
Slight	Materials: 1. Project achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials; and 2. Aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target. Waste generation: 1. ≤1% reduction or alteration in the regional capacity of landfill; and 2. Waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neutral	Materials: 1. Project achieves >99% overall material recovery/recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials; and 2. Aggregates required to be imported to site comprise >99% re-used/recycled content. Waste generation: 1. No reduction or alteration in the capacity of waste infrastructure within the region.

Sources: DMRB Volume 11 LA 110, Section 3, Part 13 Sustainability and Environment Appraisal - Material Assets and Waste, August 2019[2].

13.1.12 Environmental effects are more likely to arise from those materials which:

- Are associated with the largest quantities;
- Are primary or virgin materials; and
- Have hazardous properties.

13.1.13 Environmental effects are more likely to arise from wastes which:

- Are associated with the largest quantities; and
- Have hazardous properties.

Table 5 – Significance criteria.

Significance category	Description
Significant (one or more criteria met)	Materials: 1. Category description met for medium (moderate) or high (large) effect. Waste generation: 1. Category description met for medium (moderate), high (large or very large) effect.
Not Significant	Materials: 1. Category description met for low (neutral or slight) effect. Waste generation: 2. Category description met for low (neutral or slight) effect.

Sources: DMRB Volume 11 LA 110, Section 3, Part 13 Sustainability and Environment Appraisal - Material Assets and Waste, August 2019[2]

14. Proposed scope

14.1.1 The scoping in and out of the environmental effects for materials and waste, from the Project has been considered route-wide and presented in Table 6.

14.1.2 For the construction period, the materials required, sterilisation of MSA and/or peat resources and the waste that will be generated has been scoped in.

14.1.3 For the operational phase, waste associated with general maintenance and operation of East West Rail has been scoped in.

14.1.4 Based on DMRB LA110, the environmental effect is highly unlikely to be significant for materials for the operational phase and thus can be scoped out. However, as per DMRB LA 110, the assessment shall report on use of materials for general maintenance and operational activities during the first year of operation.

14.1.5 Materials required and waste generated from commercial activities associated with the operation of the railway such as rolling stock is not considered part of the scope of the DCO application and has been scoped out.

Table 6 – Scoping summary.

Assessment item	Scoped in
Materials use:	
• Construction	✓
• Sterilisation of MSA and/or peat resources	✓
• Operation, maintenance activities	X
Generation of waste:	
• Construction	✓
• Operation (general maintenance and operation)	✓

15. Assumptions and risks

15.1. Assumptions

15.1.1 No surveys or site visits are likely to be required for materials and waste.

15.1.2 The construction phase is likely to be from 2028 to 2034 and the first full year of operation is assumed to be 2035.

15.1.3 Where materials are consumed and waste is generated, indirect adverse effects may arise from embedded carbon, greenhouse gases, haulage, noise, dust, nuisance, vehicle emissions and water pollution. Such effects will be assessed by other EIA chapters.

15.1.4 This EIA will not assess the impact of materials use and waste associated with the manufactured goods required by the Project as these are likely to be subject to their own separate consenting and regulatory controls at the place of production.

15.1.5 This assessment will not consider the environmental effects associated with the off-site extraction of raw materials used for the off-site manufacture of products. These stages of the products or materials' lifecycles are outside of the scope of the assessment due to the range of unknown variables associated with the processes involved and are not considered to form part of the Project

15.1.6 Given the early stages of design, estimates relating to the quantity of materials required and the estimates available relating to the quantity of waste arisings, will be confirmed for the ES once the design has been further developed. As such, a qualitative exercise has been carried out at this stage, limited to identifying activities that are likely to require significant quantities of materials, or are likely to produce significant quantities of waste.

15.1.7 When distances from the Project were required (see the Technical Appendices Document), these have been measured from seven postcodes (OX5 2UP, MK18 2QS, MK1 1BQ, MK43 9AA, MK44 3BW, CB23 4JX, CB22 5HF) along the entire length of the proposed route and were chosen to give representative locations along the route.

15.1.8 Quantities of key construction materials required for by the Project will be based on calculations from the materials and waste forecast. A bill of quantities will be developed during the design process and the quantities of key construction materials will be presented in the Environment Statement.

15.1.9 The quantity of waste produced from damaged/surplus key construction materials will be based on 5% of the main materials usage (steel, aggregate,

concrete, cement and timber), this is a typical factor applied in the forecast of future waste generation from a construction project.

15.1.10 Quantities of general construction waste produced by the Project will be estimated including quantities of MSW arising from temporary compound and site office. These will be based on estimates from a materials and waste forecast; these have not yet been fully defined beyond initial estimates. Materials required and waste arising from commercial activities associated with operation of railway such as end-of-life rolling stock is not considered to be within scope.

15.1.11 The baseline landfill capacity is based on the latest information available from the Environment Agency. Future landfill capacity is based on a proportional increase in line with the average percentage increase of fill rates since 2005, for the short to mid-term forecast (2028-2035).

15.1.12 The future baseline information for treatment and metal recycling excludes capacity available for vehicle depollution units as those are irrelevant for available waste infrastructure capacities.

15.1.13 Where wastes are described as contaminated (or potentially contaminated), these will be assumed, on a precautionary basis, to be hazardous.

15.1.14 The exact quantities of materials excavated and needed in construction are likely to vary from current estimates as a result of factors that could include for example, refinement during detailed design or the final construction methodology. However, this will not be expected to change the likely significance of effects. It will be the responsibility of EWR Co and the Main Contractor(s) to confirm that the final design and construction methodology including programme, plant and equipment will not result in any new or different adverse significant materials and waste effects.

15.1.15 Information on type and quantities of materials required will be confirmed for the ES once the design has been further developed. So, at present the potential impacts from the use of materials for the construction and operational phase has been based on professional judgement.

15.1.16 Information on type and quantities of waste that is likely to be generated will be confirmed for the ES once the design has been further developed. So, at present the potential impacts from the generation of waste for the construction and operational phase has been based on professional judgement.

15.1.17 Baseline information for MSA and peat resources will be confirmed for the ES and will be determined as part of the assessment. Hence sterilisation of MSA and/or peat resources has been scoped in at this stage.

15.1.18 The assessment of contaminated land and use of DoWCoP for use of excavated materials is considered in the land quality Method Statement.

15.2. Risks

15.2.1 Information on permitted capacity of waste management facilities has been used to establish the baseline, based on current publicly available data (at the time of writing). However, it should be noted that the capacity information obtained from the Environment Agency for the sites and regions identified does not necessarily mean that the capacity detailed will be available for use by the Project.

15.2.2 It is noted that any future changes to the permitted capacity and throughput of the waste infrastructures are uncertain. It is also difficult to assess the available capacity, due to the commercial sensitivity of existing contracts, and the timescales over which waste will be produced. It is likely that additional capacity will become available. However, it is not currently possible to predict the timeframes for when these new waste management facilities will become available and how many of these sites will be available to accommodate waste arisings from the Project. Similarly, it is also possible that some of the existing waste management facilities might close or be unavailable.

15.2.3 The environmental impact assessment will be based on the information and estimates of materials and waste available at the design stage. Monitoring against DCO requirements during construction and operational phases can mitigate this risk.

15.3. Opportunities

15.3.1 Potential opportunities exist for use of recovered excavated soil, aggregates, clay, sand, soil and stone from the Project, but specific quantities or sources is likely to be not identifiable until an agreement with contractors is completed. A Project target in line with best practice, will be set for the percentage of total material value to be derived from re-used and recycled content.

15.3.2 Implementation of circular economy, resource efficiency and waste hierarchy principles, can help to maximise the use of materials and avoid generation of waste as a first instance.

15.3.3 Reuse of green waste from the site clearance work through on-site landscaping or ecological improvement works, depending on its suitability can lead to habitat creation.

15.3.4 Reuse of C&D waste in temporary haul roads or make-up for new road layouts.

15.3.5 The circular economy principles related to setting resource and waste efficiency requirements for procurement process, use of prefabricated materials can be applied to this Project, wherever practicable.

APPENDIX A Aspects and matters proposed to be scoped out

A.1.1 Use of materials and generation of waste from commercial activities associated with the operation of the railway such as rolling stock is not considered part of the scope and has been scoped out.

A.1.2 Use of materials for general and maintenance activities for the operational phase has been scoped out.

A.1.3 No other aspects for materials and waste have been scoped out.

EWR-MWJV Technical Partner

Routewide - Environmental - EIA Scoping Method Statement Technical Appendix - Resources and Waste

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1. Introduction

1.1. Purpose

This technical appendix supports the Resources and Waste Method Statement.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
AWP	Aggregates Working Party
C&D	Construction and demolition
CDEW	Construction demolition and excavation waste
C&I	Commercial and industrial
DMRB	Design manual for roads and bridges
LA	Local authority
LAA	Local aggregate assessments
MPA	Mineral Planning Authorities
MSA	Mineral safeguarding areas
NPPF	National planning policy framework
SNRHW	Stable non-reactive hazardous waste
UK	United Kingdom
WDI	Waste data interrogator

Appendix B - Baseline data

Materials

Table 2 – United Kingdom's (UK) production of minerals, mineral product and steel in million tonnes.

Materials	UK's production (2021)
Aggregate, of which	279.8
1.Crushed rock	148.2
2. Sand and gravel (land won)	47.7
3. Sand and gravel (marine)	14.3
4. Recycled and secondary aggregates*	69.6
Cementitious, of which	11.2
1.Cement	9.0
2.Other cementitious materials (Fly ash, Ground Granulated Blast Slag)	2.1
Ready mixed concrete	52.7
Concrete products	24.8
Asphalt	28.3
Dimension stones	1
Apparent steel use (2022)[1]	9.2
Total production of crude steel (2023)[2]	5.6

Sources: Mineral Products Association[1, 2, 3],

2.1.1. The total production of crude steel is available for the year 2019 to 2023, 2023 being the latest available data and stated in Appendix B, Table 2 as 5.6 million tonnes[2]. The average of total production of crude steel was 6.6 million tonnes for the period 2019 to 2023. The apparent use

[1] *Worldsteel Association* (2023) *World Steel in Figures 2023* [online]. Available at: World Steel in Figures 2023 - worldsteel.org. (Accessed April 2023).
[2] *Worldsteel Association* (2023) *Total production of crude steel [online].* Available at: Total production of crude steel (worldsteel.org). (Accessed April 2023).
[3] *Mineral Products Association* (2023). *Profile of UK Mineral Products Industry [online].* Available at:Profile_of_the_UK_Mineral_Products_Industry_2023.pdf (mineralproducts.org). (Accessed April 2024).

of steel in UK indicates the total availability of steel was 9.2 million tonnes (Appendix B, Table 2) in 2022. The average apparent use of steel from 2018 to 2022 was 10.02 million tonnes[1].

Table 3 – Production of minerals in 2021 within England, south-east of England and east of England.

Minerals[4]	UK production in million tonnes	Number of mineral workings in England	Number of mineral workings in south-east of England	Number of mineral workings in east of England
Igneous rock*	125.9	34	0	0
Limestone and dolomite		230	11	3
Sandstone		157	6	3
Sand and gravel	64.5	268	41	84

Note: *Includes marine-dredged landings at foreign ports
Source: British Geological Society (BGS)[4]

2.1.2. Appendix B Table 3 indicates that east of England and south-east of England have mineral workings for sand and gravel, a likely key primary raw material for the construction of the Project.

2.1.3. Local Aggregate Assessments (LAAs) of the local authorities (LAs) stated in paragraph 6.1.5 of the Resources and Waste Method Statement have been used to inform the baseline information for aggregates, stated in Table 4 for 2022 and is the latest available information.

Table 4 – The 10-year and 3-year total aggregates sales, reserves and landbank for 2022.

Aggregate	10-year average aggregate sales (Mtpa)	3-year average aggregate sales (Mtpa)	Annual sales (MT)	Annual Provision Rate (Mtpa)	Existing permitted reserves at end of 2022(Mt)	Landbank at end of 2022 (years)
Oxfordshire[5]						
Marine dredged aggregates	N/A	N/A	N/A	N/A	N/A	N/A
Land won sand and gravel	1.023	1.221	1.201	1.229	13.124	11
Crushed rock	0.960	1.162	1.146	0.914	6.193	7

[4] British Geological Society (2023). *United Kingdom Minerals Yearbook 2022*. [online] Available at:OR23001.pdf (nerc.ac.uk). (Accessed October 2023).

Aggregate	10-year average aggregate sales (Mtpa)	3-year average aggregate sales (Mtpa)	Annual sales (MT)	Annual Provision Rate (Mtpa)	Existing permitted reserves at end of 2022(Mt)	Landbank at end of 2022 (years)
Secondary aggregates	0.093**	0.117	c			
Recycled aggregates	0.321**	0.293	c			
Buckinghamshire[5]						
Marine dredged aggregates	N/A	N/A	N/A	N/A	N/A	N/A
Land won sand and gravel	0.984	1.065	1.089	1.070	5.386	5
Crushed rock	N/A	N/A	N/A	N/A	N/A	N/A
Recycled aggregates	0.123**	0.137	0.135			
Milton Keynes[5]						
Marine dredged aggregate sand	N/A	N/A	N/A	N/A	N/A	N/A
Land won sand and gravel	0.154	0.194	c	0.17	0.230	1
Crushed rock	N/A	N/A	N/A	N/A	N/A	N/A
Recycled aggregates	0.067**	0.134	0.187			
Central Bedfordshire, Bedford and Luton (2022)[5]						
Marine sand and gravel	N/A	N/A	N/A	N/A	N/A	N/A
Land won sand and gravel	1.453	1.369	1.414	1.453	13.548	9.3
Crushed rock (2020 data)	c	c	c	c	c	c
Secondary aggregates	N/A	N/A	N/A			

Aggregate	10-year average aggregate sales (Mtpa)	3-year average aggregate sales (Mtpa)	Annual sales (MT)	Annual Provision Rate (Mtpa)	Existing permitted reserves at end of 2022(Mt)	Landbank at end of 2022 (years)
Recycled aggregates	0.169	0.197	0.224			
Cambridgeshire and Peterborough (2022)[5]						
Marine sand & gravel	None					
Land-won sand and gravel	2.891	3.113	3.035	2.6	32.391	11.2
Crushed rock	c	c	c	N/A	c	c
Secondary aggregates	N/A	N/A	N/A			
Recycled aggregates	0.573	0.438	0.461			
East of England (2022)[5]						
Sand and gravel	11.435	11.385	11.291	N/A	116.304	10.2
Crushed rock	0.308	0.176	0.171	N/A	4.438	14.4
Marine sand and gravel (landings)	0.398	0.529	0.705			
Total primary aggregates			12.167			
Secondary aggregates	0.304	0.293	0.311			
Recycled aggregates	1.759	2.146	2.191			
South-east of England (2022)[5]						
Land won sand and gravel	5.982	5.959	5.529	6.247	52.29	8
Crushed rock	2.043	2.482	c	1.961	21.647	11

[5]Department for Levelling UP, Housing and Communities and Ministry of Housing, Communities & Local Government (2024). *Aggregates working parties: annual reports* [online]. Available at: Aggregates working parties: annual reports - GOV.UK (www.gov.uk). (Accessed April 2024).

Aggregate	10-year average aggregate sales (Mtpa)	3-year average aggregate sales (Mtpa)	Annual sales (MT)	Annual Provision Rate (Mtpa)	Existing permitted reserves at end of 2022(Mt)	Landbank at end of 2022 (years)
Marine dredged aggregates	6.457	6.979	6.319			
Total primary aggregates	14.290	15.448	14.236			
Secondary aggregates	0.388**	0.543	0.423			
Recycled aggregates***	4.142**	c	3.962			

Source: Aggregates working parties: annual reports[5]
Note: c indicates confidential, ** indicates 8-year average, ***(Table 6[5])

2.1.4. Table 2, Table 3 and Table 4 set the context to provide the baseline information on availability of key construction materials required for the Project as given for baseline scenario and will not be required for assessment.

2.1.5. Mineral planning authorities (MPAs) are required to maintain seven-year landbank for sand and gravel and 10 years for crushed rock. The length of the aggregate landbank is the sum in tonnes of all permitted reserves for which valid planning permissions are extant, divided by the annual rate of future demand based on the latest annual local aggregate assessment. Table 4 indicates that Oxfordshire County Council, Central Bedfordshire District Council, Bedford Borough Council and Cambridgeshire County Council have sufficient aggregate landbanks for sand and gravel while none of the LAs have sufficient landbanks to meet the requirement for crushed rock. However, the LAAs for east of England and south-east of England indicate that both of the regions are able to meet the landbank requirement for sand and gravel and crushed rocks.

2.1.6. East of England Aggregates Working Party (AWP) annual report for 2022 states that aggregate sand and gravel is found throughout the east of England and consequently all the east of England MPAs contribute towards local and national aggregate needs. At the end of 2022, reserves of land-won sand and gravel in the east of England was 116.3Mt with an aggregate landbank of 10.2 years.

2.1.7. The crushed rock resource (4.438Mt) in the east of England is not of sufficiently high quality for it to be economic to transport any significant distance and is, therefore, not a truly regional resource. However, it is a non-energy mineral that may be used in substitution for aggregate in certain situations depending on specification. In terms of landbanks of crushed rock, based on the rolling average of 10-year sales, a landbank of 14.4 years was demonstrated in 2022. The total permitted reserves for primary aggregates available in east of England is 120.742Mt.

2.1.8. The principal sources of primary aggregates within the south-east England AWP area are land-won from local quarries, which are widely distributed throughout south-east England. The land won sand and gravel reserves in 2022 were 52.29Mt and that of crushed rock was 21.647Mt. The landbank for the south-east of England for sand and gravel is eight years and 11 years for crushed rock, both above the national planning policy framework (NPPF) requirement.

2.1.9. Data available for the period 1986 to 2021 in UK Mineral Yearbook 2022[6] indicates that, for most years, the production of sand and gravel has been highest in the south-east England (15.08MT in 2021) followed by east of England (11.81Mt in 2021). For crushed rock, the production has been highest in east midland region.

2.1.10. A collation of the results of the 2019 aggregates minerals for England and Wales was undertaken by British Geological Survey in 2021[7] and summarises reserves of primary aggregates with valid planning permissions at 31 December 2019 in active and inactive sites otherwise known as 'permitted reserves'. East of England was the region with the highest level of sand and gravel reserves (116 Mt) equivalent to 25% of the sand and gravel total. Other English regions with significant sand and gravel reserves were the west midlands (91 Mt), east midlands (68 Mt), and the south-east (66 Mt).

2.1.11. Secondary aggregates are defined within the NPPF as 'aggregates from industrial wastes such as glass (cullet), incinerator bottom ash, coal derived fly ash, railway ballast, fine ceramic waste (pitcher), and scrap tyres; and industrial and minerals by-products, notably waste from China clay, coal and slate extraction and spent foundry sand. These can also include hydraulically bound materials.

2.1.12. East of England AWP states that there are fewer than 10 secondary aggregate sites within east of England AWP area and south-east England AWP stated that there are few-secondary aggregate sites within south-east of England AWP area.

2.1.13. Recycled aggregates are defined within the NPPF as 'aggregates resulting from the processing of inorganic materials previously used in construction, e.g. construction and demolition (C&D) waste'. This will include crushed concrete, bricks, tiles, glass, asphalt plannings and spent railway ballast. Such materials need to comply with national specifications and aggregate standards and therefore continue to provide an increasingly important contribution as substitutes for primary aggregates.

2.1.14. Robust data on arisings of construction, demolition and excavation waste including the amount sold as recycled aggregates have often been difficult to obtain and a standard methodology has not been adopted nationally. In the east of England and south-east of England, most MPAs rely on survey data taken from the Environment Agency's waste data interrogator (WDI) and has its limitations.

2.1.15. Both east of England AWP and south-east of England AWP stated that there are concerns with the data reliability for recycled aggregates as information is gathered from WDI and is likely to represent a proportion of the recycled aggregates in circulation. The concerns for data reliability include:

- Secondary aggregates, that meet quality protocol specifications are considered non-waste and therefore not included within waste tonnage returns.
- The WDI data does not account for mobile crushers or recycling and re-use that occurs on individual construction sites.

2.1.16. LA110 provides regional and national recycled aggregate targets for England, to be used for environmental assessment of materials resources and waste. If a project is located in more than one region, it has a requirement of the higher regional aggregate recycling targets to be adopted. The recycled content target for south-east of England is 26% and that of east of

[6] British Geological Survey (2022) *United Kingdom Minerals Yearbook 2022* [online]. Available at: OR23001.pdf (nerc.ac.uk). (Accessed March 2024).
[7] Mankelow, J.M., Wrighton C.E., Brown, T.J., Sen, M.A., Cameron, D.G., Bloodworth, A.J. (2021) *Collation of the results of the 2019 Aggregate Minerals Survey for England and Wales* [online]. Available at: Aggregate Minerals Survey for England and Wales, 2019 (publishing.service.gov.uk) (Accessed March 2024).

England is 31%, figures are for 2005-2020 and these are the latest available figures. In east of England, a total of 2.5Mt of secondary and recycled aggregate production was estimated for 2022, about 17.06% of the land-won sand and gravel sales. In south-east of England, 4.39Mt of secondary and recycled aggregate were estimated as sold in 2022, about 23.55% of its land-won sand and gravel sales (see Table 4).

2.1.17. Information regarding mineral safeguarding areas (MSAs) and peat resources will be obtained from LAs at a later stage.

2.1.18. Design manual for roads and bridges (DMRB LA 110) defines mineral sites as "operational sites or sites identified within strategic planning documents for the extraction of minerals". MPAs are required to define MSAs and adopt appropriate policies in order that known locations of specific minerals resources of local and national importance are not needlessly sterilised by non-mineral surface development. The National Policy Statement for National Networks requires that where a project has an impact on an MSA that there is appropriate mitigation put forward to safeguard mineral resources. In addition to the safeguarded areas, understanding of the location and nature of mineral resource is required to inform the location of potential borrow pits which may be required by the Project.

2.1.19. MSAs cover resources that are considered to be of current or future economic importance. They seek to prevent a mineral resource being needlessly sterilised by non-mineral developments.

2.1.20. The location of mineral safeguarding sites will be collected through assessment of the relevant MPA Minerals and Waste Plans and associated maps for LAs listed in paragraph 6.1.5 of the Resources and Waste Method Statement and will provides baseline information on the MSAs and its infrastructures that may be within a 500m corridor of the Project's draft Order Limits.

Waste management

2.1.21. The latest data from WDI data Environment Agency indicates that England received over 226.4 million tonnes of waste in 2022, which was managed in 5,851 permitted waste facilities. The waste facilities in the south-east region received over 34 million tonnes of waste in 2022, and the east of England region received over 29 million tonnes of waste, as shown in Table 5.

Table 5 – Waste infrastructure breakdown by site type and capacity given in tonnes.

Site type	South-east of England	East of England	England
Landfill	9,415,314	7,489,967	41,259,183
Transfer	6,205,684	4,825,635	43,832,166
Treatment	11,940,644	11,401,791	97,501,229
Metal Recovery	904,752	2,346,341	15,397,073
Incinerated	3,640,940	1,803,066	17,147,755
Use of Waste	0	991	90,297

Site type	South-east of England	East of England	England
Land Disposal	2,553,859	1,190,459	11,184,205
Total	34,661,193	29,058,250	226,411,908

Source: Waste Data Interrogator (2022)[8]
Note: Mobile plant, processing, combustion, mining and storage of waste are included in the overall waste arisings figures.

2.1.22. Potential sources of land contamination are addressed in the Land Quality Method Statement and will be used to identify sources of contaminated waste arising from excavation activities that are within 250 metres of the draft Order Limits.

2.1.23. The Environment Agency reported that at the end of 2022, 816 sites accepted waste in the south-east of England and 801 sites accepted waste in east of England region. At the end of 2022, 1,149 sites in south-east of England and 1,104 sites in east of England had environmental permits to accept waste.

2.1.24. The landfill capacity available together with the number of sites with capacity remaining for Oxfordshire, Buckinghamshire, Bedfordshire, Cambridgeshire, east of England, south-east of England and England are given in Table 6.

2.1.25. According to the Environment Agency, there are currently 102 permitted landfills in the east of England region, with 61 landfills having remaining capacity at the end of 2022 (Table 6).

2.1.26. The landfills with remaining capacity in this region are classified as follows: 39 inert landfills, 18 non-hazardous landfills, four non-hazardous landfills with stable non-reactive hazardous waste (SNRHW) cells.

2.1.27. According to the Environment Agency, there are currently 105 permitted landfills in the south-east of England region, with 52 landfills having remaining capacity at the end 2022 (Table 6).

2.1.28. The landfills with remaining capacity in this region are classified as follows: 37 inert landfills, nine non-hazardous landfills, one hazardous merchant landfill, four non-hazardous landfills with at least one SNRHW, and one hazardous restricted landfill.

[8] Environment Agency (2023). *Waste Data Interrogator* [online]. Available at: 2022 Waste Data Interrogator - data.gov.uk. (Accessed April 2024).

Table 6 – Landfill capacity at the end of 2022 in cubic metres.

Site type	Oxfordshire	Buckinghamshire	Bedfordshire	Cambridgeshire	East of England	South-east of England	England
Hazardous Merchant	-	-	-	-	-	91,524 (1)	7,921,608
Hazardous Restricted	-	-	-	-	-	173,335 (1)	708,383
Non-Hazardous with SNRHW cell	0	8,879,514 (3)	-	298,855 (2)	3,172,197 (4)	10,799,344 (4)	51,122,422
Non-Hazardous	2,347,399 (4)	13,402,399 (2)	0	14,403,734 (8)	26,162,379 (18)	17,582,210 (9)	151,481,585
Non-Hazardous Restricted	-	-	-	-	-	-	-
Inert	2,604,501 (7)	1,292,124 (4)	4,334,505 (4)	5,453,983 (10)	31,843,521 (39)	20,357,575 (37)	129,125,357
Total	4,951,900	23,574,037	4,334,505	20,156,572	61,178,097	49,003,988	340,359,354

Source: Environment Agency[9]
Note: Data in bracket indicates the number of different landfills with capacities remaining.

[9] Environment Agency (2023) *2022 Remaining Landfill Capacity – Version 2* [online]. Available at: Remaining Landfill Capacity - data.gov.uk. (Accessed April 2024).

2.1.29. A search on the Environment Agency's public register[10] was undertaken for all permitted waste management facilities within 10km of the proposed route. Seven different postcodes were selected (OX5 2UP, MK18 2QS, MK1 1BQ, MK43 9AA, MK44 3BW, CB23 4JX, CB22 5HF) along the entire length of the route. These postcodes were chosen to give representative locations along the route. The data obtained from the search in the public register is given in Table 7.

Table 7 – Waste Management Facilities suitable for C&D activities along the route.

Site type	OX5 2UP	MK18 2QS	MK1 1BQ	MK43 9AA	MK44 3BW	CB23 4JX	CB22 5HF
Waste Management facilities	8	5	13	20	13	7	11
Landfill site	2	3	11	5	5	1	4
Composting/ Biological treatment	1	1	0	2	1	0	0
Total	11	9	24	27	19	8	15

Source: Environment Agency[11]

2.1.30. Table 7 lists the various waste management facilities along the route that are likely to treat or transfer C&D waste. Not all facilities will be suitable to accept waste from the Project, but it indicates that there are waste management facilities available along the route to treat C&D waste. There are 108 waste management facilities within the 10Km from the project, however, some of the sites listed in Table 8 overlaps between the postcodes and hence the total number of waste management facilities that may be available will be less than those listed in Table 7.

2.1.31. Reuse, recycling and recovery of wastes will be prioritised within the Project, following the local policies on sustainable development.

[10] Environment Agency (2023) *Environmental permitting Regulations – Waste Operations* [online]. Available at: Environmental Permitting Regulations – Waste Operations (data.gov.uk) (Accessed October 2023).
[11] Environment Agency (2023) *Environmental Permitting Regulations - Waste Operations* [online]. Available at: Public Registers Online (data.gov.uk). (Accessed October 2023).

2.1.32. Table 6 and Table 7 indicates the permitted landfills, that are available within the proximity of the Project. Waste management infrastructure and landfills are included as part of the second study area for this assessment.

2.1.33. In addition to permitted C&D waste management sites, inert material is also managed on-sites that have an Environment Agency Environmental Permit exemption. These exempt sites generally comprise land restoration activities such as restoring mineral voids, engineering/landscaping projects and for agricultural improvements on farmland. These sites are an important part of the provision of the capacity for managing inert materials.

2.1.34. A search on the Environment Agency's waste exemption register[12] was undertaken for all waste exemption facilities within 10km of the route. The seven different postcodes that was used to identify the transfer and treatment facilities along the route were also selected (OX5 2UP, MK18 2QS, MK1 1BQ, MK43 9AA, MK44 3BW, CB23 4JX, CB22 5HF) to check for exempt facilities. The data obtained from the search in the public register is given in Table 8. Some of the sites listed in Table 8 overlaps between the postcodes and hence the total number of exempt sites that may be available will be less than those listed in Table 8.

Table 8 – Waste Exemption Facilities suitable for C&D activities along the route.

Site type	OX5 2UP	MK18 2QS	MK1 1BQ	MK43 9AA	MK44 3BW	CB23 4JX	CB22 5HF
Waste exempt sites	341	308	341	339	211	218	353

Source: Environment Agency[11]

2.1.35. Table 8 lists the various waste exemption sites that are within 10km of the route. Use #1 exemption (U1 exempt sites; sites allowed to use suitable waste material in construction, in place of virgin materials) can also be used to manage C&D waste. These sites are typically used to manage waste produced on-site only as one-off events. As a result, the operations at these exempt facilities are often short-lived and provided as part of baseline study, but should be considered upon commencement of construction.

2.1.36. Railway station and train waste quantities have been based on a waste generation rate of 0.085kg per station user[13] where station user is defined as number of passengers entering and exiting through ticket barrier. Recent trends in waste management data indicate a decline in waste generation per station user; waste forecast undertaken using this generation rate are therefore likely to represent a worst-case scenario.

[12] Environment Agency (2023) *Register of Waste Exemptions* [online]. Available at: Waste Exemptions (data.gov.uk). (Accessed October 2023).
[13] *High Speed Rail (Crewe to Manchester and west midlands to Leeds)* (2018). *Working Draft Environmental Statement Volume 3: Route -wide effects*. Available online at: ES Report (publishing.service.gov.uk).

Appendix C - Future baseline data

Waste Management

2.1.37. The capacities that are likely to be available for the regional waste treatment facilities and landfill sites have been based on the annual projection of waste generation and its treatment as stated in paragraph 4.3.3. of Resources and Waste Method Statement, given in Table 9 for east of England region and Table 10 for south-east of England region. The available waste treatment capacities and landfill void space are presented in Figure 1 to Figure 5.

2.1.38. The curves presented in Figure 1 to Figure 5 relate to a percentage reduction of capacity based on a reasoned average from the historic data.

Figure 1 – Available capacity forecast for treatment and metal recycling facilities.

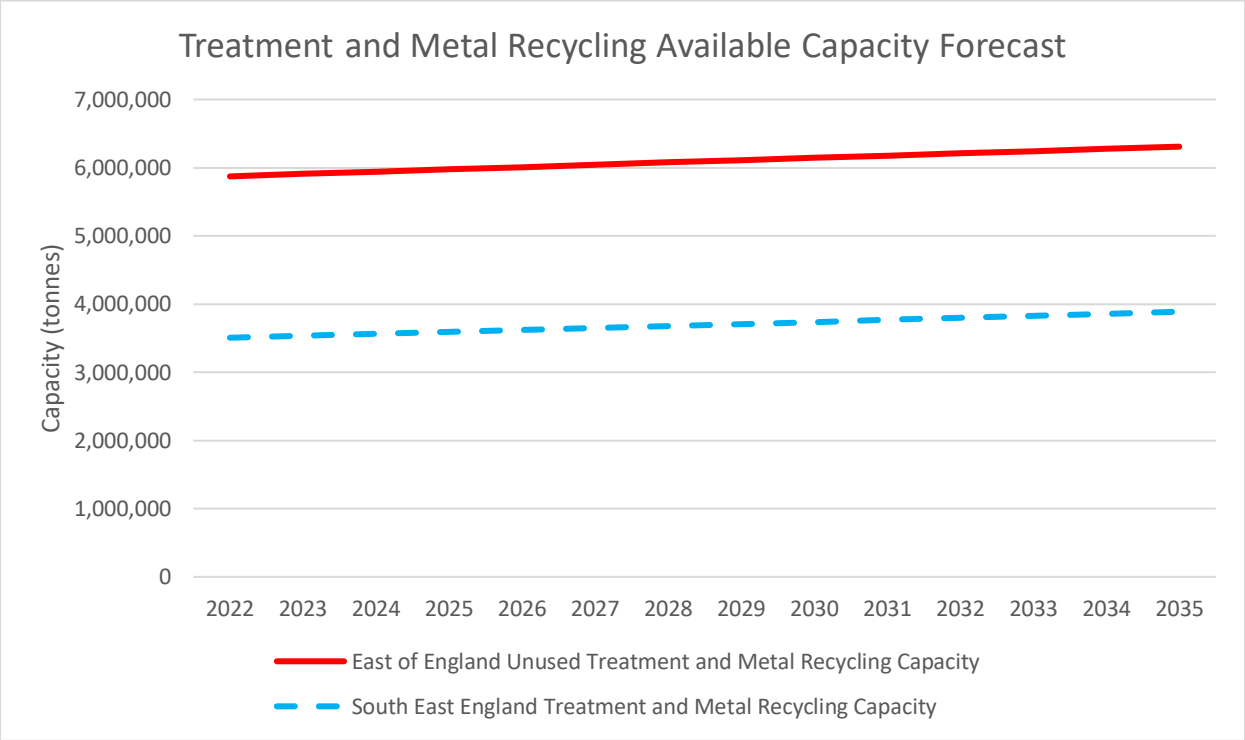

Figure 2 – Available capacity forecast for incineration facilities.

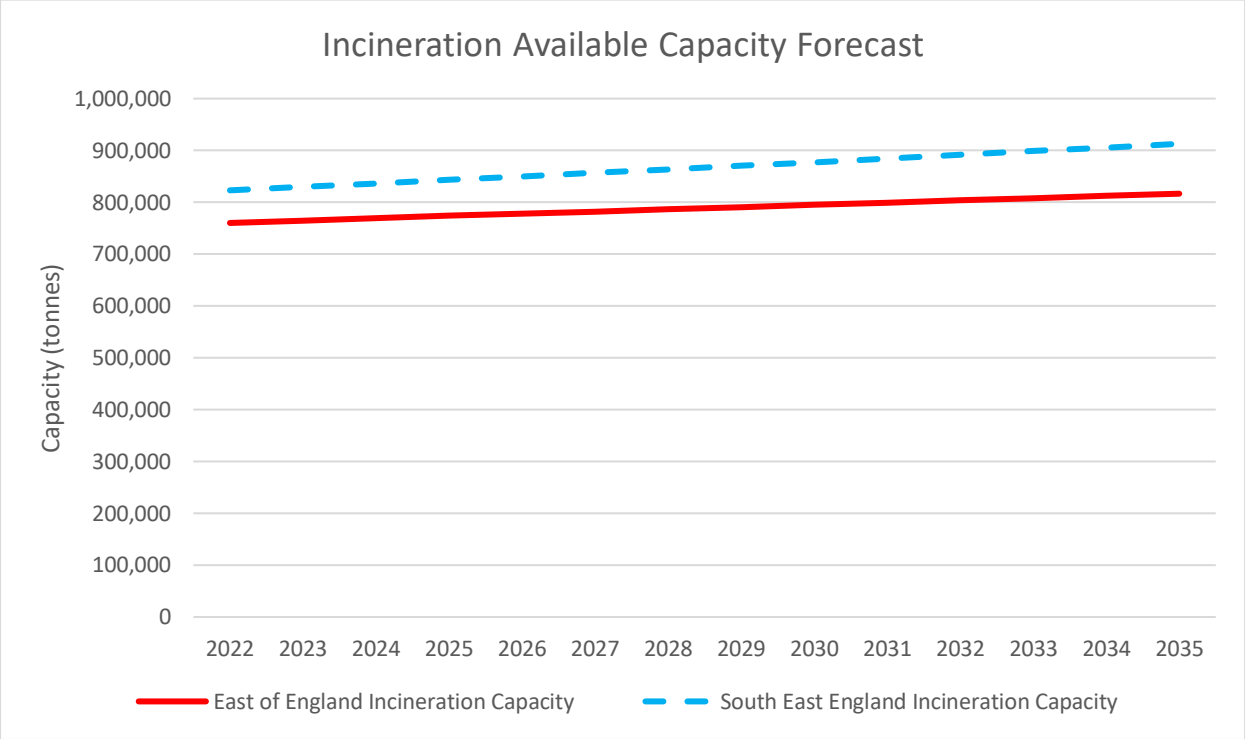

Figure 3 – Available capacity forecast for inert landfill.

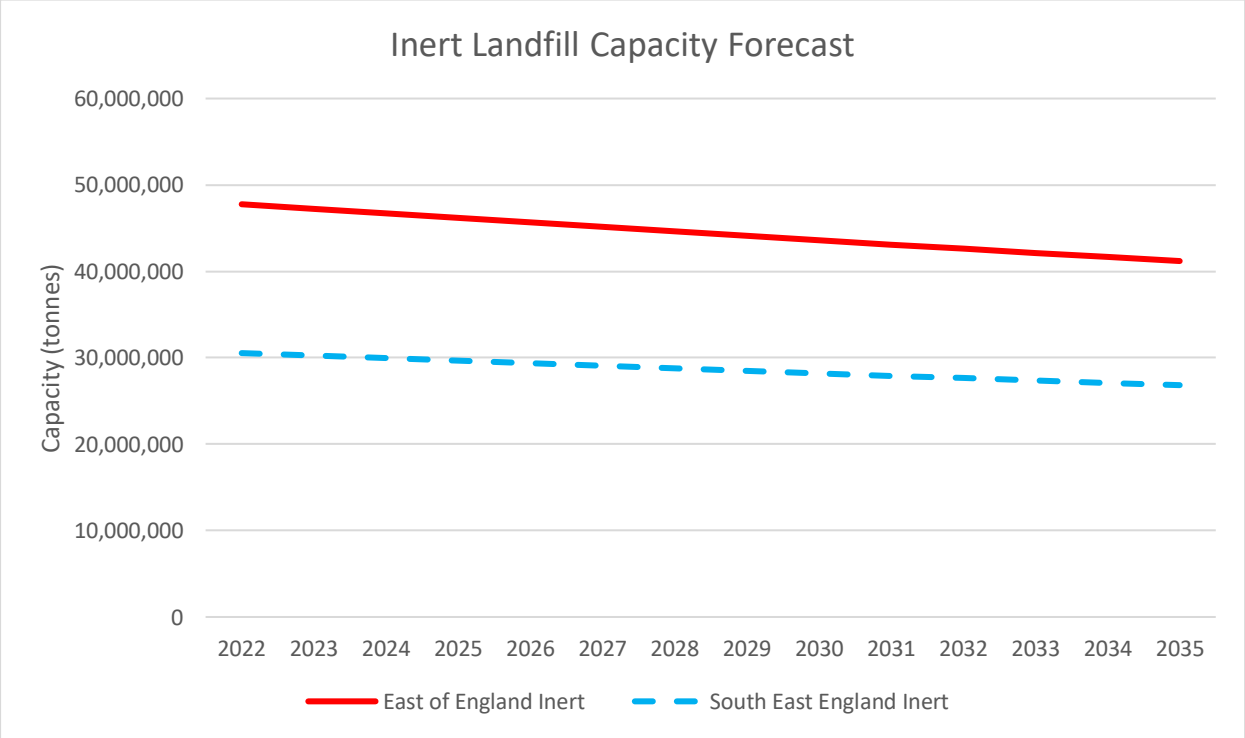

Figure 4 – Available capacity forecast for non-hazardous landfill.

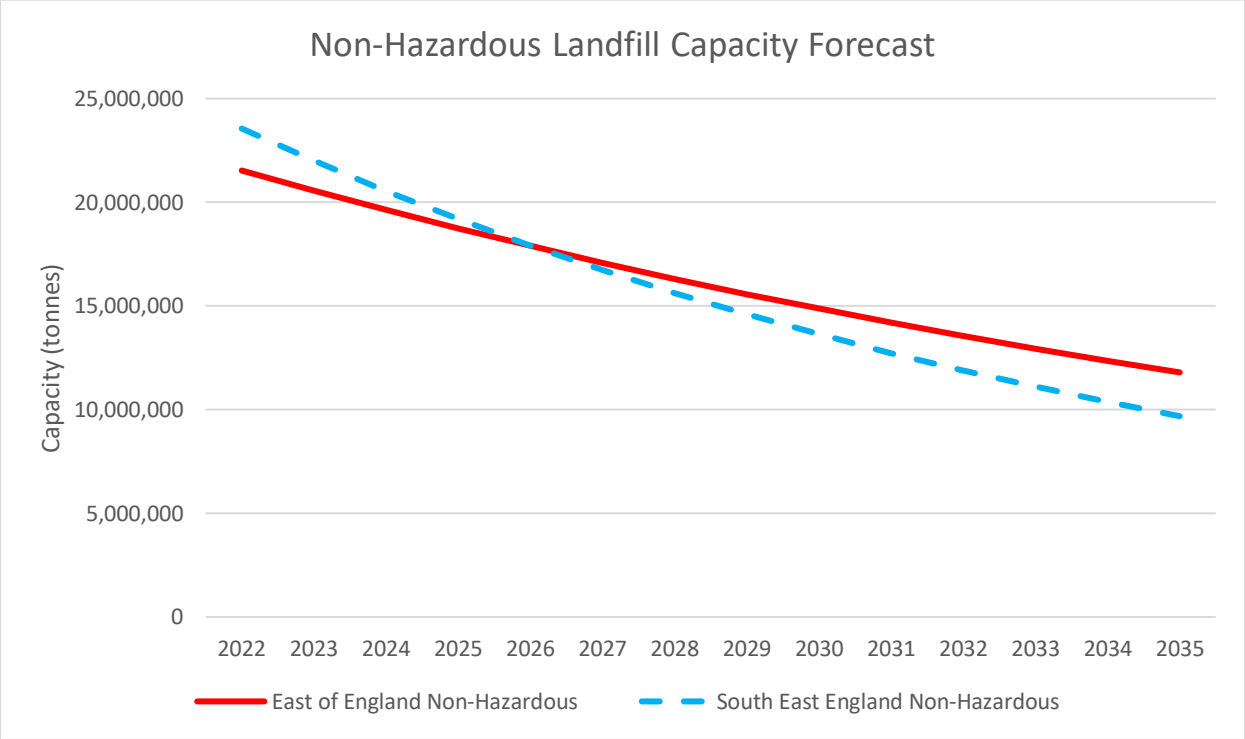

Figure 5 – Available capacity forecast for hazardous landfill

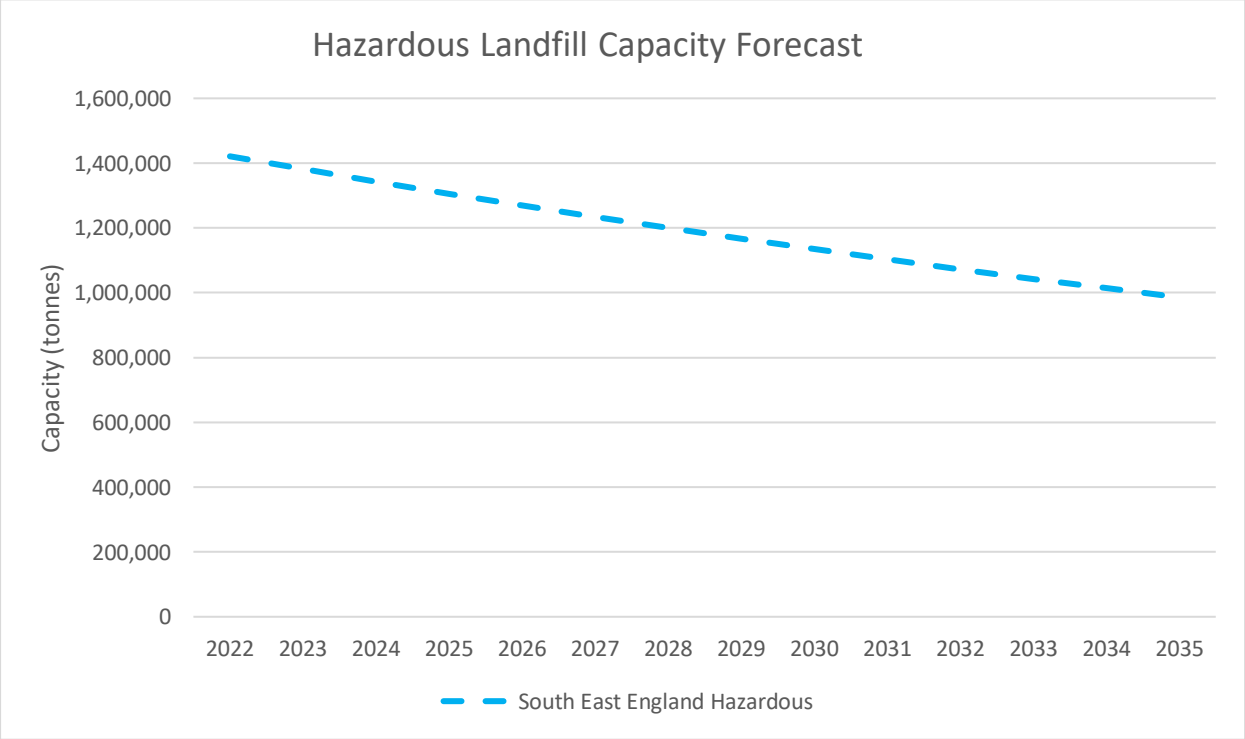

Table 9 – Future waste management available capacities in east of England in tonnes.

Waste Management	2022	2028	2031	2035
Incineration	760,111	786,552	799,410	816,553
Treatment and Material Recycling[14]	5,872,001	6,076,267	6,175,593	6,308,029
Construction demolition and excavation waste (CDEW) arisings*	2,958,400	3,027,600	3,060,600	3,106,200
CDEW Disposal to Landfill*	1,188,298	1,208,088	1,216,800	1,240,400
Commercial and industrial (C&I) Waste arisings*	1,255,543	1,299,219	1,320,457	1,348,774
C&I Waste Disposal to Landfill*	214,466	220,172	223,316	227,507
Landfill – Inert	47,765,282	44,610,160	43,111,636	41,191,613
Landfill – Non-Hazardous	21,532,090	16,309,926	14,194,984	11,795,385
Landfill – Hazardous	0	0	0	0

2.1.39. The values provided in Table 9 are for the entire east of England region unless indicated with (*), these values are solely for the Bedfordshire, Cambridgeshire and Milton Keynes regions.

Table 10 – Future waste management available capacities in south-east of England in tonnes.

Waste Management*	2022	2028	2031	2035
Incineration	823,042	863,619	884,228	912,750
Treatment and Material Recycling[14]	3,506,600	3,679,479	3,767,282	3,888,804
CDEW arisings*	2,562,000	2,562,000	2,562,000	2,562,000
CDEW Disposal to Landfill*	821,040	685,200	685,200	685,200
C&I Waste arisings*	1,260,420	1,322,560	1,354,120	1,397,800
C&I Waste Disposal to Landfill*	122,660	89,760	78,480	81,440
Landfill – Inert	30,536,363	28,765,698	27,919,248	26,829,266
Landfill – Non-Hazardous	23,556,690	15,629,854	12,731,373	9,685,061

[14] Excluding vehicle depollution

Waste Management*	2022	2028	2031	2035
Landfill – Hazardous	1,421,036	1,200,343	1,103,204	985,802

2.1.40. The values provided in Table 10 are for the entire east of England region unless indicated with (*), these values are solely for the Buckinghamshire and Oxfordshire regions.

EWR-MWJV Technical Partner

Routewide – Environment - EIA Scoping Method Statement – Socio-economics

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken, a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

[1] *National policy statement for national networks* (2024) *GOV.UK*. Available at: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf (Accessed: 29 October 2024).

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on socio-economics and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The socio-economics assessment will consider three main areas: businesses, employment and the economy. Businesses relate to local businesses that could be impacted by the Project, employment relates to employment opportunities generated from the Project and economy relates to the benefits of the Project to the economy. A key driver of the Project is to support economic growth by improving east-west connectivity and opening up new areas for businesses to grow.

2. Abbreviations & descriptions

Table 1 – Abbreviations and descriptions.

Abbreviation	Definition
CoCP	Code of construction practice
DMRB	Design manual for roads and bridges
DCO	Development consent order
EIA	Environmental impact assessment
ES	Environmental statement
EWR	East West Rail Company
NNNPS	National Networks National Policy Statement
NSAR	National skills academy for rail
ONS	Office for National Statistics
PEIR	Preliminary environmental information report
PRoW	Public right of way

3. Relevant standards and guidance

3.1. Guidance

3.1.1. The socio-economics assessment will be guided by the government's planning policy and guidance. The assessment will draw on the following guidance documents:

- Homes and Community Agency (now known as Homes England) (2015) Employment Density Guide 3rd Edition[2];
- Homes and Community Agency (now known as Homes England) (2014) Additionality Guide 4th Edition[3]; and
- Design manual for roads and bridges (DMRB) LA 112 population and human health[4].

3.1.2. The Employment Density Guide[2] and Additionality Guide[3] would be used to help inform the outcomes of the skills intelligence model from national skills academy for rail (NSAR). The DMRB LA 112 population and human health guidance[4] has been used to inform the assessment criteria set out in section 9.

3.1.3. It should be noted that whilst both the Employment Density Guide[2] and Additionality Guide[3] documents were withdrawn in 2022; no statement on replacement guides to be published by the government has been made and both are still available for reference. It is considered that in the absence of any further guidance on employment density and additionality, these documents remain relevant and appropriate guidance documents.

3.1.4. There are currently no legislative requirements which exist in relation to socio-economics.

[2] Homes and Communities Agency (now known as Homes England). (2015). *Employment Density Guide 3rd Edition*. [online] Available at: https://www.kirklees.gov.uk/beta/planning-policy/pdf/examination/national-evidence/NE48_employment_density_guide_3rd_edition.pdf (Accessed 31st October 2023).
[3] Homes and Communities Agency (now known as Homes England) (2014). *Additionality Guide 4th Edition*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/378177/additionality_guide_2014_full.pdf (Accessed 31st October 2023).
[4] National Highways. (2020). *LA 112 – population and human health*. [online] Available at: https://www.standardsforhighways.co.uk/search/1e13d6ac-755e-4d60-9735-f976bf64580a (Accessed 31st October 2023).

4. Establishing the baseline

4.1. Documentary records

The two main documents of relevance to socio-economics are the Social Baseline and business case. The Social Baseline includes baseline information relevant to socio-economics, communities, human health and equalities. This Social Baseline will be further developed for the preliminary environment information report (PEIR) and ES at relevant stages of the Project.

4.1.1. The elements of the Social Baseline that are of relevance to socio-economics are population, deprivation, employment and economic activity, qualifications, business health as well as businesses. For the economy and employment aspects of the Social Baseline (i.e. population, deprivation, employment and economic activity, qualifications), available demographic information has been reviewed in the relevant geographical areas of effect. Demographic information includes, for example, the working age population, employees by industry sector and educational attainment.

4.1.2. For the business aspects of the Social Baseline, information on business health within each of the local authority areas within the study area is provided. The Social Baseline, that accompanies the Scoping Report, also sets out the types of businesses that will be identified as the Social Baseline progresses. Where relevant, business names and types within the study area will be identified via AddressBase data[5], Ordnance Survey maps, and Google maps. Business specific websites will also be reviewed to understand business operations and land/access required for these operations. If deemed necessary at the PEIR or ES stage, a survey will be undertaken to verify directly affected businesses and further understand their business operations.

4.1.3. The key sources of information that have been used to determine the socio-economic elements of the Social Baseline are:

- Office for National Statistics (ONS) website;
- ONS NOMIS Labour Market Profiles[6]; and
- Indices of Multiple Deprivation 2019 website.

[5] AddressBase is an Ordnance Survey dataset that matches Royal Mail postal address to Unique Property Reference Numbers, which means there is a geographical dimension to the matched records.
[6] Office for national statistics. (2023). 'NOMIS Labour Market Profile'. [online] Available at: https://www.nomisweb.co.uk/reports/lmp/la/1946157262/report.aspx (Accessed: 16 April 2024).

4.1.4. As the Social Baseline progresses it will include committed developments[7] that are due to be completed prior to the construction of the Project. Committed developments that will be completed during or after the construction of the Project will be considered in the cumulative assessment.

4.1.5. The Business Case for the Project will set out the economic benefits of the Project including, for example, how the Project will support economic growth within the Oxford to Cambridge Arc. The Oxford to Cambridge Arc is a globally significant area between Oxford, Milton Keynes and Cambridge. It is formed of five ceremonial counties: Oxfordshire, Bedfordshire, Buckinghamshire, Northamptonshire and Cambridgeshire[8]. These areas form a strategic 'Arc', which is home to a unique business, science and technology ecosystem[9]. The Oxford to Cambridge Arc supports over two million jobs, adds over £110 billion to the economy every year and houses one of the fastest growing economies in England[8].

4.2. Surveys and stakeholder engagement

4.2.1. The following stakeholders will be contacted as part of the EIA process in order to inform the identification and assessment of significant socio-economic effects:

- Businesses that would be directly affected by the Project; and
- Local authorities which the Project passes through.

4.2.2. If deemed necessary at the PEIR or ES stage, a survey will be undertaken to verify directly affected businesses and further understand their business operations.

[7] Based on the Planning Inspectorate Advice Note 17, it is considered that committed development for the Project will be defined as development that falls into to the following descriptions:
Tier 1: Under construction. Permitted applications that are not yet implemented. Submitted applications that are not yet determined.
Tier 2: Nationally Significant Infrastructure Projects that have submitted a scoping report.
Tier 3: Identified in the relevant Development Plan (and emerging development plans).
Nationally Significant Infrastructure Projects that are on the Planning Inspectorate's programme of projects.
Identified in other plans and programmes which set the framework for future development.

[8] UK Government. (2021). Oxford-Cambridge Arc. Available at: Oxford-Cambridge Arc - GOV.UK (www.gov.uk) (Accessed 3rd January 2024).
[9] Ministry of Housing, Communities & Local Government (2021) Planning for sustainable growth in the Oxford-Cambridge Arc: an introduction to the spatial framework. [online]. Available at: https://www.gov.uk/government/publications/planning-for-sustainable-growth-in-the-oxford-cambridge-arc-spatial-framework (Accessed 3rd January 2024).

4.3. Modelling

4.3.1. The Applicant will develop a skills intelligence model from NSAR which will provide a detailed workforce skills profile.

4.4. Study area

4.4.1. The socio-economics assessment will consider three main areas: businesses, employment and the economy. The socio-economic study areas for the Project are outlined below:

- **Businesses:** The study area is informed by the geographic extent of the likely impacts of the Project (see section 6). The study area is focused on those locations where the land use of receptors is likely to change, and areas affected by disturbance because of construction activities or the operation of the Project. Therefore, 500m from the draft Order Limits has been used to consider impacts. In addition, some temporary and permanent components of the Project may result in changes in accessibility. This may result in impacts that occur beyond 500m from the proposed route/area of intervention. These instances will be identified separately (informed by baseline analysis, stakeholder engagement and professional judgement where relevant) and the study area will be expanded in these specific areas to assess impacts; and
- **Employment and economy:** The economic impact of the Project is considered relative to the south-east and east of England regions, as they represent the principal labour market catchment areas. The regional labour markets incorporate populations that may reasonably be expected to travel to and benefit from the Project.

4.5. Consultation

4.5.1. Consultation will be ongoing to inform the assessment of socio-economics as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. The Social Baseline for the Project forms part of the EIA Scoping Report and other supporting documents.

5.2. Socio-economics elements

5.2.1. The following sensitive receptors will be considered for the socio-economics assessment:

- Businesses which are a privately owned or operated organisation or enterprise that is engaged in commercial, industrial or professional activities. For the purpose of the socio-economic assessment, businesses consist of commercial premises and assets as well as land used for or associated with business operations; and
- Local economies and employment, including working age individuals within the study areas.

5.2.2. Land allocated in local plans as well as committed developments due to be constructed at the same time or after the Project are considered in the cumulative assessment. Therefore, the socio-economics assessment will not consider these potential developments.

5.2.3. The impacts on the viability of agricultural businesses will not be considered in socio-economics assessment. The agricultural & soils Method Statement sets out the approach to the assessment of the viability of agricultural businesses. However, agricultural land holdings and farms will be considered to be a socio-economic receptor if they provide a commercial function, for example, host commercial events.

5.3. Future baseline

5.3.1. The future baseline consists of the baseline conditions that are expected to occur if the Project did not proceed. It is anticipated that there would be changes to the distribution and structure of the population over time. There would also be changes in relation to economic growth, in particular when considering the committed developments in the vicinity of the Project. If there is a significant change in the future baseline whilst the EIA is being progressed, the socio-economics assessment will be updated.

5.3.2. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the Project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds and storms, both in summer and winter.

5.3.3. Refer to section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

6. Sources of impact

6.1.1. The Project includes works to existing stations (including closures), new stations, new railway track, works to the existing railway, works to level crossings and works to local highways and utilities.

6.1.2. The following aspects of the Project would be a source of impact for socio-economic receptors:

- Demolition of commercial premises and/or assets;
- Temporary land take required to facilitate the construction of the Project;
- Permanent land take required as part of the Project;
- Construction activities and construction traffic;
- Implementation of traffic management systems, including vehicular, footway and cycleway diversions;
- Temporary and permanent public right of way (PRoW) diversions;
- Temporary construction infrastructure and areas, including construction compounds;
- New infrastructure and structures as well as changes to existing infrastructure and structures;
- New vegetation screening and landscaping;
- Temporary job generation as a result of the construction of the Project; and
- Improved east-west transport link resulting from the operation of the Project.

7. Potential impacts and effects

7.1. Potential permanent and operational effects

7.1.1. Table 2 sets out the potential permanent and operational impacts and effects of the Project on socio-economic receptors. There would be both beneficial and adverse socio-economics impacts and effects associated with the Project. Section 10 of this Method Statement sets out the impacts that are proposed to be scoped in and out of the socio-economics assessment, along with a justification for scoping impacts out. The permanent and operational socio-economic impacts that are scoped out are operational employment generation, tourism as well as crime and safety.

Table 2 – Potential socio-economic permanent and operational effects.

Receptors	Potential impact and effects	Impact stage	Duration
Business receptors	Permanent land take (or change of use) leading to a loss of commercial premises and/or assets.	Construction	Permanent
Business receptors	Permanent land take (or change of use) leading to a loss of commercial land used for or associated with business operations.	Construction	Permanent
Business receptors	Presence of new infrastructure or removal of existing infrastructure (e.g. level crossings) resulting in reduced or improved accessibility to commercial premises/assets or land used for business operations.	Operation	Permanent
Business receptors	Presence of new infrastructure, removal or planting of vegetation, presence of trains/increased number of trains resulting in a change of amenity on an area that could affect business operations.	Operation	Permanent
Economic receptors	Generation of employment opportunities during the operation of the Project.	Operation	Permanent

7.1.2. For the socio-economics assessment, the term ‘amenity’ refers to an in-combination impact of air quality, sound, noise and vibration, visual effects as well as traffic and transport (specifically an increase in heavy goods vehicle (HGV) movements) at a single location which can result in a change in how a receptor is used. An in-combination impact is triggered when two or more residual significant effects act together on a single receptor.

7.1.3. The influence of climate change is not anticipated to exacerbate or ameliorate the Project effects to the extent that significant effects will occur. However, the socio-economics assessment considers changes to accessibility to commercial premises/assets or land used for business operations. The climate change assessment will consider how end-users (staff and passengers) are impacted by extreme weather events. For example, how end-users would be impacted by a heat wave. The climate change assessment will also consider the reliability of the improved/new rail services. For example, if there would likely be delays due to flooding or other extreme weather events.

7.2. Potential temporary construction effects

7.2.1. Table 3 details the potential temporary construction impacts and effects of the Project on socio-economic receptors. The socio-economics impacts that are proposed to be scoped out are tourism, increased demand for accommodation and community facilities due to an influx of construction workers as well as crime and safety (see section 10).

Table 3 – Potential socio-economic temporary construction effects.

Receptors	Potential impact and effects	Impact stage	Duration
Business receptors	Temporary land take (or change of use) leading to a loss of commercial land used for and associated with business operations.	Construction	Temporary
Business receptors	Temporary land take as well as pedestrian, cyclist and vehicular diversions resulting in reduced accessibility to commercial premises/assets or land used for business operations.	Construction	Temporary
Business receptors	Construction activities and construction traffic resulting in a change of amenity on an area that could affect business operations.	Construction	Temporary
Economic receptors	Generation of employment opportunities during the construction of the Project.	Construction	Temporary

8. Assumed mitigation

8.1.1. Table 4 details examples of potential embedded mitigation and enhancement measures for socio-economics. The mitigation measures for the Project will be progressed as part of the EIA and detailed in the PEIR and ES.

Table 4 – Examples of potential embedded mitigation for socio-economics.

Receptor Sources of impact	Project element and users affected	Potential impact	Embedded mitigation	Assurance mechanism
Demolition of commercial premises/assets	New railway, structures and accesses Business receptors	Loss of commercial premises/assets and associated business viability	Re-provision of premises/assets where possible and appropriate Engagement with businesses	Draft code of construction practice (CoCP)
Temporary land take required to facilitate the construction of the Project	Temporary structures and accesses as well as construction compounds Business receptors	Temporary loss of land used for business operations	Re-provision of land used for business operations where possible and appropriate Engagement with businesses	Draft CoCP Draft Construction Management Plan (CMP)
Permanent land take required as part of the Project	New railway, structures and accesses Business receptors	Permanent loss of land used for business operations		Draft CoCP Draft CMP
Implementation of traffic management systems, including vehicular, footway and cycleway diversions Temporary PRoW diversions	Temporary structures and accesses as well as construction compounds Business receptors	Temporary changes to vehicular, cyclist and pedestrian access to commercial premises/assets and land used for business operations	Engagement with businesses Signage to advertise that businesses are open and operating as normal Advanced notice of construction works and diversions to access or PRoW Agreement with relevant local authority regarding	Draft CoCP Draft Construction Traffic Management Plan (CTMP) Draft Public Right of Way Management Plan

Receptor Sources of impact	Project element and users affected	Potential impact	Embedded mitigation	Assurance mechanism
New infrastructure and structures as well as changes to existing infrastructure and structures Permanent PRoW diversions	New railway, structures and accesses Business receptors	Permanent changes to vehicular, cyclist and pedestrian access to commercial premises/assets and land used for business operations	the PRoW diversion routes	Draft CoCP Draft Public Right of Way Management Plan
Construction activities and construction traffic	Temporary structures and accesses as well as construction compounds Business receptors	Temporary changes to amenity on an area that could affect business operations	Engagement with businesses New vegetation screening and landscaping; Mitigation measures set out in the air quality, Method Statement, sound, noise and vibration Method Statement, landscape and visual impact assessment Method Statement as well as traffic and transport Method Statement are also relevant.	Draft CoCP Draft CTMP
New infrastructure, removal or planting of vegetation, presence of trains/increased number of trains	New infrastructure, removal or planting of vegetation, presence of trains/increased number of trains Business receptors	Permanent changes to amenity on an area that could affect business operations		Draft CoCP Draft Landscape and Environment Management Plan
Temporary employment generation as a result of the construction of the Project	The Project as a whole Economic receptors	Temporary employment generation	The Applicant would seek to recruit locally, wherever practicable, and enable access to training and career development. The processes used to recruit and manage staff to work at the Project would be demonstrably fair and offer equal opportunities to all.	Draft CoCP
Improved east-west transport link during operation	The Project as a whole Economic receptors	Permanent changes to the economy		Draft CoCP

8.1.2. Although crime and safety has been scoped out of the EIA, the following mitigation measures would be implemented to ensure that significant impacts can be avoided:

- During construction, site security arrangements will be in line with the Construction (Design and Management) Regulations 2015[10] where appropriate levels of security (staff/ CCTV) will be appointed, and fencing will be in place during the construction phase. Security arrangements will be referenced in the CoCP, which will be prepared as part of the Project; and
- Appropriate levels of security (staff/CCTV) will be implemented during the operational phase of the Project. These include, for example, controlled entry automated gate car park access barrier, lighting, and fencing and repairment. Security arrangements will be set out in a CoCP.

8.1.3. The influence of climate change is not anticipated to impede the effectiveness of the potential mitigation measures set out in Table 4 or paragraph 8.1.2.

8.2. Mitigation principles

8.2.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation could make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving the scheme's route; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.2.2. The EIA team will inform the design through successive stages and by using a prescribed process that takes into account potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce or otherwise mitigate potentially likely significant effects. The proposals will therefore have embedded within them various mitigation measures and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

[10] *The Construction (Design and Management) Regulations 2015* (2015). [online] Available at: https://www.legislation.gov.uk/uksi/2015/51/contents/made (Accessed: 16 April 2024).

8.2.3. The draft Order limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.2.4. For the assessment of impacts on socio-economics, potential embedded mitigation measures are detailed in Table 4.

8.3. Design principles

8.3.1. The approach to the design of the Project aims to include the following measures:

- The avoidance of taking land from businesses;
- To work with the business operator to reorganise remaining land under the business' control, where land is required from businesses on a permanent basis;
- To reduce as much as possible, the duration of any effect on land where land is required to be taken from businesses on a temporary basis, and implement reasonable measures;
- The avoidance of splitting or islanding linked groups of business properties, for example a commercial/industrial trading estate; and
- Wherever possible, to locate the most disruptive activities away from businesses that provide a service where tranquillity or noise levels are important, for example cafes with outside seating areas or emergency call centres.

8.4. Code of construction practice

8.4.1. Construction work can be one of the main causes of environmental impact. A draft CoCP will be developed for the Project that sets out a range of measures and principles which future contractors will be required to abide by in undertaking their work.

8.4.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic assets. The environmental assessment of socio-economics impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

8.4.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on socio-economics may be organised in the following generic categories:

- Timing of construction works and working hours;
- Construction traffic routes;
- PRoW diversions;
- Vehicular, footway and cycleway diversions;
- Site safety and security;
- Stakeholder engagement;
- Recruitment;
- Hoarding, fencing, screening and lighting;
- Site specific measures; and
- Monitoring requirements.

8.4.4. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

9. Evaluating significance

9.1.1. The socio-economic assessment will identify the potential impacts and effects of the Project on businesses, employment and economy and assess these against the baseline conditions, in order to determine whether the socio-economic effects of the Project are significant or not. Significant effects are effects that can be considered or are material in the decision-making process. Sections 9.2, 9.3, 9.4 and 9.5 set out the assessment methodology, significance criteria and approach to determining significant effects that will be used for the business, employment and economy assessment.

9.2. Business assessment methodology

9.2.1. Firstly, the baseline conditions for business will be collated, which will include identifying the location of businesses within the study area as well as understanding their business operations and land/access required for these operations. The potential direct and indirect impacts and effects of the Project on these businesses will be assessed taking into consideration the following:

- Land use – the assessment will consider how land use required for the Project will impact on the viability of a business through the temporary or permanent loss or partial loss of commercial premises and assets as well as land used for or associated with business operations;
- Accessibility – the assessment will consider how the Project would lead to changes in accessibility to commercial premises and assets as well as land used for or associated with business operations. For the purpose of the assessment, accessibility is considered to be the extent to which people are able (or not able) to access businesses. Changes in accessibility could affect businesses and business operations in three different ways: changes in footfall (for example, passing trade); changes to routes which are required for business operations as well as changes to employees access to the workplace; and
- Amenity – the assessment will also consider whether the Project would result in a loss of business viability due to changes to the amenity of an area used for business operations.

9.2.2. For those businesses that are anticipated to be directly affected, responses gathered as part of stakeholder engagement will help inform the assessment and identify appropriate mitigation measures.

9.2.3. The potential direct and indirect impacts and effects will be assessed using the significance criteria detailed in section 9.4, to determine whether they are significant or not. The assessment of significance will be based on the environmental value/sensitivity of a business receptor, which will be derived from the baseline conditions, and the magnitude of change from baseline conditions. Significant effects are effects that can be considered or are material in the decision-making process.

9.2.4. The cumulative assessment will consider development land allocated in local plans as well as committed developments due to be constructed at the same time or after the Project. Therefore, the socio-economics assessment will not consider these potential developments.

9.2.5. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline.

9.3. Employment and economy assessment methodology

9.3.1. The baseline conditions for employment and the economy will be identified to understand the sensitivity of the south-east and east of England economies and employment market. EWR Co will develop a skills intelligence model from NSAR which will provide a detailed workforce skills profile. The outcomes of this skills intelligence model will be used as the basis of the employment assessment. EWR Co will also undertake an economic study which will be presented in the Business Case. The Business Case will also set out the benefits of the Project in relation to supporting economic growth within the Oxford to Cambridge Arc. The assessment of effects on employment and the economy will draw on the outcomes of these relevant supporting studies. Enhancement measures will be further developed as part of the EIA process and detailed in the PEIR and ES. The impacts and effects of the Project on employment and the economy will be assessed to determine whether they are significant or not based on the approach set out in section 9.5.

9.4. Business assessment significance criteria

9.4.1. Business receptors will be assigned a value and/or sensitivity using the criteria set out in Table 5 as a basis. The criteria have drawn on DMRB LA 112 – population and human health[4] and adapted for the socio-economics assessment. Each receptor's value will be assigned taking account of

professional judgement and past experience of similar schemes, including the operational nature of the business in question and its ability to adapt to change.

Table 5 – Socio-economics receptor value/sensitivity criteria.

Resource value and/or sensitivity	Definition
Very High	Existing commercial premises/assets and land associated with business operations covering >5ha and/or have no capacity to experience the impact without incurring a significant socio-economic loss (or gain).
High	Existing commercial premises/assets and land associated with business operations covering >1 - 5ha and/or have little capacity to experience the impact without incurring a significant socio-economic loss (or gain).
Medium	Existing commercial premises/assets and land associated with business operations covering > 0.5 - 1ha and/or have a limited or average capacity to experience the impact without incurring a significant socio-economic loss (or gain).
Low	Existing commercial premises/assets and land associated with business operations covering <0.5ha and/or generally have adequate capacity to experience impacts without incurring a significant socio-economic loss (or gain).

9.4.2. Table 6 sets out the criteria that will be used to assign the magnitude of impact for the business assessment. The criteria have drawn on DMRB LA 112 – population and human health[4]. Each receptor's value will be assigned taking account of professional judgement and past experience of similar schemes.

Table 6 – Socio-economics magnitude of impact criteria.

Magnitude of change	Definition
High	Loss of commercial premise/asset and/or land associated with business operations or large changes to amenity on an area used for business operations that leads to a business becoming non-viable.
Medium	Partial loss of/damage to key characteristics, features or elements of a commercial premise/asset and/or land associated with business operations. For example, partial removal or substantial amendment to access, substantial changes in amenity on an area used for business operations or acquisition of land compromising viability of businesses.
Low	Minor loss of, or alteration to, one (maybe more) key characteristics, features or elements of a commercial premise/asset and/or land associated with business operations. For example, amendment to access, changes in amenity on an area used for business operations or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of businesses.

9.4.3. The overall significance of effects will be determined based on the matrix shown in Table 7. Effects that are deemed to be **significant** for the purpose of the socio-economics assessment are those that are described as being **moderate** or **major beneficial** or **adverse.**

Table 7 – Significance matrix.

		Magnitude of impact		
		Low	**Medium**	**High**
Resource value and/or sensitivity	**Very high**	Moderate or major	Major	Major
	High	Minor or moderate	Moderate or major	Major
	Medium	Minor	Moderate	Moderate or major
	Low	Neutral or minor	Minor	Minor or moderate

9.5. Economy and employment assessment significance criteria

9.5.1. The sensitivity of the economy and employment receptors will be identified on a case-by-case basis with reference to relevant guidance where applicable and/or by employing professional judgement; determination of sensitivity varies depending on the type of receptor.

9.5.2. For the economy and employment assessment, there is no accepted definition of what constitutes a significant (or not significant) socio-economic effect. It is however recognised that 'significance' reflects the relationship between the scale of effect (magnitude) and the sensitivity (or value) of the affected resource or receptor.

9.5.3. As such, economy and employment effects will be assessed on the basis of:

- **Consideration of sensitivity to effects** – specific values in terms of sensitivity are not attributed to economy and employment receptors (i.e. the labour market and regional economy) due to their diversity in nature and scale, however the assessment instead takes account of the qualitative (rather than quantitative) 'sensitivity' of the receptors and, in particular, on their ability to

respond to change. For example, an economic receptor that will be considered as having a high sensitivity could have low rates of economic activity and low levels of employment in the area;

- **Magnitude of impact** – this entails consideration of the size of the impact on economy and employment in the context of the area in which the effects will be experienced. As an example, a major impact could affect large numbers of people in the labour market (with the number depending on the context and nature of the impact); and
- **Scope for adjustment or mitigation** – this assessment is concerned in part with economies which adjust themselves continually to changes in supply and demand. The scope for the changes brought about by the Project to be accommodated by market adjustment will therefore be a criterion in assessing effect significance.

9.5.4. The assessment process aims to be objective and quantifies effects as far as possible. However, many economy and employment effects can only be evaluated on a qualitative basis. Effects are defined as follows:

- **Beneficial** classifications of significance indicate an advantageous or beneficial effect on an effect area, which may be minor, moderate, or major in effect;
- **Neutral** classifications of significance indicate imperceptible effects on an effect area; and
- **Adverse** classifications of significance indicate a disadvantageous or adverse effect on an effect area, which may be minor, moderate or major in effect.

9.5.5. Based on consideration of the above, where an effect is assessed as being beneficial or adverse, significance has been assigned using the scale below based on professional judgement:

- **Neutral**: The effect is unlikely to make a measurable difference on the receptors in the relevant areas of effect;
- **Minor**: The effect is likely to make a small measurable positive or negative difference on receptors in the relevant area(s) of effect;
- **Moderate**: The effect is likely to make a measurable positive or negative difference on receptors in the relevant area(s) of effect; and
- **Major**: The effect is likely to make a substantial positive or negative difference on receptors in the relevant area(s) of effect.

9.5.6. The duration of effect is also considered, with more weight given to permanent changes than to temporary ones. Effects that are deemed to be **significant** for the purpose of the socio-economics assessment are those that are described as being **moderate** or **major beneficial** or **adverse**.

10. Proposed scope

10.1.1. The potential impacts and effects of the Project on socio-economics are set out in section 7 of this document. The items that are considered to be scoped in are described in Table 8.

Table 8 – Elements of the socio-economic assessment to be scoped in.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Loss of commercial premises and/or assets	✓	✓	✓	✓	✓	✓	✓	✓
Temporary loss of land used for business operations	✓	✓	✓	✓	✓	✓	✓	✓
Permanent loss of land used for business operations	✓	✓	✓	✓	✓	✓	✓	✓
Temporary changes to vehicular and pedestrian access to commercial premises/assets and land	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
used for business operations								
Permanent changes to vehicular and pedestrian access to commercial premises/assets and land used for business operations	✓	✓	✓	✓	✓	✓	✓	✓
Temporary changes to amenity on area that could affect business operations	✓	✓	✓	✓	✓	✓	✓	✓
Permanent changes to amenity on area that could affect business operations	✓	✓	✓	✓	✓	✓	✓	✓
Temporary employment generation	✓	✓	✓	✓	✓	✓	✓	✓
Permanent changes to the economy	✓	✓	✓	✓	✓	✓	✓	✓

10.1.2. Other items that are intended to be scoped out of the assessment are set out in Table 9.

Table 9 - Items proposed to be scoped out

Item proposed to be scoped out	Justification
Operational employment generation	For the purposes of the socio-economic assessment, the 'worst case' scenario in economic and employment terms has been considered. It has been assumed that Network Rail employees would undertake operational and maintenance duties for the Project, given that Network Rail has an existing maintenance team that are responsible for the upkeep and condition of all railway infrastructure in Britain. Therefore, employment generation would likely be limited in the context of the regional labour market. It is anticipated that operational employment generation would not be significant and, therefore, this has been proposed to be scoped out of the EIA.
Tourism	The Project spans between Oxford and Cambridge. The route of the Project passes through nine local authority boundaries: Oxford City Council; Cherwell District Council; Buckinghamshire Council; Milton Keynes Council; Central Bedfordshire Council; Bedford Borough Council; Huntingdonshire District Council; South Cambridgeshire District Council; and Cambridge City Council. However, due to the linear nature of the Project and the construction methodology to be implemented (i.e. constructing the Project in sections) it is not anticipated that the Project would have a large impact on tourism in the context of overall tourism industries along the route. The business assessment, that will be undertaken as part of the socio-economic assessment, will consider tourist related businesses. In addition, disruption to routes which may be used by tourists will be considered as part of the traffic and transport assessment. During operation, the improved connectivity afforded by the Project has the potential to benefit tourist and tourist attractions, however, this is not considered to be significant in the overall context of the tourism industries in the area. Overall, it is anticipated the Project would not significantly impact on tourism and, therefore, this has been proposed to be scoped out of the EIA.
Increased demand for accommodation and community facilities due to an influx of workers	The Project is linear in nature and passes through a number of urban areas, including Oxford, Milton Keynes, Bedford and Cambridge. These areas are well connected with good public transport and road network linkages. It is anticipated that construction workers would reside in these locations and travel to site. Due to the nature of the Project and construction methodology that will be adopted, it is anticipated that the use of specialised contractors would be limited and the majority of the workforce will be from the local and regional area within a commutable distance from the site. This is in line with past experience of similar schemes and the construction methodology used.

	Given the urban location of elements of the Project, good transport linkages and workforce to be utilised, it is anticipated that there would not be a significant increase in demand for accommodation, social infrastructure such as community and recreational resources from construction workers relocating close to the Project. Therefore, increased demand for accommodation and community facilities due to an influx of workers has been proposed to be scoped out of the EIA.
Crime and safety	It is assumed that site security arrangements for the Project will be in line with the requirements set out the Construction (Design and Management) Regulations 2015 where appropriate levels of security (staff/CCTV) will be appointed, and fencing will be in place during the construction phase. With these measures in place, there is unlikely to be a significant effect in relation to crime and safety during construction and this has been scoped out of the EIA. It is anticipated that appropriate levels of security (staff/CCTV) will be implemented during the operational phase of the Project. These include, for example, controlled entry automated gate car park access barrier, lighting, and fencing and repairment. Therefore, there is unlikely to be a significant effect in relation to crime and safety during operation and this has been proposed to be scoped out of the EIA.

11. Assumptions and risks

11.1. Assumptions

11.1.1. Key assumptions underlying the assessment may include:

- This assessment will rely, in part, on data provided by third parties (e.g. Ordnance Survey Mapping, local authorities, ONS) which are the most up-to-date data available at the time of writing. No significant changes or limitations in these datasets have been identified that would affect the robustness of the assessment;
- Land allocated in local plans as well as committed developments due to be constructed at the same time or after the Project are considered in the cumulative assessment. Therefore, the socio-economics assessment will not consider these potential developments;
- Agricultural land holdings and farms are not considered to be socio-economics receptors. The exception is where farms provide a commercial function, for example, hosts commercial events; and
- The assessment of effects on amenity is triggered where residual significant effects are identified by two or more related aspects. These related aspects are air quality, noise and vibration, visual effects as well as traffic and transport (specifically an increase in HGV movements) at a single location which can result in a change in how a receptor is used. The assumptions that apply to these aspects (air quality, noise and vibration, visual effects as well as traffic and transport) also apply to this Method Statement.

11.2. Risks

11.2.1. Key risks include:

- Directly affected businesses and/or local authorities are not willing to engage on the Project; and
- Access is denied and verification surveys are not able to be undertaken.

11.3. Opportunities

11.3.1. Key opportunities include:

- EWR Co will seek to source materials locally and responsibly where possible.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping Method Statement - Sound, Noise and Vibration

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken, a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on sound, noise and vibration and should be read in conjunction with the Method Statements prepared for other aspects. The assessment of impacts from sound, noise and vibration will consider the potential for noise and vibration generated by various activities associated with the operation and construction of the Project to affect sensitive receptors. There are many types of effects due to noise and vibration (for example annoyance and sleep disturbance) which require different methods of assessment.

[1] Department for Transport (2024) *National Networks National Policy Statement*. Accessed at: National Networks - National Policy Statement (publishing.service.gov.uk) (Accessed April 2024).

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
BS	British standard
CRN	Calculation of railway noise
CRTN	Calculation of road traffic noise
CoCP	Code of construction practice
dB	Decibel
DCO	Development consent order
Defra	Department for Environment, Food and Rural Affairs
DIN	Deutsches Institut fur Normung
DMRB	Design manual for roads and bridges
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
HS2	High Speed 2
ISO	International Organization for Standardization
L_{Aeq}	A-weighted equivalent continuous sound pressure level
LOAEL	Lowest observed adverse effect level
$L_{Amax,F}$	Maximum A-weighted sound pressure level with the fast time weighting
$L_{Amax,S}$	Maximum A-weighted sound pressure level with the slow time weighting
NIA	Noise important area
NOEL	No observed effect level

Abbreviation	Definition
NNNPS	National networks national policy statement
NPSE	Noise policy statement for England
NSIP	Nationally significant infrastructure project
PAVA	Public address and voice alarm
PPGN	Planning practice guidance – noise
PPV	Peak particle velocity
SOAEL	Significant observed adverse effect level
UAEL	Unacceptable adverse effect level
VDV	Vibration dose value
WHO	World Health Organization

3. Relevant standards and guidance

3.1. Legislation, regulations and policy

3.1.1. The legislation and policy relevant to the assessment of the Project in relation to sound, noise and vibration include:

- Control of Pollution Act 1974 (Her Majesty's Stationery Office, 1974);
- Environmental Protection Act (Secretary of State for the General Environment, 1990);
- UK Noise Insulation (Railways and other guided systems) Regulations (1996);
- National planning policy framework (Department for Levelling Up, Housing and Communities, 2023); and
- NNNPS (Department for Transport, 2024).

3.2. Guidance

3.2.1. The guidance relevant to the assessment of the Project in relation to sound, noise and vibration include:

- Noise Policy Statement for England (NPSE) (Department for environment, food and rural affairs (Defra, 2010)) Guidance.
- Planning practice guidance – noise (PPGN) (Ministry of Housing, Communities & Local Government, 2019);
- British standard (BS) 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BS 5228-1-) (BS Institution, 2014);
- BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BS 5228-2) (BS Institution, 2014);
- Calculation of railway noise 1995 (CRN) (Department for Transport, 1995);
- Calculation of road traffic noise 1988 (CRTN) (Department for Transport and the Welsh Government, 1988);
- Additional Railway Noise Source Terms For "Calculation of Railway Noise 1995" (Defra, 1995);
- Design manual for roads and bridges (DMRB) LA 111 – Noise and vibration. Revision 2 (Highways England et al., 2020);
- Guidelines for Community Noise (World Health Organization (WHO), 1999);
- Night Noise Guidelines for Europe (WHO, 2009);
- Environmental Noise Guidelines for the European Region (WHO, 2018);
- BS 8233:2014: Guidance on sound insulation and noise reduction for buildings;
- (BS 8233) (BS Institution, 2014);
- BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS Institution, 2019);

- BS and International Organization for Standardization (ISO) 14837-1:2005 Mechanical vibration. Ground-borne noise and vibration arising from rail systems. General guidance;
- (BS ISO 14837-1) (BS Institution, 2005);
- Building Bulletin 93 (BB93) Acoustic design of schools – performance standards (2015);
- British Council for Offices 'Guide to Specification';
- BS 6472 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting (BS Institution, 2008); and
- Railway Safety and Standards Board Sustainable Rail Blueprint.

4. Establishing the baseline

4.1. Baseline surveys

4.1.1. The description of baseline conditions for sound, noise and vibration will be developed using the outputs of surveys of background sound levels, ambient noise levels and vibration. These will be undertaken at key locations along the temporary and permanent extents of the Project.

4.1.2. The baseline surveys will be undertaken before the publication of a preliminary environmental information report, supplemented where required with further surveys carried out before the ES is prepared. These surveys will establish the baseline noise conditions along various parts of the Project and will assist with the assessment of both temporary and permanent impacts. It is expected that these baseline surveys will be predominantly undertaken as long-term, unattended surveys. Short-term, attended surveys will be undertaken where it is not possible to undertake long-term measurements.

4.1.3. The baseline surveys will be supplemented with further information obtained from additional data search. The following sources of information will be used to establish the baseline for the purpose of the sound, noise and vibration assessment where appropriate:

- Defra strategic noise maps for road and rail;
- Any measurements undertaken by others (e.g. property developers, National Highways) at locations near to the alignment of the route; and
- Any measurements undertaken by or on behalf of Network Rail.

4.2. Study area

4.2.1. For the purpose of the EIA, the study areas set out in Table 2 will be developed and used for the sound, noise and vibration assessment.

Table 2 – Summary of relevant study areas to be used in the sound, noise and vibration assessment.

Assessment	Study area
Construction phase – noise	For the construction phase, a study area of 300m from the closest construction activity (including construction compounds, access routes and haul routes) will be used for the assessment of construction noise. This will be sufficient to encompass potential adverse effects from noise at sensitive receptors.
Construction phase – vibration	A study area of 125m from the closest construction activity with the potential to generate ground-borne vibration will be used for the assessment of construction vibration. This will be sufficient to encompass potential adverse effects from vibration during construction.
Operational phase – noise	A distance of 300m from the new or altered railway will be used for the operational assessment of airborne noise from trains.

Assessment	Study area
	A distance of 125m from the new or altered railway will be used for the operational assessment of ground-borne noise from trains. For new sections of roads, a distance of 600m from the new or altered roads will be used for the operational assessment of airborne noise from road traffic. For existing sections of road (public highways) where road traffic noise is expected to change (increase or decrease) by 1 dB or more as a result of the Project, a distance of 50m from the nearest kerb of the carriageway will be used for the operational assessment of airborne noise from road traffic. Noise from fixed plant will be assessed at the nearest sensitive receptor within 1km taking into account the influence of background sound levels and screening, which may result in higher impacts at receptors that are more remote than the closest receptor.
Operational phase – vibration	A distance of 125m from the new or altered railway will be used for the operational assessment of ground-borne vibration from trains.

4.3. Consultation

4.3.1. Consultation will be ongoing to inform the assessment of sound, noise and vibration as the DCO application progresses. A non-statutory consultation commenced in November 2024.

5. Preliminary baseline description

5.1. Sensitive receptors

5.1.1. For the purposes of the baseline and future assessment, the Project has been divided into eight route sections, these comprise of:

- Oxford to Bletchley;
- Fenny Stratford to Kempston;
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

5.1.2. There is no formal guidance available on the value or sensitivity of receptors in relation to noise and vibration. The assessment of temporary and permanent noise and vibration impacts will include consideration of the following receptors within the relevant study areas, some of which may only be sensitive during the daytime:

- Human receptors – when present at outdoor amenity areas or within buildings used as:
  - Residential (including residential moorings);
  - Hotels, hostels and care homes;
  - Healthcare facilities (hospitals, general practitioner surgeries, clinics, dentists);
  - Offices (including law courts);
  - Ancillary offices (e.g. as part of garage or gym);
  - Community facilities;
  - Educational buildings and libraries;
  - Places of worship;
  - Recreational facilities (restaurants, pubs, social clubs and youth clubs);
  - Commercial (shops, supermarkets and showrooms);
  - Animal centres;
  - Community facilities (community centres and village halls);
  - Theatres, concert halls, cinemas, galleries and museums;
  - Recording and broadcast studios;
  - Sports facilities (including gyms);
  - Childcare facilities;
  - Public open space (including cemeteries and active burial grounds);
  - Play areas (including school playgrounds); and
  - Arboretums and public gardens.
- Noise important areas (NIA) – NIAs are locations within England and Wales that have been identified by Defra, using noise modelling, where residential

receptors are exposed to the highest levels of noise. The results of the strategic noise maps have been used to indicate the residential receptors that are exposed to the highest 1% of noise levels;

- Ecological receptors – when present in designated areas (e.g. special areas of conservation, special protection areas and sites of special scientific interest); and
- Infrastructure receptors – buildings, both contemporary (e.g., commercial, industrial or research facilities) and historical (e.g. listed buildings). Potential impacts on historical assets are reported in the historic environment Method Statement.

5.2. Oxford to Bletchley

5.2.1. There are many residential receptors located within several areas in close proximity to this section of the Project. These include large urban areas (e.g. Oxford, Bicester, Far Bletchley), smaller residential areas (e.g. Winslow) and also isolated groups of residential receptors. The baseline noise climate from Oxford to Bicester, and in the area close to Bletchley station includes a contribution from the existing railway. The extent to which this contributes to the baseline depends upon other infrastructure along the route, including roads, industry, construction activities or general noise associated with residential areas (e.g. small construction activities, local road traffic).

5.2.2. The railway line between Oxford north junction and Bletchley is not included within the Defra strategic noise maps (England Noise and Air Quality Viewer, 2020) due to the low number of train movements on a route outside an agglomeration. Therefore, no baseline data can be gathered from that source except for the area between Oxford station and Oxford north junction. Sections of the A40, A44 and A4260 roads include NIAs in the area of the EWR route.

5.2.3. Non-residential receptors along the route include schools, nurseries, and industrial areas. In general, the expected baseline noise levels at non-residential locations would be similar to those for the residential areas described above.

5.2.4. Subjectively, the baseline noise levels are moderate to high towards the centres of the Oxford, Bicester and Far Bletchley areas of the route, and are low to moderate in the other areas of the route.

5.3. Fenny Stratford to Kempston

5.3.1. There are many residential receptors located within close proximity of this section of the route. These are in large urban areas (e.g. the Fenny Stratford area east of Bletchley and the Kempston and South End areas south-west of Bedford), smaller residential areas (e.g. Woburn Sands) and also isolated groups of residential receptors. In all of these areas, the baseline includes a

contribution from the existing railway. The extent to which this contributes to the baseline depends upon other infrastructure along the route, which includes roads, industry, construction activities or general noise associated with residential areas (e.g. small construction activities, local road traffic). Furthermore, railway noise is a very minor contributor to the baseline noise climate due to the suspension of rail services during the period 2022 to 2023, and the relatively light service when it resumed in late 2023.

5.3.2. The railway line between Fenny Stratford east of Bletchley and Kempston south-west of Bedford is not included within the Defra strategic noise maps (England Noise and Air Quality Viewer, 2020) due to the low number of train movements on a route outside an agglomeration. Therefore, no baseline data can be gathered from that source except for areas close to Bletchley and Bedford, which were included in the Defra noise mapping for agglomerations.

5.3.3. Non-residential receptors along the route include schools, nurseries, and industrial areas. In general, the expected baseline noise level at non-residential locations would be similar to those for the residential areas described above.

5.3.4. Subjectively, the baseline noise levels within the study area are low to moderate.

5.4. Bedford

5.4.1. The immediate area surrounding the EWR route between the connection of the Marston Vale Line with the Midland Main Line south of Bedford station and the proposed junction with the Core section of the EWR route north of Bedford is predominantly residential. The northern part includes educational receptors that are separated from the existing Midland Main line by sports fields. In addition to the railway, road traffic on the urban road network is expected to be a dominant source of environmental noise in the area. Defra noise mapping considers the rail and main road sources in this area. There is a NIA associated with the railway close to the Poets area of north Bedford, and for short sections of the A428 and A5141 roads in this area. There is a large NIA associated with the Midland Main Line in the Kempston area adjacent to Eastdale Close and Harefield Avenue. It is close to a NIA attributed to the A5141 Ampthill Road.

5.4.2. Subjectively, the baseline noise levels within the study area are moderate to high.

5.5. Clapham Green to Colesden

5.5.1. This section of the EWR route lies within a largely rural area with very few major sources of environmental noise and is situated at a distance from those at the western end of this section (i.e. the A6 road and Midland Main Line at the western end). The route is generally more than 500m from the large residential

area north of Bedford. There are no NIAs in this area of the route. Subjectively, baseline noise levels are generally low in this area of the route. The introduction of a new railway would affect the acoustic character of this area.

5.6. Roxton to east of St Neots

5.6.1. The baseline noise climate in this section of the Project is mainly affected by road traffic noise from the A1 road and East Coast Main Line in the area of Tempsford. The route is generally within a lightly populated area except the area east of St Neots, which includes a newly developed residential area. Short sections of the A1 road close to the route are attributed as NIAs. Subjectively, baseline noise levels are generally moderate around the route. Although railway noise is already a feature of the noise climate, the introduction of a new railway would make railway noise more widespread, affecting the smaller residential areas including Roxton, Chawston and Tempsford.

5.7. Croxton to Toft

5.7.1. This section of the EWR route lies within a largely rural area with the main residential areas at the east including Cambourne, Highfields Caldecote and Comberton. The baseline noise climate in the area of this section of the route is unaffected by existing railway noise. The distant East Coast Main Line may be perceptible at the western end in the area of Wintringham. Elsewhere, the main sources of noise affecting the baseline climate are road traffic associated with the parallel section of A428 road. There are a number of NIAs associated with the A428 road in the area of the EWR route. Subjectively, baseline noise levels are generally low to moderate in this area of the route. The introduction of a new railway would affect the acoustic character of the area particularly the eastern and western parts of this area.

5.8. Comberton to Shelford

5.8.1. The closest residential receptors are generally scattered, isolated dwellings or villages such as Haslingfield, Harston, Hauxton Little Shelford and Great Shelford. The baseline noise climate in the western area and towards Haslingfield is unaffected by existing railway noise sources. Elsewhere, the EWR route joins the Hitchin to Cambridge Line and the West Anglia Main Line. The main other sources of noise affecting the baseline climate are road traffic associated with the M11 motorway in the area of Hauxton and Little Shelford, and the A10 road through Harston. Subjectively, baseline noise levels are generally low to moderate in this area of the route. The introduction of a new railway would affect the acoustic character of the western part of this area.

5.8.2. The Mullard Radio Astronomy Observatory to the south-west of Cambridge is sensitive to vibration. The expected baseline noise level at non-residential

locations would be similar to those for the residential receptors in the area of this section.

5.9. Cambridge

5.9.1. The receptors within the area surrounding the EWR route in the Cambridge area are educational/research facilities, residential buildings, offices and sports facilities. The baseline noise climate in mainly affected by rail traffic on the West Anglia Main Line and road traffic on the A1307 Hills Road. There are NIAs associated with road traffic on parts of Hills Roads and with rail traffic on the West Anglia Main Line just south of Hills Road. The introduction of a new railway would not significantly affect the acoustic character of this area.

5.9.2. Key non-residential receptors adjacent to the West Anglia Main Line, that are sensitive to vibration, include the Microbiological Research Centre laboratory and the Ann McLaren Building (biomedical research facility).

5.9.3. Subjectively, baseline noise levels are moderate in this area of the route.

5.10. Future baseline

5.10.1. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.10.2. Refer to the section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

5.10.3. Changes to the relevant environmental conditions may occur in the absence of the Project. The potential changes in baseline conditions that can be reasonably foreseen will be considered within the sound, noise and vibration assessment if those changes would be expected to alter the conclusions of the assessment as to whether there would be significant environmental effects because of the Project.

5.10.4. Relevant factors to the evolution of the baseline which it is proposed the sound, noise and vibration assessment will consider, are:

- Committed developments, in terms of sensitive receptors that may be introduced, traffic they may generate, and screening that may be provided by any buildings; and
- Changes to the long-term road and rail travel patterns (e.g. the proposed High Speed 2 (HS2) Infrastructure Maintenance Depot at Calvert, which is approximately midway between Oxford and Bletchley, may introduce additional rail traffic and/or a noise source).

6. Sources of impact

6.1.1. The Project is expected to result in temporary and permanent noise and vibration impacts. The sources of these impacts are given in Table 3 and the corresponding types of impact.

Table 3 – Sources of noise and vibration impacts.

Source	Impacts
Temporary	
Construction activity (including the movement of mobile plant)	Airborne noise Ground-borne vibration
Construction road traffic	Airborne noise
Construction rail traffic	Airborne noise • Rolling noise; • Stationary noise; • Curve/wheel squeal; and • Horn/audible warning device noise. Ground-borne noise and vibration
Permanent	
Operational railway traffic	Airborne noise • Rolling noise; • Stationary noise; and • Curve/wheel squeal. Ground-borne noise and vibration
Maintenance activities (maintenance of the railway infrastructure along the route and of the railway vehicles at depots)	Airborne noise
Road traffic on existing public highways and new or altered links	Airborne noise
Fixed plant at depots and substations	Airborne noise
Station Public Address and Voice Alarm (PAVA)	Airborne noise
Audible warning devices including horns, level crossing sounders and train door opening/closing alarms	Airborne noise

6.1.2. The calculation of temporary and permanent noise and vibration levels will be used in the assessment of the potential impacts of the Project.

6.1.3. The noise and vibration levels from construction will be calculated at selected locations which are considered representative of all noise-sensitive receptors in

the study area. These selected locations may be individual sensitive receptors or groups of sensitive receptors. The items of plant and corresponding noise levels will be selected from existing data sources, such as published data or that used in previous assessments. Calculations for noise will be undertaken in accordance with the procedures described within BS 5228-1, and for vibration the calculations will be undertaken in accordance with procedures in BS 5228-2.

6.1.4. The potential impact from additional construction traffic on the road network and from diversion routes will be calculated in accordance with methodologies described within CRTN and the modifications to CRTN given within DMRB LA 111.

6.1.5. For operational railway noise impacts, the assessment will compare the predicted noise levels with and without the Project at individual or groups of sensitive receptors. For railway noise, the noise levels will be calculated using the methodology and train data within CRN, which will be supplemented with information produced by Defra titled '*Additional railway noise source terms For "Calculation of Railway Noise 1995*"'. Data that are not covered by either of these publications, will be sourced from other published assessments or measurements.

7. Potential impacts and effects

7.1. Potential permanent and operational effects

7.1.1. The main potential permanent impacts will be due to:

- Airborne noise and ground-borne noise and vibration from rail traffic;
- Airborne noise and ground-borne vibration from operational maintenance activities;
- Airborne noise from road traffic on new or altered links, or changes on existing links as a result of the Project;
- Fixed plant at depots and substations; and
- Station PAVA overspill.

7.1.2. Likely significant effects that may arise as a result:

- Annoyance of people in outdoor amenity areas or within buildings used for residential, educational facilities, places of worship, childcare facilities, offices, commercial or community facilities; and
- Disturbance of people sleeping in buildings: residential, hospitals, hotels, camp sites, residential moorings.

7.1.3. The carriageway surfaces of new or modified roads will be constructed and maintained to be free of irregularities. Therefore, ground-borne vibration from operational road traffic is not expected to result in significant adverse effects and is scoped out of the assessment.

7.1.4. The influence of climate change is not anticipated to exacerbate or ameliorate the project effects to the extent that significant effects will occur. The influence of climate change is not relevant to sound, noise and vibration because the identification of significant effects is based on a typical, worst case impact (generally annual average), rather than extreme events or seasonal conditions.

7.2. Potential temporary construction effects

7.2.1. The main potential temporary impacts will be from:

- Airborne noise and ground-borne vibration due to construction activities and the movement of mobile plant; and
- Airborne noise from road traffic on temporary diversion routes or road realignments, or changes on existing links as a result of the Project.

7.2.2. Likely significant effects that may arise as a result:

- Annoyance of people in outdoor amenity areas or within buildings used for residential, educational, places of worship, childcare facilities, offices, commercial or community facilities; and
- Disturbance of people sleeping in buildings: residential, hospitals, hotels, camp sites, residential moorings.

7.2.3. Noise and vibration impacts due to construction are temporary and do not result in permanent effects.

7.2.4. Ground-borne vibration from construction traffic may arise due to the movement of heavy vehicles over irregularities in the surfaces of access tracks and haul routes. Provided road surfaces will be maintained to be free of irregularities, in accordance with requirements set out in the Code of Construction Practice, then ground-borne vibration due to construction traffic is not expected to result in significant adverse effects and is scoped out of the assessment.

8. Assumed mitigation

8.1. Overview

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project proposals will therefore have embedded within them various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The draft Order Limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. For the assessment of permanent impacts on noise and vibration, embedded mitigation might include:

- Noise bunds and barriers;
- Management of friction at the wheel/rail interface;
- Resilient track forms, rail fixings, rail dampers; and
- Restrictions on services in terms of numbers and speeds.

8.1.5. The influence of climate change is not anticipated to impede the effectiveness of mitigation. This is because mitigation requirements are generally defined to avoid significant effects based on typical, worst case impacts (generally annual average), rather than extreme events or seasonal conditions.

8.2. Mitigation principles

8.2.1. Mitigation measures will be incorporated into the Project throughout the design development and this will continue through to the DCO application. The design consideration measures relevant for the sound, noise and vibration assessment and to be relied upon in the EIA are:

- When considering noise mitigation or enhancement during the design and assessment, the principle of source – path – receptor will be applied. This is a principle where noise mitigation is first considered at source as this is often the most practical and cost-effective solution. It will also provide a reduction in noise to all the surrounding receptors. The reduction of noise between the source and receptor is considered next as, after controlling noise at source, a reduction in the path would benefit the greatest number of receptors. The mitigation of noise at the receptor (e.g. sound insulation of buildings) is the last resort in terms of noise mitigation. This is because it would only be of benefit to the individual receptor. In addition, providing insulation in terms of improved glazing would be ineffective if the windows of a property are open or if the individuals are outside;
- Selecting the horizontal and vertical alignments to achieve the greatest possible separation from sensitive receptors and keeping the alignments low in the environment. Also where practicable considering other competing engineering and environmental factors (e.g. existing noise sources);
- Ensuring that the track curve radii reduces the risk of rail squeal wherever practicable;
- Examining opportunities to create noise barriers in the form of earthworks (bunds/false cuttings), especially where there is an opportunity to integrate noise with landscape and visual mitigation, or where surplus material is available for re-use;
- Engineering features (e.g., retaining walls, bridge parapets) to be used where possible to provide noise screening; and
- Specifying (or designing to enable use of) quieter rolling stock.

8.2.2. In addition, a set of construction management measures will be set out in the draft code of construction practice (CoCP). These are intended to reduce or avoid potential construction effects. This includes managing the risk of an uncertain environmental effect due to an unintended activity, e.g. a pollution incident.

8.3. Design principles

8.3.1. The approach to embedding mitigation in the design is:

- Design alignment/position of noise sources to avoid significant adverse effects;
- Control noise and/or vibration at source;
- Minimise noise or vibration propagation; and
- Mitigate at receptor.

8.3.2. The aims of national noise policy, as defined in the NPSE, inform the design principles of the Project to achieve environmental noise and vibration objectives, while taking into account the guiding principles of sustainable development. These aims are:

- “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".

8.3.3. The principles defined for the assessment of noise are applied to the assessment of vibration. The term 'noise' generally refers to unwanted sound.

8.3.4. The designer will follow the principle of Best Practicable Means in the design and construction of the Project as defined by Section 72, Part III, Control of Pollution Act 1974. This includes the implementation of mitigation measures to minimise adverse noise effects of the Project as far as sustainable. This is consistent with the second aim of government noise policy as set out above.

8.3.5. At the earliest stages of the design, noise and vibration will be taken into consideration in the location of noise sources in relation to sensitive receptors within the context of other engineering and environmental constraints. This would apply to construction compounds, the permanent railway or road alignments, depots, and stationary systems.

8.3.6. Consideration will next be given to the potential to minimise noise at source during the construction and operational phases where minimum separation distances to avoid adverse effects cannot be achieved. Screening distances where adverse noise and vibration effects may occur will be developed as further information about the operation of the railway and detail about construction activities become known. The reduction of noise or vibration at source has the advantage of reducing noise effects at all receptor locations and in communities, thus contributing to meeting the second aim of the NPSE.

8.3.7. Once the sources of noise and vibration have been controlled as far as reasonably practicable, steps will be taken to avoid significant adverse effects or to mitigate and minimise adverse effects by the use of bunds and noise barriers to control the propagation of noise and trenches to control the propagation vibration to the receptors.

8.3.8. Finally, where other options to avoid significant adverse effects have been exhausted, mitigation at the property will be considered.

8.4. Code of construction practice

8.4.1. Construction work can be one of the main causes of environmental impact. A draft CoCP will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

8.4.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic environment assets. The environmental assessment of noise and vibration impacts will assume that these measures will, as a minimum, be

implemented. The measures will represent a best practice approach and are generic to most construction activity for a Project of this nature.

8.4.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on noise and vibration may include the following generic categories:

- Community relations;
- Timing of construction works and working hours;
- Construction site layout and good ‘housekeeping’;
- Construction traffic routes and the maintenance of the surfaces of access and haul routes;
- On-site working practice and amelioration;
- Selection and operation and siting of construction plant;
- Hoarding, fencing, screening and lighting;
- Site access;
- Pollution prevention measures;
- Investigation and reporting;
- Pre-emptive environmental surveys to guide on-site activities;
- Demolition;
- Selection and management of materials;
- Workplace travel plans;
- Site specific measures; and
- Monitoring requirements.

8.4.4. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

9. Evaluating significance

9.1.1. The EIA is required to identify likely significant effects and consider the mitigation to prevent, avoid or reduce effects to a minimum.

9.1.2. The significance of effect due to a temporary or permanent noise and vibration impact is based on the comparison of the predicted level of impact with appropriate threshold values for the type of receptor accounting for factors such as the duration of the impact, frequency of occurrence, time of day or resulting change relative to baseline.

9.1.3. The sensitivity of a receptor to a given type of noise or vibration impact, under given conditions (e.g. daytime or night-time), is accounted for by applying specific threshold values for defined conditions, rather than by assigning sensitivity.

9.1.4. The assessment of noise and vibration effects will follow the policy and guidance set out in the NPSE with regard to adverse effects of noise on health and quality of life. This involves the identification of the 'no observed effect level' (NOEL), 'lowest observed adverse effect level' (LOAEL), the 'significant observed adverse effect level' (SOAEL) and the 'unacceptable adverse effect level' (UAEL). The equivalent approach will also be taken for vibration.

9.1.5. The PPGN provides guidance on the effects of noise exposure, relating these to the perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL, SOAEL and UAEL.

9.1.6. PPGN identifies the NOEL as the level below which no adverse effect on health and quality of life can be detected:

- "noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life."

9.1.7. PPGN identifies the LOAEL as the level above which adverse effects on health and quality of life can be detected:

- "noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; 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."

9.1.8. PPGN identifies the SOAEL as the level above which significant effects on health and quality of life occur:

- "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. Quality of life diminished due to change in acoustic character of the area."

9.1.9. PPGN identifies the UAEL as the level at which significant adverse effects on health and quality of life are to be prevented:

- "Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory."

9.1.10. For the Project, where noise or vibration exceeds LOAEL, steps will be taken to limit the effect, and to avoid exceedances above SOAEL in accordance with national policy. In line with the approach adopted by the government in recent decisions on other transport infrastructure projects, means for avoiding SOAEL may include the provision of noise insulation and/or temporary rehousing where appropriate. The government has recognised that SOAEL is aligned with established noise insulation thresholds. Exceedances above UAEL should be prevented.

9.1.11. The noise and vibration assessment approach for individual dwellings or on a community basis: interaction between government policy and guidance, and EIA requirements (based on the noise hierarchy table presented in PPGN) is given in Table 4. The NOEL is not defined as it is considered that the LOAEL will be sufficiently similar.

Table 4 – Application of government policy in assessing significance of effects due to noise and vibration impacts.

	Government noise policy and practice and guidance			EIA		Mitigation	
← Increasing level of noise or vibration	**Perception**	**Effect**	**Action**	**Assessment**	**Effect**	**Scheme**	**Receptor**
	Not noticeable	No effect	No specific measures required	Special cases only	No adverse effect	Special cases only	None
	Noticeable and not intrusive	No observed adverse effect	No specific measures required				
	LOAEL						
	Noticeable and intrusive	Observed adverse effect	Mitigate and reduce to a minimum	Noise level change + contextual significance	Change in noise level may cause adverse effect on acoustic	Maximise mitigation as far as sustainable – take all reasonable steps to minimise	None

		increasingly likely		criteria (see paragraph 9.1.13)	character. This may be considered a likely significant effect in EIA terms on a community basis	and mitigate adverse effects	
	SOAEL						
	Noticeable and disruptive	Significant observed adverse effect very likely	Avoid	Exceeding SOAEL – likely significant effect	Likely Significant adverse effect on each receptor	Maximise mitigation as far as sustainable	Noise insulation
	Noticeable and very disruptive	Unacceptable adverse effect	Prevent	Exceeding UAEL – each receptor is a significant effect			Prevent at source or offer to rehouse

9.1.12. Table 5 presents the relevant threshold values for the assessment of impacts at human receptors. All airborne noise levels are defined as free field values except where stated.

Table 5 – Application of assessment criteria for human receptors.

	Impact	Receptor type	LOAEL	SOAEL	UAEL
Construction activities and maintenance of railway infrastructure during operation	Airborne noise (1)	Residential	65 dB $L_{Aeq,12h\ day}$ 55 dB $L_{Aeq,4h\ evening}$ 45 dB $L_{Aeq,8h\ night}$	75 dB $L_{Aeq,12h\ day}$ 65 dB $L_{Aeq,4h\ evening}$ 55 dB $L_{Aeq,8h\ night}$	85 dB $L_{Aeq,12h\ day}$ 75 dB $L_{Aeq,4h\ evening}$ 65 dB $L_{Aeq,8h\ night}$
	Ground-borne vibration (2)	Residential	PPV 1.0 mm/s	PPV 3.0 mm/s	PPV 10.0 mm/s
Operational	Airborne noise (railway and road traffic) (3)	Residential	50 dB $L_{Aeq,0700 – 2300}$ 40 dB $L_{Aeq,2300 – 0700}$	65 dB $L_{Aeq,0700 – 2300}$ 55 dB $L_{Aeq,2300 – 0700}$ 80 or 85 dB $L_{Amax,F}$ façade (4)	74 dB $L_{Aeq,0700 – 2300}$ (5)

	Ground-borne vibration (6)	Residential	PPV 0.3 mm/s VDV_{day} 0.2m/s$^{1.75}$ VDV_{night} 0.1m/s$^{1.75}$	PPV 1.0 mm/s VDV_{day} 0.8m/s$^{1.75}$ VDV_{night} 0.4m/s$^{1.75}$	PPV 10 mm/s (2) VDV_{day} 1.6m/s$^{1.75}$ VDV_{night} 0.8m/s$^{1.75}$
	Ground-borne noise (7)	Residential	35 dB $L_{Amax,S}$	45 dB $L_{Amax,S}$	

(1) The criteria given correspond with the example trigger thresholds given in BS 5228-1 for the determination of eligibility for noise insulation.

(2) The peak particle velocity (PPV) criterion given correspond with the level that can cause complaint in residential environments without prior warning given in BS 5228-2 and the damage criterion for transient vibration for buildings susceptible to damage as given in Deutsches Institut fur Normung (DIN) 4150 'Structural Vibration – Part 3: Effect of Vibration on Structures' (1999). The vibration dose value (VDV) criteria correspond with the upper end of the range of 'Adverse comment probable' in residential buildings.

(3) In order for an adverse effect to be identified and mitigation considered, in addition to Project noise levels being predicted that are in excess of the LOAEL, a sufficient noise change as a result of the Project must also be predicted. For receptors where the Project would contribute to noise levels in excess of the LOAEL, an increase of 3 dB due to the Project in the long-term will be taken as the threshold of an adverse effect; where existing noise levels are in excess of the SOAEL, an increase of 1 dB due to the Project will be taken as the threshold of an adverse effect.

(4) The daytime level of 65 dB $L_{Aeq,0700-2300}$ is considered a SOAEL, which is consistent with the daytime trigger level in the UK Noise Insulation (Railways and other guided systems) Regulations. The night-time level of 55 dB $L_{Aeq,2300-0700}$ is considered a LOAEL, which is consistent with the WHO Night Noise Guidelines for Europe Interim Target. 80 dB $L_{Amax,F}$ where there are more than 20 night-time train pass-bys and 85 dB $L_{Amax,F}$ where there are 20 or fewer night-time train pass-bys.

(5) The criteria given correspond to the levels adopted in the Noise Action Plan Major Railway which defined Priority Locations for the relevant rail authorities to investigate as a priority, and these were where noise levels are at least 73 dB $L_{Aeq,18h}$. The level of 73 dB $L_{Aeq,18h}$ is equivalent to a level of 74 dB $L_{Aeq,16h}$. The UAEL at night has not been assigned as there is currently insufficient guidance available to define a level.

(6) An initial assessment will be undertaken considering vibration using the PPV descriptor, since the effects at certain levels of vibration are better described for this index. The criteria given correspond with levels likely to perceptible or cause complaint in residential environments as presented in BS 5228-2. If potential significant effects are identified from the PPV value and also considering the number of events, then the impacts may also be investigated using the VDV index which is more appropriate for a continuous exposure to vibration. The VDV criteria given correspond with the ranges for adverse comment presented in BS 6472:2008.

(7) Near the centre of any dwelling room. More stringent criteria are expected to apply to theatres, recording studios, courts, lecture theatres and auditoria.

9.1.13. Where the predicted levels of noise or ground-borne vibration exceed the relevant SOAEL value in Table 5, then a likely significant adverse effect will be reported for each affected receptor. For residential receptors, the likely

significant effects on a community basis will be determined where the predicted noise or ground-borne vibration level exceeds the relevant LOAEL but is less than the relevant SOAEL values in Table 5 and taking into account contextual significance criteria factors such as:

- Type of effect being considered (e.g. annoyance);
- The magnitude of the predicted noise level compared to the relevant LOAEL and SOAEL values;
- The baseline environment in terms of the absolute level and character;
- The number and grouping of receptors subject to noise effect and noise change;
- Any unique features of the baseline environment or the Project;
- The potential combined impacts of sound and vibration; and
- The effectiveness of mitigation through design or other means.

9.1.14. Ground-borne vibration may also affect buildings and structures that are not human receptors but which may be susceptible to cosmetic or structural damage. Suitable criteria will be applied with reference to relevant standards and guidance including BS 5228-2, DIN 4150 'Structural Vibration – Part 3: Effect of Vibration on Structures' (1999) and the Association of Noise Consultants Guidelines 'Measurement and Assessment of Ground borne Noise and Vibration' (2020).

9.1.15. The Project may result in temporary and permanent beneficial changes to the noise climate. For example:

- Temporary or permanent closure or realignment of a major road resulting in a reduction in the exposure of sensitive receptors to road traffic noise; and
- The installation of a permanent acoustic barrier alongside an existing section of railway to be used by the Project resulting a reduction of in the exposure of sensitive receptors to rail traffic noise.

9.1.16. Beneficial impacts will be assessed using the scale set out in Table 6 and moderate impacts or greater are considered to be Significant. This will be considered on a case by case basis, taking into account overall baseline ambient noise levels at the sensitive receptor and whether the reduction in noise from an existing source or sources will be effective in reducing overall levels.

Table 6 – Magnitude of impact of changes in airborne noise.

Impact magnitude	Short term noise change	Long term noise change
Major	Greater than or equal to 5.0 dB	Greater than or equal to 10.0 dB
Moderate	± 3.0 < 4.9 dB	± 5.0 < 9.9 dB
Minor	± 1.0 < 2.9 dB	± 3.0 < 4.9 dB

Impact magnitude	Short term noise change	Long term noise change
Negligible	0.0 < ± 0.9 dB	< ± 2.9 dB

9.1.17. Permanent noise impacts from stationary systems (e.g. substations, depot plant, station PAVA system overspill at new or altered stations), systems at new or altered stations, will be assessed using the methodology described within BS 4142 in the case of impacts on dwellings. For non-residential receptors, suitable criteria will be applied with reference to relevant standards and guidance such as BS 8233 (2014), British Council for Offices 'Specification for Offices' (2019) and the Education Funding Agency Building Bulletin 93 'Acoustic Design of Schools' (2014).

9.1.18. The potential impact from temporary changes to the traffic on the road network (e.g. due to diversions, temporary realignments and additional traffic) will also be assessed. This will be calculated in accordance with methodologies contained within CRTN (Department of Transport and Welsh Office, 1988) and following the assessment principals within DMRB LA 111 (Highways England et al, 2020).

9.1.19. Bespoke criteria for noise and vibration are expected to apply in the case of some sensitive receptors such as the Mullard Radio Astronomy Observatory and research facilities south of Cambridge. These will be agreed in consultation with the relevant stakeholders.

9.1.20. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigations which are pertinent to addressing the repercussions of climate change will be identified and reported within the sound, noise and vibration chapter of the ES.

10. Proposed scope

10.1.1. A summary of the impacts scoped in and out of the sound, noise and vibration assessment are set out in Table 7 below. Further information on the impacts scoped out of the sound, noise and vibration assessment is provided in Appendix A.

Table 7 – Elements scoped in or out of further assessment.

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Baseline noise survey	✓	✓	✓	✓	✓	✓	✓	✓
Baseline vibration survey	✓	✓	✓	✓	✓	✓	✓	✓
Temporary airborne noise and ground-borne vibration from construction activities	✓	✓	✓	✓	✓	✓	✓	✓
Temporary airborne noise from construction road traffic	✓	✓	✓	✓	✓	✓	✓	✓
Temporary ground-borne vibration from construction road traffic	X	X	X	X	X	X	X	X
Temporary airborne noise and ground-borne vibration from construction rail traffic	✓	✓	✓	✓	✓	✓	✓	✓
Permanent airborne noise and ground-borne vibration from operational rail traffic	✓	✓	✓	✓	✓	✓	✓	✓
Permanent airborne noise	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
and ground-borne vibration from operational maintenance activities								
Permanent airborne noise from operational road traffic	✓	✓	✓	✓	✓	✓	✓	✓
Permanent ground-borne vibration from operational road traffic	X	X	X	X	X	X	X	X
Permanent airborne noise from operational fixed plant at depots and substations	✓	✓	✓	✓	✓	✓	✓	✓
Permanent airborne noise from operational fixed plant associated with station PAVA	✓	✓	✓	✓	✓	✓	✓	✓
Temporary and permanent airborne noise due to horns/audible warning devices	X	X	X	X	X	X	X	X

Intensification of railway lines on the wider network

10.1.2. The assessment of impacts due to the movement of trains on the wider network will be considered as appropriate.

11. Assumptions and risks

11.1. Assumptions

11.1.1. The EIA must set out any limitations encountered, or assumptions made as part of the assessment process. At this stage, the following limitations and assumptions have been identified for the purposes of the proposed scope and methodology for the sound, noise and vibration assessment:

- Surveys of baseline noise and vibration along the extents of the Project will be carried out to inform the EIA;
- It is assumed that the input data for the noise model concerning the noise from the trains in use are readily available from within the CRN. If these data are not available, then the assessment method would describe how the data has been obtained; and
- Input data for the noise generated by stationary trains are not contained within the CRN or any other official published documents. This is a limitation in that these data will need to be sourced and potentially, assumptions made.

11.2. Risks

11.2.1. The measurement and modelling of noise and vibration involves a degree of uncertainty. Best practice is followed to minimise uncertainty by managing factors which influence the outputs of modelling and measurements. This includes:

- The use of calibrated monitoring equipment and appropriate and regular checking of the sensitivity of the measurement system;
- The careful review of survey results and the exclusion of data that has been affected by extraneous events; and
- The validation of modelling including the traffic modelling used to inform road traffic noise calculations.

11.3. Opportunities

11.3.1. The mitigation of operational airborne noise may be achieved through screening provided by buildings and landscaping earthworks. For example, false cuttings can be effective in reducing the spread of rolling noise by breaking line of sight to the wheel/rail interface, but this requires adequate space and availability of materials for earthworks. This type of solution would also provide more desirable visual impacts than the introduction of lineside barriers.

APPENDIX A

Aspects and matters proposed to be scoped out

Ground-borne vibration from road traffic
The impact from vibration caused by vehicles using a road is recommended to be scoped out within DMRB LA 111.

Horn noise
Noise from train horns sounded at whistle boards used at footpath crossings or to give warnings to personnel working at the track side are required for safety reasons. Consequently, these noise impacts are unavoidable but are short in duration and will generally result in a minor contribution to the daytime and night-time L_{Aeq} noise levels. Furthermore, train drivers are instructed not to use horns at whistle boards during the Network Rail Night Time Quiet Period between midnight and 06:00, except in emergencies. Therefore, train horn noise is not expected to result in significant environmental effects. The elimination of track crossings and the sensitive siting of whistle boards will be undertaken where feasible and in compliance with relevant safety requirements.

Audible warning devices
Airborne noise is generated by audible warning devices used at level crossings and around train doors during opening and closing, which are required for safety reasons. The level and spatial extent of noise generated by level crossing sounders are set to be sufficiently audible to crossing users. In similarity to horn noise, these impacts are unavoidable, short in duration and lower in magnitude compared with airborne noise from train movements. However, the design will seek to minimise the impact of audible warning devices on noise-sensitive receptors.

EWR-MWJV Technical Partner

Routewide - Environmental - EIA Scoping Method Statement – Traffic & Transport

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS) (May 2024)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on traffic and transport (T&T) and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The T&T assessment will assess the impacts on journeys and access and consider how the Project could affect the amenity and ability of people in making journeys and getting to their destinations. It will consider changes in journey times and journey length for users of roads, footpaths, and public rights of way (PRoW). This includes motorised users such as drivers and

[1] https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf

passengers of vehicles including cars, Heavy Good Vehicles (HGVs), and buses; and non-motorised users (NMU) such as walkers, cyclists, and horse riders. Impacts on rail passengers and rail freight, severance of communities, perceptions of safety (fear and intimidation) and pleasantness of journeys are also assessed.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
AADT	Annual average daily traffic
ATC	Automatic traffic counts
CoCP	Code of construction practice
DCO	Development consent order
DfT	Department for Transport
DMRB	Design manual for roads and bridges
ECML	East Coast Main Line
EIA	Environmental impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
HGV	Heavy goods vehicle
IEMA	Institute of Environmental Management and Assessment
LNR	London Northwestern Railway
MCTC	Manual classified turning counts
MML	Midland Main Line
NMU	Non-motorised users
NNNPS	National Networks National Policy Statement
NSIP	Nationally significant infrastructure project
ORR	Office of rail and road
PRoW	Public rights of way

Abbreviation	Definition
T&T	Traffic and transport
TA	Transport assessment
TAG	Transport analysis guidance
WAML	West Anglia Main Line
WCML	West Coast Main Line

3. Relevant standards and guidance

3.1. Guidance

3.1.1. The assessment of T&T effects will be informed by the following guidance:

- Design manual for roads and bridges (DMRB), 'LA 112 Population and human health' (Highways England, 2020);
- DMRB, 'LA 104 Environmental assessment and monitoring' (Highways England, 2020);
- DMRB, Volume 11 – Environmental assessment, section 3, part 8 – pedestrians, cyclists, equestrians, and community effects [now withdrawn] (Highways Agency, 1993a);
- Guidelines for the environmental assessment of road traffic, Institute of Environmental Assessment (IEA) Guidelines (1993);
- Environmental assessment of traffic and movement, Institute of Environmental Management and Assessment (IEMA) Guidelines (2023);
- Transport analysis guidance (TAG) (Department for Transport (DfT), various publication dates); and
- Guidance on travel plans, transport assessments and statements (Ministry of Housing, Communities and Local Government, 2014).

3.2. Policy

3.2.1. The assessment will take account of relevant national, regional and local policies and strategies. These will include:

National Policy

- National Networks National Policy Statement (May 2024).
- National Infrastructure Delivery Plan 2016-2021, March 2016
- National Planning Policy Framework, December 2023
- Transport Investment Strategy, July 2017
- Gear change: a bold vision for cycling and walking July 2020 (Active Travel England).
- DfT Circular 01/22 Strategic Road Network and the delivery of sustainable development

Regional and Local Policy

- England's Economic Heartland (EEH) Regional Transport Strategy: Connecting People, Transforming Journeys (2021).

Local Transport Plans (LTPs):

- Oxfordshire Local Transport and Connectivity Plan, July 2022
- Buckinghamshire's Local Transport Plan 4, December 2016
- Mobility Strategy for Milton Keynes 2018-2036 (LTP 4) Mobility for All, March 2018

- Central Bedfordshire Local Transport Plan 3, 2011
- Bedford Borough Local Transport Plan 2011 to 2021 (2011) and supporting strategy documents
- Cambridgeshire and Peterborough Combined Authority Local Transport and Connectivity Plan, 2020.

Local Plans (to include any that are in the process of being updated):

- Oxford Local Plan 2036 (adopted June 2020)
- Cherwell Local Plan 2011-2031 (adopted July 2015)
- Vale of Aylesbury Local Plan 2013-2033
- Milton Keynes Council: Plan MK 2016 – 2031 (adopted March 2019)
- Central Bedfordshire Local Plan 2015 - 2035 (adopted July 2021)
- Bedford Borough Local Plan 2030 (adopted January 2020)
- South Cambridgeshire Local Plan (adopted (September 2018)
- Huntingdonshire's Local Plan to 2036 (adopted May 2019)
- Cambridge Local Plan 2018 (Adopted October 2018).
- Local Policies as contained in Supplementary Planning Documents

4. Establishing the baseline

4.1. Documentary records

4.1.1. The following sources of information will be used to establish the baseline for the purpose of the T&T assessment and have informed the description of the baseline environment within the study area in this Method Statement:

- Physical characteristics of the road network from site visits, OS mapping and local highway authority network plans;
- Recent observed traffic counts on the road network from National Highways, DfT and relevant local authorities;
- Additional baseline data collected to include traffic counts and NMU surveys;
- Information on bus services, routes, and frequencies from relevant local authorities and bus service operators;
- Physical characteristics of the NMU network and public rights of way (PRoW) and associated facilities, including:

- National Trail routes sources from the National Trails website;
- National Cycle Network routes sourced from the Sustrans website;
- Important regional routes from the long-distance walkers' association website and relevant local authorities; and
- Other PRoW from relevant local authorities.

- Physical characteristics of the railway network and stations and their concourse facilities, from Network Rail and train operators;
- The current rail timetable on relevant lines/routes, from Network Rail and train operators;
- Current passenger demand at railway stations on relevant lines/routes, from the office of rail and road (ORR); and
- Committed development plans and transport interventions covering the temporal scope of the assessment, from local authorities and government (linked to the development of the Oxford to Cambridge Arc Spatial Framework) to understand how and where the current baseline may change in the short to medium term.

4.2. Surveys

4.2.1. The need and reliability of existing and potential data sources has been identified and survey scopes have been developed. Surveys have been scoped in four tranches including traffic count surveys, level crossing surveys, NMU surveys, and rail station surveys, with new data collected in 2023 and 2024.

4.2.2. A review of existing traffic count data has been undertaken to identify additional locations required for surveys. The review of traffic count data has been based on the following sources:

- Cambridgeshire County Council traffic surveys;
- South-east Regional Traffic Model surveys;
- DfT Traffic Monitoring Surveys; and
- WebTRIS surveys.

4.2.3. The scope of the surveys was defined after consideration given to the following elements:

- Additional clarity available since the initial scoping stage on extents and details of the Project;
- The ongoing development of a traffic modelling approach to support the DCO application prior to confirming survey requirements; and
- The development of the scope for the transport assessment (TA) and environmental assessment.

4.2.4. The following types of surveys have been undertaken:

Table 2 – Surveys undertaken.

Survey Type	Summary
Automatic traffic counts (ATCs)	ATCs to count flows of traffic along links of the highway.
Manual classified turning count (MCTC)	MCTC surveys, also referred to as simply classified turning counts surveys, are to be undertaken at several junctions in the vicinity of the crossings to understand turning movements.
Level Crossing	Census, which measure: • The number of road vehicles (including cyclists) using the crossing by direction (and two-way) and classification (following the same formats as for manual classified counts); • Type of foot traffic using the crossing by direction and classification (including cyclist if on the footpath); and • The number of trains passing by direction.
	Closure of the crossing, which measures: • Barrier open and closure times (i.e., the time of changing traffic signals, the time when barrier is in the raised position allowing pedestrian and vehicle movements; and the time when the barrier is lowered) • Duration the road was closed for; and • The minimum, maximum and average road closure times.
	Blocking back lengths, which measure downstream congestion blocking vehicles at the crossing from proceeding.
	Queue lengths, which measure length of vehicle queues from the barriers at the start of green light.

	Speed surveys, ATCs and MCTCs.
Interviews & Stations Entry/Exit	Entries and exits: a count of people entering/exiting the station for each entrance by direction. using digital cameras.
	Interviews: questionnaires undertaken at existing stations to understand its user level, and how the users travel to and from the station.
Station Car Park	To understand the capacity and utilisation of existing station car parks.
Station ATC and MCTCs	Station ATCs and MCTCs are linked to the nearby car park surveys for quality control and to understand link and junction capacity at station approaches.
NMU/ProW	NMU/ProW surveys provide information on NMU on PRoW paths. Depending on location and dates instructed for the survey they intend to inform commuter or leisure behaviour.

4.2.5. Details of survey locations will be made available.

4.3. Modelling

4.3.1. Traffic modelling will be undertaken to assess impacts upon the highway network in relation to delay and congestion. A route-wide corridor highway model is being produced for the Project which will utilise the survey data discussed in the previous section. The modelling will cover the construction and operational phases of the Project, with the following scenarios to be assessed:

Table 3 – Modelling assessment years.

Modelling Scenario	Assessment Year
Baseline Year	2023
Construction Year (peak)	2032
Opening Year	2034
Future Year (operational)	2049

4.3.2. For each of the scenarios (except for baseline) there will be information produced for the year itself without Project demand (i.e. no construction or operational impacts) called reference years, then additional scenarios firstly 'with Project demand' and then a third scenario to include 'with Project demand and with mitigation'.

4.3.3. By comparing the reference years to the with demand scenarios, the impact that the Project has upon the network within an assessment year can be understood. Mitigation will be developed and tested within the model to determine if the applied mitigation addresses the adverse impacts identified and to identify any residual impacts.

4.3.4. The TA will report this exercise in detail. For the purposes of the ES, outputs from the modelling will be used to determine where there have been changes in traffic flow to inform assessments on significance, as detailed in Section 9.

4.4. Study area

4.4.1. The study area for the construction and operational assessments is not yet fixed. It will be based upon the spatial extent of the highway models which will provide information on traffic flows and how these will change in response to changes in demand due to the Project.

4.4.2. The T&T assessment will only be focussing upon links within this area which experience changes in traffic flow aligned to specific thresholds as further detailed in the rest of this Method Statement.

4.4.3. In determining the study area, due cognisance will be made to the 2023 IEMA guidance which states that highway links where traffic flows (or heavy goods vehicle (HGV) flows) will increase by 30% or more will be included in the assessment, being a reasonable threshold as a starting point in establishing the study area. The guidance also recommends including any

other link or location where it is felt specific environmental or population sensitivities may occur and traffic flows have increased by 10% or more.

4.4.4. When the assessment is undertaken, the extent of the highway model will be of a sufficient size to capture impacts and effects caused by:

- Construction traffic movements;
- Temporary or permanent closures, restrictions, and diversions of roads and PRoW during construction of the Project;
- Permanent closures, restrictions, and diversions of roads and PRoW during operation of the Project; and
- Changes in rail passenger demand[2] (increases in patronage on the railway) and its associated impacts (such as increases in travel to/from stations).

4.4.5. The study area for the assessment will be determined based on the following criteria:

Table 4 – Study area criteria.

Assessment	Study area
General – applies to whole route except as specified:	
2032 Construction year assessment (will include temporary and permanent effects)	The study area for the construction assessment will evolve as the detailed construction programme for the Project is developed. It will be defined based on the following elements of the Project with reference to where significant effects are likely to occur: • Designated HGV and abnormal indivisible load routes between construction sites and strategic road network junctions; • Links on the highway network which experience an increase in traffic flow (as per thresholds specified in Section 9) when the Project (construction) demand is considered; • Roads directly impacted by construction activities (for example full closures, lane closures, speed/width restrictions); • Roads indirectly impacted by construction activities (for example where activities lead to traffic diversions to alternative routes, increasing baseline traffic flow); • PRoW impacted by construction activities (for example closures, restrictions, diversions); and • The rail network impacted by construction activities, including stations and station access routes and facilities.
2034 and 2049 Operational year assessments (will include permanent effects)	The study area for the operation assessment will evolve as more information is known on the final design and its likely impact on the transport network. It will be defined based on the following elements of the Project with reference to where significant effects are likely to occur: • Links on the highway network which experience an increase in traffic flow (as per thresholds specified in Section 9) when Project (operational) demand is considered;

[2] It should be noted that rail passenger demand is based on high growth and certain/near certain developments highlighted in local plans only. It does not include developments which are considered dependent upon the Project to be viable.

Assessment	Study area
	• Changes to the operation of the rail network, including stations and station access routes and facilities; • Roads directly impacted by the operation of the Project (for example full closures, lane closures, speed/width restrictions); and • PRoW impacted by the operation of the Project (for example closures, restrictions, diversions).

4.5. Receptors

4.5.1. The main environmental features within the study area include the receptors set out in Table 5.

Table 5 – Summary of relevant baseline features for T&T.

Receptor	Study area
Users of motorised vehicles on the public highway (including buses) – drivers and passengers	The highway network across the entire study area for the whole of the Project from Oxford to Cambridge. During construction, the relevant locations would be likely to be determined by the construction access routes (which have not been identified at this stage) and the location of temporary or permanent road closures, restrictions, and diversions. During operation, this would be likely to be associated with surface access at stations and the location of permanent roads closures, restrictions, and diversions.
Users of the rail network, including passengers and freight	The existing rail network within the study area specifically the Marston Vale Line in the Bletchley to Bedford section, and other stations on the route such as Oxford, Milton Keynes Central, Bedford and Cambridge.
NMU to include walking, wheeling, cyclists and horse riders.	The NMU network and PRoW affected by the Project, in particular PRoW crossing the proposed Project route.

4.6. Consultation

4.6.1. Consultation will be ongoing to inform the assessment of traffic and transport as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

5. Preliminary baseline description

5.1. General description

5.1.1. As noted in the earlier section, the extents of the study area for assessment are yet to be determined for the ES. For the purposes of setting out baseline only, the description is based upon the broad area around the proposed route of the Project. This buffer has been developed based on professional judgement. It is indicative only at this stage and does not mean that T&T impacts occurring more than 10km from the new rail line will be excluded from the EIA study area. As previously noted, the full extent of the T&T study area is limited to the extent of the highway model, but with the assessment only focussing upon links within this area which experience changes in traffic flow aligned to specific thresholds.

5.1.2. This section describes at a high level the main features of the rail and road networks. Details of the bus network and NMU network will be provided in the ES.

5.1.3. The study area is divided into 8 main sections running from west to east. For each area rail passenger demand for stations contained therein and traffic data from key routes are presented. For rail, the latest data from the ORR are presented from 2021-22. These data are compared with pre-pandemic data from 2019-2020. Similarly for traffic data, the latest information available from the DfT is presented for the year 2022. This is compared with pre-pandemic data for 2019.

5.1.4. The sections are:

- Oxford to Bletchley;
- Fenny Stratford to Kempston;
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

5.2. Oxford to Bletchley

Baseline rail network

5.2.1. The baseline rail network can be seen in Figure 27 in the EIA Scoping - Figures.

5.2.2. Historically, the Varsity Line (or Oxford to Cambridge railway) provided a direct rail connection between Oxford and Cambridge via Bletchley and Bedford. However, between Oxford and Bletchley, only the south-western end is in use at present. A two-track connection is provided between Oxford station and the Chiltern Mainline which passes through High Wycombe and Princes Risborough towards London Marylebone. On this western section there are intermediate stations at Oxford Parkway, Islip (not within the Project) and Bicester Village. The Chiltern Mainline continues north-west of the Project route and includes a station at Bicester North. Oxford station is also on the Thames Valley branch line of the Western Route, providing a connection into London Paddington via the Great Western Main Line.

5.2.3. At the western end of this section, Bletchley station provides a stop on the West Coast Main Line (WCML) into London Euston. It is served by trains operated by London Northwestern Railway (LNR) and Southern. Milton Keynes Central station is one stop to the north of Bletchley on the WCML and is expected to be served by a branch of the Project once operational. It is served by trains operated by Avanti West Coast, LNR and Southern.

5.2.4. Passenger demand at stations between Oxford and Bletchley is summarised in Table 6. Over six million passengers used Oxford station in 2022/23 with over one million using Bicester Village and just over half a million using Oxford Parkway. In contrast, Islip station was only used by just over 26,000 passengers in the year, around 70 per day on average.

Table 6 – Passenger demand at stations between Oxford and Bletchley.

Station	Entries and exits **(April 2022 to March 2023)**	**Interchanges (April 2022 to March 2023)**
Oxford	6,581,606	514,180
Oxford Parkway	584,930	0
Islip (not part of the Project)	26,038	2,146
Bicester Village	1,610,596	616
Bletchley	734,210	58,278

Source: Office of Rail and Road - Estimates of station usage | ORR Data Portal

NMU network

5.2.5. Near the stations and in close proximity to the route, there are a number of PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 19 EIA Scoping - Figures.

Bus network serving stations

5.2.6. There are numerous bus services which provide interchange ability at the stations within this section and provide connectivity to the adjacent residential areas.

5.2.7. Oxford Station is served by a range of services across several operators which provide connectivity to locations such as Blackbird Leys, Oxford Parkway, Oxford Science Park, Wantage, Risinghurst, Banbury, Chipping Norton, Witney, Aylesbury, and Thame.

5.2.8. Oxford Parkway Station is served by services with provide connectivity to Oxford, Kidlington, Bicester and Thornhills Park and ride via Oxford's Hospitals.

5.2.9. Bicester Village Station is served by services which provide connectivity to Bicester, Bicester North Station, Bletchley, Milton Keynes, Heyford, Banbury, Buckingham, Upper Arncott, Oxford and JR Hospital.

Highway network

5.2.10. The baseline highway network can be seen in Figure 11 in EIA Scoping - Figures and is described in this section.

5.2.11. The area is mostly rural and connected by single carriageway roads and B roads. The M40 motorway runs north-south between London and Birmingham, crossing the route of the Project to the south of M40 junction 9 and the village of Wendlebury.

5.2.12. Other main roads in the area include the A34 and A41. Together, they provide a connection from Oxford to Aylesbury via Bicester (the A41 crosses the route of the Project via a bridge just to the south-west of Bicester Village station) and the A421, connecting Bletchley with the M40 junction 10 via the A43.

5.2.13. Traffic flows on motorways and major A roads in the study area (recorded as annual average daily traffic (AADT) by the DfT) are summarised in Table 7. This indicates that the M40 and the A34 are the busiest routes – both carried over 70,000 vehicles per day (both directions combined) in 2019. In 2022 both routes had not quite yet recovered to pre-pandemic traffic levels but were within 7%. All routes experienced a reduction in traffic from 2019 to 2022 except for the A40 (north-east of Oxford) with an increase of 14%.

Table 7 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2022) – all vehicles
M40 (north of Merton)	68,746
A34 (north of Islip)	69,523
A41 (north of Wendlebury)	33,104
A421 (north of Little Horwood)	19,941
A40 (north-east of Oxford)	39,481

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.2.14. There is an existing level crossing over the route of the Project at London Road, Bicester, immediately to the north-east of Bicester Village station, with options for this crossing being reviewed as part of the Project. Other level crossings between Bicester Village and Oxford (for example at Mansoor Road, north-west of Oddington, and Mill Lane) have been closed and replaced with overbridges.

5.3. Fenny Stratford to Kempston

Baseline rail network

5.3.1. The baseline rail network can be seen in Figure 28 in EIA Scoping - Figures and is described in this section.

5.3.2. The predominantly two-track line is currently used by passenger services operated by LNR that call at 9 intermediate stations.

5.3.3. Passenger demand at stations between Fenny Stratford and Kempston is summarised in Table 8 (with stations listed from west to east). Eight of the 9 stations listed were used by less than 25,000 passengers per year in 2019/20 (i.e. less than 69 per day on average) with Stewartby the only station not on a main line route where passenger activity exceeded this threshold. Some stations (for example Bow Brickhill, Aspley Guise and Kempston Hardwick) were used by less than 5,000 passengers per year (less than 14 per day on average).

Table 8 – Annual rail passenger demand at stations between Fenny Stratford and Kempston.

Station	Entries and exits (April 2022 to March 2023)	Interchanges (April 2022 to March 2023)
Fenny Stratford	11,350	0
Bow Brickhill	2,228	0
Woburn Sands	24,618	0
Aspley Guise	4,650	0
Ridgmont	11,570	0
Lidlington	11,542	0
Millbrook	6,566	0
Stewartby	72,444	0
Kempston Hardwick	4,458	0

Source: Office of Rail and Road - Estimates of station usage | ORR Data Portal

NMU network

5.3.4. Near the stations and in close proximity to the route, there are a number of PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 20 in EIA Scoping - Figures.

Bus network serving stations

5.3.5. There are numerous bus services which provide interchange ability at the stations within this section and provide connectivity to the adjacent residential areas. These are summarised as:

- Woburn Sands – Bus stops along the A5130 Newport Road just south-east of the railway station. Services include the 450 Woburn Sands to Central Milton Keynes and FL12 Maulden - Ampthill - Woburn - Milton Keynes;
- Ridgmont – Bus stops located on Station Road adjacent to the railway station. Services to Milton Keynes. Services include 34 Central Milton Keynes, The Point - Ampthill Heights, Wagstaff Way; 47 Tingrith - Ridgmont - Woburn - Eggington - Leighton Buzzard; FL4 Silsoe - Flitwick - Milton Keynes;
- Lidlington – Bus stops located on Station Road and Church Street nearby the station however no regular local bus services serve these stops; and
- Stewartby – Bus stops located on Stewartby Way adjacent to the railway station. C5 Cranfield Connect Cranfield - Stewartby - Wootton Upper School; A1 Kempston - Stewartby- Cranfield - Milton Keynes.

Highway network

5.3.6. The baseline highway network can be seen in Figure 12 in EIA Scoping Figures and is described in this section.

5.3.7. The primary traffic routes in the area are as follows:

- The M1, running north-south and crossing the route of the Project just south of M1 junction 13 and west of Ridgmont station;
- The A5, connecting Luton and Dunstable with Milton Keynes and Towcester and crossing the route of the Project via an underbridge between Fenny Stratford and Bow Brickhill stations;
- The A421, connecting Bletchley and Milton Keynes with Bedford, which runs broadly parallel and for the most part to the north of the Project route, but crosses the route via an overbridge on the southern edge of Bedford north of Kempston Hardwick station;
- The A6, connecting Luton with Bedford, which crosses the Project route at Bedford St Johns station; and
- The A509/A422/A428/A4280 provides an alternative road connection between Milton Keynes and Bedford further to the north of the A421 and does not cross the Project route.

5.3.8. There are numerous other B roads and unclassified roads in the study area between Bletchley and Bedford. There are also multiple locations with level crossings providing road access across the railway, for example at Fenny Stratford, Bow Brickhill, Browns Wood, Pony (near Old Farm Park), Woburn Sands, Aspley Guise, Ridgmont, Lidlington, Marston, Millbrook, Stewartby, Wootton Broadmead, Kempston Hardwick, and Woburn Road. In addition, private crossings of the railway exist at Woodley's Farm (Woburn Sands) and Berry Lane, Long Leys and Matey Boys (all in Aspley Guise).

5.3.9. Traffic flows on motorways and major A roads in the study area (recorded as AADT by the DfT) are summarised in Table 9. Unsurprisingly, the M1 is the busiest traffic route in this section carrying almost 108,500 vehicles per day in both directions combined in 2022. Away from the motorway network, the busiest traffic route is the A421, which carried 64,000 vehicles in 2022.

Table 9 – Annual Average Daily Traffic.

Road name (location)	Daily two-way traffic flow (2022) - vehicles
M1 (east of Milton Keynes)	108,492
A421 (south of Bedford)	63,944
A5 (east of Bletchley)	41,337
A421 (north of Lower End)	35,643
A6 (south of Bedford)	17,281
A428 (west of Bedford)	15,741
A422 (west of Bedford)	8,328

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.4. Bedford

Baseline rail network

5.4.1. The baseline rail network can be seen in Figure 29 in the EIA Scoping - Figures and is described in this section.

5.4.2. Bedford St Johns is the next stop east after Kempston Hardwick. This station is located on a single-track railway as it changes from a two-tracked railway to the south of the station before it joins with the Midland Main Line (MML) at Bedford Station.

5.4.3. Bedford station is a stop on the MML into London St. Pancras. Train services are provided by both East Midlands Railway and Thameslink.

Table 10 – Bedford entries and exits.

Station	Entries and exits (April 2022 to March 2023)	Interchanges (April 2022 to March 2023)
Bedford St Johns	141,586	0
Bedford	3,035,712	40,131

Source: Office of Rail and Road - Table 1410

NMU network

5.4.4. Near the stations and in close proximity to the route, there are a number of PRoWs which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 21 in the EIA Scoping - Figures.

Bus network serving stations

5.4.5. There are numerous bus services which provide interchange ability at the stations within this section and provide connectivity to the surrounding residential areas.

5.4.6. For Bedford St Johns, the closest bus stop to the station is on the A600 Kingsway (approximately 500m walk). Services from this station provide connections to destinations including Flitwick, Fenlake, Shortstown Hitchen, Ampthill, Biggleswade, Luton and Meppershall.

5.4.7. For Bedford, the local bus services operate along the A5181 Ashburnham Road with stops located on both sides of the road close to the entrance. The northbound stop includes three bus stands (two of which are sheltered) as part of a small interchange facility. The southbound stop is a standard stop with no shelter. Services from this station provide connections to Northampton and Rushden.

Highway network

5.4.8. The baseline highway network can be seen in Figure 13 in the EIA Scoping - Figures and is described in this section.

5.4.9. The route passes through the urban area of Bedford mainly along the route of the existing railway north to south.

5.4.10. The main road connection linking Bedford and Cambridge is the A421 and A428 via the A1 at Wyboston, which also crosses the Project route at multiple locations. The A603 also provides a connection between Bedford and Sandy to the south. The Project route would also cross the A6 and the A4280 to the north of Bedford, and the A10 at Harston.

5.4.11. Traffic flows on motorways and major A roads in the study area (recorded as AADT by the DfT) are summarised in Table 11. The A4280 carried just under

11,600 vehicles per day through the study area in 2022 in both directions combined and the A421 carried around 35,000 in 2022.

Table 11 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2022) - vehicles
A4280 (East of Bedford)	11,586
A421 (North of Great Barford)	35,299
A6/A5141 (north of A421)	31,856
A5141 Kempson Road south of Ouse	16,726
A4280 west of railway (Broham Road)	15,637
A6 Great Ouse Way	16,938

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.5. Clapham Green to Colesden

Baseline rail network

5.5.1. There is no existing railway network or stations between Clapham Green and Colesden. The existing MML runs to the east of Clapham alongside the A6.

NMU network

5.5.2. Near the route, there are several PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 22 in the EIA Scoping -Figures.

Highway network

5.5.3. The baseline highway network can be seen in Figure 14 in the EIA Scoping - Figures. and is described in this section.

5.5.4. North-south, the A6 runs to the west of Clapham connecting to Bedford to the south and the B660 runs north-south between Clapham Green and Colesden. East-west, the A4280 runs to the south of Clapham and joins the A421 south of Coldesden.

Table 12 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2022) - vehicles
B660 North of Brickhill* 2019 data	5,557
A421	35,229
A6	16.938

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.6. Roxton to east of St Neots

Baseline rail network

5.6.1. The baseline rail network can be seen in Figure 31 in the EIA Scoping - Figures. and is described in this section.

5.6.2. The East Coast Main Line (ECML) passes through the study area in this section with an existing station at St Neots and crosses the route of the Project close to Roxton. St Neots station is served by Thameslink with additional services by Great Northern during the peaks.

Table 13 – Annual rail passenger demand at stations between Roxton to east of St Neots.

Station	Entries and exits (April 2022 to March 2023)	Interchanges (April 2022 to March 2023)
St Neots	886,088	0

Source: Office of Rail and Road - Estimates of station usage \| ORR Data Portal

NMU network

Near the route, there are several PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 23 in the EIA Scoping - Figures.

Baseline highway network

5.6.3. The baseline highway network can be seen in Figure 15 in the EIA Scoping - Figures and is described in this section.

5.6.4. North-south, the A1 bypasses both Sandy and St Neots; and the A1198 links Royston and Huntington. East-west, the A428 crosses the Project route at multiple locations within this area.

5.6.5. Traffic flows on motorways and major A roads in the study area (recorded as AADT by the DfT) are summarised in Table 14. The A1 carried just under 42,300 vehicles per day through the study area in 2022 in both directions combined and the A428 (south-east of St Neots carried around 20,000 in 2022.

Table 14 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2022) - vehicles
A428 (south-east of St Neots)	19,639
A1 (west of St Neots)	42,258

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.7. Croxton to Toft

Baseline rail network

5.7.1. There is no existing railway network or stations between Croxton and Toft.

NMU network

5.7.2. Near the route, there are several PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 24 in the EIA Scoping - Figures.

Highway network

5.7.3. The baseline highway network can be seen in Figure 16 in the EIA Scoping - Figures. and is described in this section.

5.7.4. North-south, the A1198 links Royston and Huntington and east-west, the A428 runs to the north of Croxton and Toft.

5.7.5. East-west, the A428 crosses the Project route at multiple locations within this area.

5.7.6. Traffic flows on motorways and major A roads in the study area (recorded as AADT by the DfT) are summarised in Table 15. The A1198 carried just above 6,500 vehicles per day through the study area in 2022 in both directions combined and the A428 (south-east of St Neots carried around 20,000 in 2022.

Table 15 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2022) - vehicles
A428 (south-east of St Neots)	19,639
A1 (east of St Neots)	42,258
A1198 (west of Cambourne Park)	6,525

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.8. Comberton to Shelford

Baseline rail network

5.8.1. The baseline rail network can be seen in Figure 33 in the EIA Scoping - Figures and is described in this section.

5.8.2. There are two existing rail lines which pass through this section of the study area.

5.8.3. The Shepreth Branch Line links Thameslink services between Cambridge and London King's Cross. There are no stations for this line within the study area.

5.8.4. The West Anglia Main Line (WAML) passes through the study area with an existing station at Shelford. This station is served by Great Anglia with services between Cambridge and London Liverpool Street. Shelford is not a Project station and will not be served by the Project.

Table 16 – Annual rail passenger demand at stations between Comberton to Shelford.

Station	Entries and exits (April 2022 to March 2023)	Interchanges (April 2022 to March 2023)
Shelford (Cambs)	170,262	0

Source: Office of Rail and Road - Estimates of station usage \| ORR Data Portal

NMU network

Near the route, there are several PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in]. Figure 25 in the EIA Scoping - Figures.

Highway network

5.8.5. The baseline highway network can be seen in Figure 17 in the EIA Scoping - Figures and is described in this section.

5.8.6. The key north-south roads through the area, which would cross the route of the Project, include the M11. East-west, the A603 connects Cambridge with the M11 junction 12 and continues south-west.

5.8.7. Traffic flows on motorways and major A roads in the study area (recorded as AADT by the DfT) are summarised in Table 17. The M11 carried around 85,800 vehicles per day through the study area in 2022 in both directions combined. The A603 carried nearly 9,000 vehicles per day in 2022.The A1 carried just under 47,000 vehicles per day through the study area in 2019 in both directions combined and the A428 (south-east of St Neots carried around 20,000 in 2022.

Table 17 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2019) - vehicles	Daily two-way traffic flow (2022) - vehicles	% change from 2019 to 2022
M11 (south of Bin Brook - west Cambridge) A428 (south-east of St Neots)	17,996	85,781 19,639	9%
A603 (south-west of Cambridge) A1 (east of St Neots)	46,828	8,903 42,258	-10%

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.9. Cambridge

Baseline rail network

5.9.1. The baseline rail network can be seen in Figure 34 in the EIA Scoping - Figures and is described in this section.

5.9.2. At the eastern end, Cambridge is a stop on both the WAML (providing a connection to London Liverpool Street via Bishop's Stortford) and the Cambridge Line which provides a link, via Royston, to the ECML into King's Cross. Trains on the WAML are operated by Greater Anglia and trains on the Cambridge line are operated by Greater Northern (King's Lynn to King's Cross) and Thameslink (Cambridge to Brighton via St Pancras). Cross Country services between Birmingham New Street and Stansted Airport, and Greater Anglia services to Ipswich, Stansted Airport, and Norwich, all call at the station.

5.9.3. North of its junction with the Cambridge Line at Hitchin, the ECML also passes through the study area in this section with existing stations at St Neots and Sandy and crosses the route of the Project close to Tempsford. These stations are served by Thameslink with additional services by Great Northern during the peaks.

5.9.4. Passenger demand at stations between Bedford and Cambridge is summarised in Table 18 (with stations listed from west to east). Carrying over 7 million passengers per year (19,200 per day on average), Cambridge station was the busiest in the study area considered in this Method Statement in 2021/22. Bedford carried over under 2 million, while St. Neots and Sandy carried nearly 700,000 and just under 400,000 respectively. Like other route sections, a distinct decline in rail travel in 2021/22 can be seen when compared to pre Covid levels in 2019/2020.

Table 18 – Annual rail passenger demand at stations in Cambridge.

Station	2022/2023 Entries/exits	2022/2023 interchanges
Cambridge	9,341,600	481,342

Source: Office of Rail and Road - Estimates of station usage \| ORR Data Portal

NMU network

5.9.5. Cambridge has an extensive network of cycle paths and routes. Near the route, there are several PRoW which provide routes for NMUs. The extent of the NMU network for this section of the study area can be seen in Figure 26 in the EIA Scoping - Figures. There is currently an electric bike and scooter hire scheme being trialled in the city, which at the time of writing is scheduled to end May 2024.

Bus network servicing stations

5.9.6. There are numerous bus services which provide interchange ability at the station within this section and provide connectivity to the wider city and surrounding local areas.

5.9.7. At Cambridge station entrance on Station Place there are nine bus stops with shelters (five northbound, four southbound). Services from this station provide connections to St Ives, Cherry Hinton, Cabraham park and ride, Huntingdon, Addenbrookes, Arbury, Fulborn, Safron Walden Station Street, Haverhill as well as university campus locations.

Highway network

5.9.8. The baseline highway network can be seen in Figure 18 in the EIA Scoping - Figures and is described in this section.

5.9.9. The area is mainly rural except for the towns of Sandy and St Neots. There are three main north-south roads through the area, which would all cross the route of the Project: the M11, which bypasses Cambridge and merges with the A14 to the north-west; the A1, which bypasses both Sandy and St Neots; and the A1198 linking Royston and Huntington.

5.9.10. East-west, the main road connection linking Bedford and Cambridge is the A421 and A428 via the A1 at Wyboston, which also crosses the Project route at multiple locations. The A603 also provides a connection between Bedford and Sandy to the south. The Project route would also cross the A6 and the A4280 to the north of Bedford, and the A10 at Harston.

5.9.11. Traffic flows on motorways and major A roads in the study area (recorded as AADT by the DfT) are summarised in Table 19. The M11 carried close to 80,000 vehicles per day through the study area in 2019 in both directions combined, while the A1 carried just under 47,000 and the A421 and A428 each carried around 35,000. As with the other sections, the impact of the

Covid-19 pandemic on traffic levels in between 2019 and 2022 and change in travel behaviour is very evident on most routes.

Table 19 – Annual average daily traffic.

Road name (location)	Daily two-way traffic flow (2019) - vehicles	Daily two-way traffic flow (2022) - vehicles	% change from 2019 to 2022
A4280 (east of Bedford)	12,976	11,586	-11%
A421 (north of Great Barford)	35,553	35,299	-1%
A428 (south-east of St Neots)	17,996	19,639	9%
A428 (north-west of Cambourne)	35,860	28,651	-20%
M11 (south of Bin Brook - west Cambridge)	79,151	85,781	8%
A1 (east of St Neots)	46,828	42,258	-10%
A1198 (west of Cambourne Park)	7,287	6,525	-10%
A603 (south-west of Cambridge)	10,008	8,903	-11%

Source: Department for Transport - Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

5.10. Future baseline

5.10.1. Changes to the relevant transport conditions may occur in the absence of the Project which are discussed in this section to become a future baseline scenario.

5.10.2. The potential changes in baseline conditions that can be reasonably foreseen will be considered within the T&T assessment. If those changes are expected to alter the conclusions of the assessment as to whether there would be significant environmental effects because of the Project, these will be assessed and reported in more detail, and where appropriate mitigation specified.

5.10.3. The relevant factors to the evolution of the baseline that it is proposed that the T&T assessment considers are:

- Changes to future EWR demand;
- The long-term impacts of the COVID-19 pandemic on travel behaviour, with reference to Transport Analysis Guidance (TAG) Unit M4 'Forecasting and Uncertainty' (DfT, 2019) and the 'Uncertainty Toolkit – TAG Supplementary Guidance' (DfT, 2021), and any updates to those documents that can be practicably considered in the assessment;
- Background population and employment growth, and committed land-use development (defined as 'near certain' or 'more than likely' in TAG); and
- Committed transport-related investment (defined as above based on TAG) on the evolution of the baseline road network (including parking and loading facilities), bus network, rail network, and NMU network (including PRoW).

5.10.4. The status of all development and investment plans in the study area will be confirmed with the relevant planning, highway, and transport authorities

(including national agencies such as National Highways) during the early stages of the T&T assessment.

5.10.5. It is considered that climate change will not have a direct impact on the T&T aspects assessed but may impact indirectly through potential influence on modal choice and advances in technology. Any updates on guidance on this issue will be monitored and where practical, considered in the assessment.

5.10.6. The physical impacts of climate change may impact the project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.10.7. Refer to the climate resilience Method Statement, section 5 for further details on the current and projected future climate.

6. Sources of impact

6.1.1. The proposed scope and method of assessment has been based on the description of the Project set out in the EIA Scoping Report. This includes the flexibility within the design that is to be retained moving forward through, for example, the limits of deviation and the constraints upon that flexibility.

6.1.2. The Project includes works to existing stations, new stations, new railway, works to existing railway, and works to road crossings. The elements of the Project most relevant to T&T during construction would be the location of construction sites, construction traffic routes and freight train paths required (for any movement of construction materials), and any temporary or permanent closures, restrictions, and diversions of roads and PRoW due to the interaction of these elements with road, rail and NMU networks. All these features will be temporary in nature as they are part of the construction activities. The duration of these activities will be taken account when determining whether a feature is permanent or temporary.

6.1.3. During the operation of the Project, elements such as the railway route, the location of new and relocated stations, alterations and closure of existing stations and associated access facilities, and permanent closures, restrictions, and diversions of roads and PRoW are also relevant to T&T because of the interaction of these elements with the road, rail and NMU networks. All operational features are permanent.

6.1.4. Likely sources of impact for T&T therefore include:

- The introduction of new stations and increased patronage of existing ones;
- Temporary or permanent road closures (to include level crossings) and the introduction of diversion routes;
- Closures or diversions of PRoW or NMU routes;
- The introduction of construction compounds to support construction; and
- The introduction of construction traffic on the network on the construction routes.

6.1.5. These elements have been considered in identifying the potential effects of the Project as set out in Section 7.

7. Potential impacts and effects

7.1. Potential impacts

7.1.1. The following types of impacts will be considered within the ES:

- Severance of communities (due to the introduction of new highway or rail links, or the removal of existing highway or PRoW links);
- Changes in journey time for vehicle occupants (passengers and drivers) – this could either be beneficial (decreased journey time) or adverse (increased journey time);
- Changes in journey time and/or distance for NMUs – this could either be beneficial (decreased journey time or distance) or adverse (increased journey time or distance);
- NMU journey amenity; and
- Fear and intimidation on and by road users.

7.1.2. These can be broken down into several temporary and permanent effects for different receptor types based on whether they are temporary or permanent.

7.2. Potential permanent and operational effects

7.2.1. Permanent effects that could occur during operation are as follows:

- Adverse or beneficial effects on NMUs caused by permanent closures/restrictions/diversions of PRoW which change journey time and/or distance. This could be adverse or beneficial;
- Change in the amenity (general pleasantness) of NMU journeys due to changes in traffic flow and composition and provision of suitable footways and segregation from traffic;
- Fear and intimidation for NMUs created by the presence of moving objects (such as increases in traffic flow, traffic speed and/or changes in vehicle composition);
- Journey time changes for vehicle users could be caused by impacts such as congestion, permanent road closures/restrictions/diversions and amendments to parking facilities; changes in road traffic due to changes in journeys to/from affected railway stations; and changes in demand for parking at affected railway stations. This could be adverse or beneficial; and
- Journey time changes for passengers could be caused by impacts such the closure/relocation of railway stations; amendments to timetables and journey times; the availability of train paths; and changing rail passenger numbers at stations and on trains. This could be adverse or beneficial.

7.2.2. Table 20 provides an overview of the temporary impacts and associated effects and when they are likely to occur.

Table 20 – Impacts and effects scoped into the assessment – permanent.

Relevant receptor types	Impact	Description of likely effect	Design element/activity
Railway users	Change in rail journey time	Effect on passenger journey time	The operation of the new railway and its services including but not limited to: • New passenger services; • Change in passenger service; • Change in station capacity (through modification of existing stations, new stations, and closure of existing stations); and • Change in speed for existing train services.
	Change in provision of rail services (for passengers)	Effect on passenger accessibility	The operation of the new railway including a change in passenger service.
	Change in travel movements to existing stations due to improved rail service provision	Effect on users from change in vehicle use on the road network	The operation of the new railway and its services including: • New passenger services; • Change in passenger service; • Change in station capacity (through modification of existing stations, new stations, and closure of existing stations); and • Change in speed for existing train services.
Road vehicle occupants (including buses)	Change in travel movements to new stations	Effect on users from change in vehicle use on the road network	The operation of the new railway and its services including: • New passenger services; • Change in passenger service; • Change in station capacity (through modification of existing stations, new stations, and closure of existing stations); and • Change in speed for existing train services. Permanent changes to the highway network altering flows and including: • New roads; • Closed roads; and • Realigned roads.
	Re-distribution of trips, and use of alternative routes by road	Effect on users from change in vehicle use on the road network	
	Change in vehicle movements due to construction	Effect on users from change in vehicle use on the road network	HGV movements and other construction vehicles using the road network.
	Re-distribution of trips, and use of alternative routes	Effect on users from change in	Temporary changes to the highway network altering flows including temporary roads closures and traffic management (including diversions).

Relevant receptor types	Impact	Description of likely effect	Design element/activity
	by road due to construction	vehicle use on the road network	
NMUs	Re-distribution of trips, and use of alternative routes by NMU users	Effect on severance and journey time	Permanent closure/diversion of PRoW.
	Change in vehicle movements (impacting crossing of highway)	Effect on severance and journey time	Changes in vehicle movements arising from the operation of the new railway and its services including: • New passenger services; • Change in passenger service; • Change in station capacity (through modification of existing stations, new stations, and closure of existing stations); and • Change in speed for existing train services. Permanent changes to the highway network altering flows and including: • New roads; • Closed roads; and • Realigned roads.
	Change in vehicle flow, speeds or composition on highways adjacent to pedestrian routes	Effect on NMU amenity	
		Effect on NMU fear and intimidation	

7.2.3. The influence of climate change is not anticipated to exacerbate or ameliorate the project effects for T&T to the extent that significant effects will occur. This is due to materials used in design for highways being tolerable and not sensitive to changes in temperature. It is recognised that changes in weather may influence modes used for travel to and from stations for those with a mode choice which may affect the amount of highway traffic, however it is not expected that there would be variations in flow due to climate change to the extent that it would change the assessment.

7.3. Potential temporary construction effects

7.3.1. Temporary effects that could occur during construction are as follows:

- Effects on NMUs caused by temporary closures/restrictions/diversions of PRoW leading to changes in journey time and distance (adverse or beneficial);
- Change in the amenity (general pleasantness) of NMU journeys due to changes in traffic flow and composition due to construction traffic and provision of suitable footways and segregation from traffic;
- Fear and intimidation for NMUs created by the presence of moving objects (such as increases in traffic flow, traffic speed and/or changes in vehicle composition);

- Journey time changes for vehicle users could be caused by impacts such as congestion, temporary road closures/restrictions/diversions and amendments to parking facilities; changes in road traffic due to changes in journeys to/from affected existing railway stations. This could be adverse or beneficial;
- Journey time changes for passengers could be caused by impacts such the closure/relocation of existing railway stations; amendments to timetables and journey times; the availability of train paths due to construction activities; and
- Adverse or beneficial effects on NMUs caused by temporary or permanent closures/restrictions/diversions of PRoW which change journey time and/or distance. This could be adverse or beneficial.

7.3.2. Table 21 provides an overview of the temporary impacts and associated effects and when they are likely to occur.

Table 21 – Impacts and effects scoped into the assessment – temporary.

Relevant receptor types	Impact	Description of likely effect	Design element/activity
Railway users	Change in provision of rail services (for passengers)	Effect on passenger accessibility	Temporary closures of existing railway or stations during construction.
Road vehicle occupants (including buses)	Change in vehicle movements due to construction	Effect on users from change in vehicle use on the road network	HGV movements and other construction vehicles using the road network.
	Re-distribution of trips, and use of alternative routes by road due to construction	Effect on users from change in vehicle use on the road network	Temporary changes to the highway network altering flows including temporary roads closures and traffic management (including diversions).
NMUs	Re-distribution of trips, and use of alternative routes by NMU users	Effect on length of journey	Temporary closure/diversion of PRoW.
	Change in vehicle movements	Effect on severance and journey delay	HGV movements and other construction vehicles using the road network, and temporary changes to the highway network altering flows including temporary roads closures and traffic management (including diversions).
	Change in vehicle flow, speeds, or composition on highways adjacent to pedestrian routes	Effect on NMU amenity	
		Effect on NMU fear and intimidation	

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will make a potentially significant effect not significant. Mitigation can be achieved in a variety of ways: from moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on historic environment assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project will therefore have embedded various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The draft Order Limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation and flood compensation.

8.1.4. For the assessment of impacts on Traffic & Transport, embedded mitigation might include:

- Specifying construction routes to contain construction traffic on more appropriate routes as much as possible, to reduce impacts upon residential streets;
- Reduce as much as possible construction vehicle movements during peak times on the highway network;
- Providing attractive and ample parking for cyclists at stations to encourage active travel to stations; and
- Providing attractive walking routes into stations to encourage active travel to stations.

8.1.5. The influence of climate change is not anticipated to impede the effectiveness of mitigations. It is recognised however that for those with a choice of mode, changing weather conditions may influence their choice of travel to and from stations i.e. if weather is warmer and dryer, cycling and walking may be more attractive, vs wetter or colder weather making private car travel more attractive.

8.2. Design principles

8.2.1. Mitigation measures have been incorporated into the Project throughout the design development and this will continue through to the DCO application. The measures relevant for the T&T assessment and to be relied upon in the EIA are as listed in Table 22.

Table 22 – Mitigation measures relevant to T&T.

Measure	Outcome/Benefit for T&T
New/replaced NMU crossings of the Project railway route	Would reduce the need for additional mitigation for impacts and effects on NMU using PRoW once the Project is operational.
New/replaced road crossings of the Project railway route	Would reduce the need for additional mitigation for impacts and effects on road users once the Project is operational.
New/additional station facilities (new platforms, concourse, waiting areas, ticket halls)	Would reduce impacts and effects on rail passengers using parts of the network affected by the Project.
Upgrades to/provision of station access facilities (for example vehicle/cycle parking, bus facilities, walking/cycling facilities)	Would reduce impacts and effects on existing users of the transport networks in the vicinity of stations affected by the Project.
Upgrades to the highway network on access routes to stations	Would reduce impacts and effects on road users once the Project is operational.

8.3. Future monitoring proposals

8.3.1. Monitoring is likely to focus on the construction phase of the Project (as long-term effects are not considered likely at this stage) and could include:

- Monitoring of construction traffic use of identified construction routes with a focus on compliance with identified routes;
- Monitoring of the carriageway on construction routes to identify mud and debris build-up and signs of failure, e.g. surface cracking or the development of potholes;
- Recording vehicles entering and leaving construction sites including the time and vehicle registration;
- Recording logistic-related incidents on and off the construction sites for safety purposes;
- Monitoring complaints received related to construction activity from members of the public, road users and other transport stakeholders; and
- Monitoring of staff travel through provisions in the construction workforce travel plan.

8.3.2. Monitoring during the operational phase could include:

- Undertaking post opening traffic surveys to compare results with predictions using during assessment;
- Assessing the suitability of implemented mitigation in addressing quantified impacts;
- Monitoring staff travel to stations as part of the station travel plans; and
- Monitoring passenger travel to stations as part of the station travel plans.

8.4. Code of construction practice

8.4.1. Construction work can be one of the chief causes of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

8.4.2. The draft CoCP will be a fundamental part of the Project and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic assets. The environmental assessment of T&T impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

8.4.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on T&T may include the following generic categories:

- Timing of construction works and working hours;
- Construction traffic routes;
- Site access;
- Site-specific measures;
- Workplace travel plans;
- Construction traffic management plan; and
- Monitoring requirements.

8.4.4. A register of environmental actions and commitments will also be developed alongside the ES and the CoCP.

9. Evaluating significance

9.1. Overview

9.1.1. This section outlines the methodology used to assess those matters scoped into the assessment in Section 7. This will be used through the EIA process and feed into the ES. This section describes the process that will be used to assess the significance of effects for T&T, including parameters to be used for sensitivity and magnitude. The section concludes with a summary of how significance will be assessed with assumptions made and limitations anticipated.

9.1.2. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Mitigation measures which are identified and reported within the T&T chapter of the ES will also be climate resilient.

9.1.3. In accordance with the relevant guidance, the general approach to determining whether a likely impact would result in a significant effect will be derived through a combination of the sensitivity of a receptor and the magnitude of the impact. The significance of an effect is influenced by both these variables.

9.1.4. Proportionate mitigation for significant adverse impacts identified by the TA on transport network connectivity, capacity and safety will be developed in accordance with relevant TA guidance and not covered in the ES.

9.2. Sensitivity of receptors

9.2.1. Receptors from a T&T perspective are groups which are sensitive to changes in traffic conditions. For this assessment, the receptors will include the following groups:

- NMUs and PRoW users; and
- Vehicle occupants (to include all vehicles such as private vehicles, public transport vehicles such as bus drivers and passengers and freight).

9.2.2. The sensitivity of vehicle occupants as receptors of impacts is not covered by IEMA Guidance, nor LA 112. For the EIA T&T assessment, these receptors will be assumed as having ‘low’ sensitivity to travel time changes as vehicles generally have more ability to vary their route by using diversion or alternative routes, to avoid locations of delay or congestion on the highway network.

9.2.3. The sensitivity of T&T NMU and PRoW user receptors for the assessment will be determined with reference to criteria set out in Table 23, which is sourced from the DMRB LA 112 ‘Population and human health’ (Highways England, 2020) and sits broadly in line with IEMA Guidance (2023).

Table 23 – Sensitivity criteria.

Value (sensitivity)	Typical descriptors
Very high	NMUs: 1) national trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient NMU route. Little/no potential for substitution. 2) routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. 3) rights of way for NMU crossing roads at grade with >16,000 vehicles per day.
High	NMUs: 1) regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or 2) rights of way for NMU crossing roads at grade with >8,000 - 16,000 vehicles per day.
Medium	NMUs: 1) public rights of way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys; and/or 2) rights of way for NMU crossing roads at grade with >4000 – 8000 vehicles per day.
Low	NMUs: 1) routes which have fallen into disuse through past severance, or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes; and/or 2) rights of way for NMU crossing roads at grade with <4000 vehicles per day. Vehicle Occupants: Vehicle occupants (to include all vehicles such as private vehicles, public transport vehicles such as bus drivers and passengers and freight)
Negligible	N/A.

9.3. Journey time and/or distance (NMUs)

9.3.1. An assessment will be made of the likely changes, during construction and operation, in journey length and time that would occur due to the Project. The main way in which the Project would affect journey length and time is related to certain restrictions on NMU movement, as follows:

- Changes to NMU journeys due to temporary or permanent road closures, restrictions, or diversions; and

- Changes to NMU journeys due to temporary closures, restrictions and diversions of PRoW during construction and permanent closures, restrictions and diversions of PRoW during operation.

9.3.2. A change in journey distance would likely result in a change in journey time and therefore could constitute a delay. The time (delay) element associated crossing roads for pedestrians/wheelers would be covered under severance.

9.3.3. The magnitude of impact on NMU journey length will be assessed as per the criteria outlined in Table 24, which is sourced from the DMRB 'LA 112 Population and human health' (Highways England, 2020).

Table 24 – Magnitude of impact on NMU journey length.

Magnitude of impact	Change in journey length
Negligible	Increase or decrease of less than 50m
Minor	Increase or decrease of more than 50m and less than 250m
Moderate	Increase or decrease of more than 250m and less than 500m
Major	Increase or decrease of more than 500m

9.3.4. There is no guidance on thresholds for the magnitude of impact on journey time in IEMA nor DMRB and so the criteria summarised in Table 25 will be applied in this assessment. These criteria are based on previous DMRB guidance (in the now-withdrawn Volume 11, Section 3, Part 8) that specified traffic flow changes of more than 30% as potentially significant (i.e. moderate or major). As there is no current guidance, this appraisal is for information and professional judgement on outcomes/mitigation has been applied.

Table 25 – Magnitude of impact on journey time.

Magnitude of impact	Change in journey time
Negligible	Increase or decrease of less than 10%
Minor	Increase or decrease of more than 10% and less than 30%
Moderate	Increase or decrease of more than 30% and less than 50%
Major	Increase or decrease of more than 50%

9.4. Severance

9.4.1. Severance is defined in the DMRB 'LA 112 Population and human health' as the extent to which members of communities are able (or not able) to move around their community and access services/facilities. This would include for example difficulty crossing highway links due to increases in traffic flow so constituting journey delay for NMUs. The IEMA guidance states that the assessment of pedestrian delay severs as a proxy for the delay that other NMU modes may experience when crossing roads.

9.4.2. This guidance provides the following definitions for magnitude of the impact of severance:

- Negligible: very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision;
- Minor: introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision;
- Moderate: introduction (adverse) or removal (beneficial) of severe severance with limited/moderate accessibility provision; and
- Major: introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision.

9.4.3. The impacts of PRoW closures, restrictions, or diversions on NMU journeys will be captured in the assessment of the Project impacts on journey length as described earlier.

9.4.4. The assessment of severance for T&T will therefore cover the impact of forecast changes in traffic flow (for example associated with Project construction T&T using alternative routes due to temporary or permanent road closures, restrictions, or diversions) on NMU using the road network in the study areas.

9.4.5. The DMRB 'LA 112 Population and human health' does not include any quantifiable definitions for the magnitude of impact categories for severance summarised earlier. Consequently, the T&T assessment will use the category definitions summarised in Table 26. These are derived from previous guidance (criteria related to 'built up areas' in the now-withdrawn DMRB Volume 11, Section 3, Part 8 chapter on 'relief from existing severance') and will be applied to both increases and decreases in traffic flow to determine beneficial and adverse impacts.

Table 26 – Magnitude of impact for severance.

Magnitude of impact	Criteria
Negligible	Up to 10% change in traffic
Minor	10-30% change in traffic
Moderate	30-60% change in traffic
Major	Greater than 60% change in traffic

9.4.6. IEMA guidance states “caution needs to be observed when applying these thresholds as very low baseline flows are unlikely to experience severance impacts even with high percentage changes in traffic”. The DMRB Volume 11, Section 3, Part 8 indicated that "given that relief of severance is not significant where traffic flows are already relatively low, the guidelines do not apply to roads with an existing AADT [Annual Average Daily Traffic] flow of less than 8,000 vehicles".

9.4.7. This logic will be applied to both beneficial and adverse impacts, including roads where AADT is forecast to increase up to 8,000 vehicles or less due to the Project. However, it is recognised that any increase in traffic flow could increase severance to a degree, so this threshold will only be used to downgrade the magnitude of adverse impacts if appropriate, rather than to automatically determine them as 'negligible'.

9.4.8. Once initial magnitude of impact categories has been assigned based on changes in traffic flow, these categories will be reviewed qualitatively based on other factors, including road classification, functionality, geometry, and the availability and spacing of dedicated crossing facilities.

9.4.9. In some cases, this will result in manual adjustments to the magnitude of impact category (for example on roads with existing high-quality NMU crossing provision where an increase in traffic is unlikely to have an impact on severance). This process will be reported transparently in the assessment, with a clear rationale provided for any adjustments made.

9.5. Journey time (vehicle occupants)

9.5.1. The assessment of journey time changes for vehicle occupants will be based upon outputs from the traffic modelling exercise and will focus on locations where the highway network is already operating at or close to capacity.

9.5.2. The IEMA 2023 guidance states 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”. The main way in which the Project

would affect journey length and time is related to certain restrictions on vehicle occupant movement, as follows:

- Impacts on rail passengers/freight due to Project construction activities on the railway or use of the railway for transporting construction materials;
- Changes to car occupant travel time due to Project construction traffic and temporary or permanent road closures, restrictions, or diversions; and
- Changes to bus occupant travel time due to Project construction traffic and temporary or permanent road closures, restrictions, or diversions.

9.5.3. The assessment of the significance of changes in journey time for highway vehicle occupants will be limited to the following parameters which are mirrored in the TA:

- Junctions with a degree of saturation above 0.85 on any arm indicate the junction is operating over practical capacity; and/or
- Consideration to vehicle occupant diversions will be limited to those above 2km. For diversions which are proposed to be less than 2km, assessment of these will be through agreement with relevant stakeholders on a case-by-case basis.

9.5.4. Where these parameters are met, in collaboration with relevant stakeholders, professional judgement will be applied to determine if the delay is significant taking into account duration of impact (temporary or permanent), the extent of the delay (is it only realised in peak periods for example), the nature of the surrounding area (e.g. are there sensitive receptors such as schools or community facilities adjacent to the problem) and how effective mitigation would likely be in addressing the issue. This would be discussed with relevant stakeholders to reach a consensus on significance.

9.5.5. Locations which see a network performance improvement will be noted as a beneficial effect.

9.5.6. For rail passengers, consideration will be given to changes in rail service patterns which could affect rail journey times. These changes could be beneficial (reductions in journey time) or adverse (increases in journey time associated with delay).

9.5.7. Professional judgement will be applied to determine if the delay is significant considering duration of impact (temporary or permanent), the extent of the delay (is it only realised in peak periods for example) and how effective mitigation would likely be in addressing the issue. This would be discussed with relevant stakeholders to reach a consensus on significance.

9.6. NMU journey amenity

9.6.1. The pleasantness of a journey for pedestrians using footways alongside the highway is generally affected due to changes in traffic flow and composition on the route. The 1993 IEMA guidelines suggest that where a traffic flow is halved or doubled, or where the HGV component of a traffic flow is halved or

doubled, the effect would be considered significant and require further consideration. Whilst this guidance is no longer live, it has not been replaced by anything and the more recent 2023 IEMA guidelines still advocate its use.

9.7. Fear and intimidation on and by road users

9.7.1. Fear and intimidation can be affected by the total volume of adjacent traffic and its composition (% of HGVs) and the speed at which it passes, and the proximity of the vehicles to pedestrians (in terms of footway provision and segregation).

9.7.2. For the ES, the assessment of fear and intimidation will follow the hazard scoring approach as set out in the 2023 IEMA guidelines. This requires a review of the average traffic flow on a route over an 18-hour day (all vehicles/hour 2 way), the total 18-hour HGV flow and the average speed of the road.

Table 27 – Degree of hazard calculation.

Average traffic flow over 18-hour day (all vehicles, 2-way) (a)	Total 18-hour HGV flow (b)	Average vehicle speed (c)	Degree of hazard score
+1,800	+3,000	>40	30
1,200-1,800	2,000-3,000	30-40	20
600-1,200	1,000-2,000	20-30	10
<600	<1,000	<20	0

9.7.3. These factors are each given a degree of hazard score which is then combined to give a level of fear and intimidation grade.

Table 28 – Level of fear and intimidation.

Level of fear	Total hazard score (a+b+c)
Extreme	71+
Great	41-70
Moderate	21-40
Small	0-20

9.7.4. The magnitude of the impact is based upon how this score has changes from the baseline position as shown in Table 29.

Table 29 – Magnitude of impact for fear and intimidation.

Magnitude of impact	Change from baseline
Negligible	No change in step changes
Minor	One step change in level with <400 vehicle increase total and/or <500 HGV increase
Moderate	One step change in level with >400 vehicle increase total and/or >500 HGV increase
Major	Two step changes in level

9.8. Impacts on station access routes and facilities

9.8.1. The assessment of impacts on station access routes and facilities due to changes in passenger numbers because of the Project in operation will be dependent on the characteristics of the stations affected. Stations can be divided into four categories as follows:

- New railway stations delivered as part of the Project;
- Existing stations that would be directly served by the Project rail services but where no major capacity expansion is proposed;
- Existing stations that would be expanded to accommodate the increase in passengers generated by the Project; and
- Existing stations that would be closed and relocated as part of the Project.

9.8.2. Impacts on the transport network in the vicinity of stations significantly affected by a change in rail passenger numbers due to the Project will be assessed as set out earlier in Section 7 (i.e. considering impacts on journey length, journey time, and severance).

9.8.3. The extent of the assessment undertaken at each station and the level of additional mitigation proposed will be dependent on the volume of additional rail passengers expected to use the station due to the Project. Local Plan site allocations around stations will be excluded from the assessment as they do not qualify as ‘near certain’ or ‘more than likely’, in line with Transport Analysis Guidance (TAG) Unit M4 ‘Forecasting and Uncertainty’ (Department for Transport, 2019).

9.8.4. In some cases, it may be appropriate to address mitigation requirements at affected railway stations through the development of a station travel plans following the DCO. This is because impacts at stations caused by changes in passenger numbers would be directly affected by the final timetable for the Project, which would not be established until after the DCO has been granted. Specific improvements to station access routes and facilities should therefore be developed when there is more certainty about the final timetable for the Project, and its forecast impact on rail passenger demand.

9.9. Criteria for determining significant effects

9.9.1. Significant effects for the T&T assessment will be determined by the matrix set out in Table 30 as defined in the DMRB 'LA 104 Environmental assessment and monitoring' (Highways England, 2020) based on the sensitivity and magnitude findings as set out earlier in this section.

Table 30 – Matrix for determining significance.

Value (sensitivity)	Magnitude of impact (degree of change)				
	No change	Negligible	Minor	Moderate	Major
Very high	Neutral	Slight	Moderate (significant)	Large (significant)	Very large (significant)
High	Neutral	Slight	Moderate (significant)	Large (significant)	Very large (significant)
Medium	Neutral	Neutral	Slight	Moderate (significant)	Large (significant)
Low	Neutral	Neutral	Neutral	Slight	Moderate (significant)
Negligible	Neutral	Neutral	Neutral	Neutral	Slight

Source: DMRB 'LA 104 Environmental assessment and monitoring' (Highways England, 2020)

9.9.2. For the T&T assessment in the EIA, an effect within the moderate, large or very large categories will be significant, in line with guidance in the DMRB 'LA 104 Environmental assessment and monitoring'.

10. Proposed scope

10.1.1. Table 31 and Table 32 summarise the proposed scope of the assessment.

10.1.2. The reasons for scoping out are discussed in Appendix A.

Table 31 – Summary of scope of the T&T assessment - construction.

Assessment item	All route sections
Railway users - Change in provision of rail services (for passengers)	✓
Vehicle occupants - Change in travel movements to existing stations due to improved service	✓
NMUs - Re-distribution of trips, and use of alternative routes by NMUs affecting journey time	✓
NMUs - Severance effects on routes used by NMUs	✓
NMU journey amenity	✓
NMU fear and intimidation	✓
Road safety *(covered in TA)*	×

Table 32 – Summary of scope of the T&T assessment - operational.

Assessment item	All route sections
Railway users – change in journey time	✓
Railway users - Change in provision of rail services (for passengers)	✓
Vehicle occupants - Change in travel movements to existing stations due to improved rail service and any changes in journey time	✓
Vehicle occupants - Change in travel movements to new stations and any changes in journey time for existing network users (network delay)	✓
Vehicle occupants - Re-distribution of trips, and use of alternative routes by road	✓
NMUs - Re-distribution of trips, and use of alternative routes by NMUs affecting journey time	✓
NMUs - Severance effects on routes used by NMUs	✓
NMU - journey amenity	✓
NMU - fear and intimidation	✓
Road safety *(covered in TA)*	×
Vehicle occupants - Increase in maintenance vehicle movements on highway	×
Railway users - Change in provision of rail services (for passengers) due to closure for maintenance	×

11. Assumptions and risks

11.1. Assessment assumptions and limitations

11.1.1. The EIA must set out any limitations encountered, or assumptions made as part of the assessment process. At this stage the following limitations and assumptions have been identified for the purposes of the proposed scope and methodology for the T&T assessment.

11.1.2. The assumed rail service provision associated with the Project will be indicative for the purposes of assessment. The final timetable for rail services would be determined by regulated rail industry processes after the DCO process has been completed.

11.1.3. The assessment will consider changes in transport volumes, and journey times due to the Project forecast by strategic transport models and spreadsheet modelling tools. These changes will not be forecast outside the study areas described in the geographic scope section.

11.1.4. Strategic transport model forecasts will be based on assumptions on background growth and investment in the transport network in the study areas.

11.1.5. Mitigation measures will be developed as part of the EIA process.

11.2. Risks

11.2.1. For the assessment of temporary effects during the construction phase, the duration of impacts may be difficult to define to inform this. Construction works are to be phased, with construction on-going but affecting different locations at different times. The modelling approach will consider a single year scenario only which will represent a worst-case scenario but this may not be considered realistic.

11.3. Opportunities

11.3.1. The introduction of mitigation measures may give rise to other, indirect improvements, for example the introduction of diversion routes may reduce journey times and distances and redirect traffic from residential routes.

11.3.2. The introduction of measures to improve junction capacity many alleviate congestion at secondary locations by removing a bottleneck from the network.

11.3.3. The introduction of mitigation such as improved station access, cycle parking and upgraded PRoW may facilitate and support increased active travel movements and use of the bus network and remove reliance upon private vehicles.

APPENDIX A – Aspects and matters proposed to be scoped out

The following items have been scoped out of the assessment:

- **Road safety** (construction and operation) – This will be covered within the TA. New or upgraded highway mitigation will be required to adhere to relevant design standards and requirements in relation to Road Safety Audits to confirm their suitability in terms of safety. It is therefore not considered necessary to further comment on road safety within the ES;
- **Increase in maintenance vehicle movements on highway during operation** – Whilst servicing and maintenance would generate some vehicle movements on the public highway, this is expected to be very low (several per month) and generally take place at off-peak time of day as is common practice for general railway maintenance. It is therefore considered that maintenance vehicles would be unlikely to cause significant cumulative effects; and
- **Change in provision of rail services (for passengers) due to closure for maintenance** (during operation) – Maintenance activities could generate some disruption for railway users. Maintenance is a routine activity on the existing railway network that is planned in advance and typically undertaken overnight to reduce disruption. It is unlikely to cause significant cumulative effects.

A stand-alone TA of the Project will be developed in accordance with the TA Scoping Report, with both included with the DCO submission.

The TA is different to the ES as it is focussed on the traffic impacts from the Project upon the highway network, compared to the ES which focusses more on the effects from the impact and the significance of these upon receptors (people and the environment).

EWR-MWJV Technical Partner

Routewide- Environmental - EIA Scoping Method Statement – Water Resources

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. The National Networks National Policy Statement (NNNPS)[1] sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made.

1.1.4. To plan how the EIA for the Project should be undertaken a scoping exercise has been undertaken. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.5. This EIA Method Statement sets out the proposed scope of the assessment of impacts on water resources and should be read in conjunction with the Method Statements prepared for other aspects.

1.1.6. The assessment on water resources will consider surface water quantity, quality, and flow; hydromorphology; and groundwater quantity, quality, and flow. Surface water bodies include natural (rivers, streams, lakes) and artificial

[1] *National policy statement for national networks* (2024) *GOV.UK*. Available at: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf (Accessed: 29 October 2024).

(canals, land drains) water bodies. Groundwater includes all water below the ground surface within the saturated and unsaturated zone.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
BGS	British Geological Survey
CoCP	Code of construction practice
DCO	Development consent order
DMRB	Design manual for roads and bridges
EA	Environment Agency
EIA	Environmental impact assessment
EQS	Environmental quality standards
ES	Environmental statement
EWR Co	East West Rail Company
GWDTE	Groundwater dependant terrestrial ecosystem
HEWRAT	Highways England water risk assessment tool
HRA	Habitats regulations assessment
IDB	Internal Drainage Board
MAGIC	Multi agency geographic information for the countryside
NNNPS	National networks national policy statement
NPS	National policy statement
NSIP	Nationally significant infrastructure project
OS	Ordnance Survey
RBMP	River basin management plans
SAC	Special areas of conservation

Abbreviation	Definition
SPZ	Source protection zone
SSSI	Site of special scientific interest
SuDS	Sustainable drainage systems
WER	Water Environment Regulations
WFD	Water Framework Directive

3. Overlaps with other aspects

3.1. Overview

3.1.1. Where the assessment of the potential impacts of the Project on water resources overlaps with other environmental aspects these are set out below. Close and proactive inter-aspects collaboration will be undertaken where necessary (for example, in assessing impacts at groundwater dependent terrestrial ecosystems (GWDTE) and developing appropriate mitigation measures).

3.1.2. Flooding including groundwater flooding is considered in the flood risk Method Statement.

3.1.3. Changes in groundwater levels and flows at GWDTE resulting from the Project will be assessed under water resources. However, the ecological impacts of such changes in level and flow or direct loss of groundwater dependent ecological features or impacts on aquatic ecology are covered within the biodiversity Method Statement.

3.1.4. Impacts on groundwater, surface water, abstractions, and private water supplies as a result of the Project disturbing existing contaminated ground and groundwater from current and historical land uses are considered in the land quality Method Statement. Water quality impacts on these receptors from drainage discharges or activities such as accidental discharges of pollutants such as fuel from the operation of the Project are considered under water resources.

3.1.5. The impacts of climate change on the Project are considered in the climate resilience Method Statement. The cumulation of the Project's impacts with climate impacts (e.g. drought flows exacerbate water quality impacts as there is less dilution) are considered under water resources.

3.1.6. Water Environment Regulations (WER) assessment will be the subject of a separate screening and scoping exercise and is not covered in this Method Statement. However, reference will still be made to the designation of Water Framework Directive (WFD) water bodies and the magnitude of impacts based on the water body scale. The WER assessment will inform the assessment of effects relating to water quality and quantity, and hydromorphology and assessment of these aspects during the EIA process will be undertaken collaboratively with the WFD assessment.

3.1.7. Ecological effects at sites covered under habitats regulations assessment (HRA) arising from changes in groundwater or surface water flows or quality will be reported under the HRA.

4. Relevant standards and guidance

4.1. Introduction

4.1.1. This section sets out the standards and guidance that are relevant to this Method Statement.

4.2. Guidance

4.2.1. The assessment of water environment effects will be informed by the following guidance:

- Design manual for roads and bridges (DMRB) LA 113[2];
- The Environment Agency's (EA) approach to groundwater protection v1.2[3];
- The sustainable drainage systems (SuDS) Manual[4];
- Guidance on the construction of SuDS, C768[5];
- Guidebook of applied fluvial geomorphology[6];
- Manual of river restoration techniques[7];
- The fluvial design guide[8];
- Applied fluvial geomorphology for river engineering and management[9];
- Engineering in the water environment: good practice guide – river crossings, WAT-SG-25[10]; and
- Fish pass manual: guidance notes on the legislation, selection and approval of fish passes in England and Wales[11].

4.3. Stakeholder engagement undertaken to date

4.3.1. A summary of the stakeholder engagement undertaken to date is presented in Table 2

[2] Highways England (2020). *LA 113 Road drainage and the water environment*. [online] Available at: https://www.standardsforhighways.co.uk/tses/attachments/d6388f5f-2694-4986-ac46-b17b62c21727?inline=true (Accessed 23 April 2024).
[3] Environment Agency (2018). *The Environment Agency's approach to groundwater protection*. [online] Available at: https://assets.publishing.service.gov.uk/media/5ab38864e5274a3dc898e29b/Envirnment-Agency-approach-to-groundwater-protection.pdf (Accessed 23 April 2024).
[4] CIRIA (2015). *The SuDS Manual (C753)*. London: CIRIA
[5] CIRIA (2017). *Guidance on the construction of SuDS (C768)*. London: CIRIA
[6] D. Sear, D. Malcolm, D. Newson and C. Thorne (2009). *Guidebook of Applied Fluvial Geomorphology*. London: ICE Publishing
[7] The River Restoration Centre (2014). *Manual of River Restoration Techniques*. [online] Available at: https://www.therrc.co.uk/manual-river-restoration-techniques (Accessed 23 April 2024).
[8] Flood and Coastal Erosion Risk Management Research and Development Programme and Environment Agency (2010). *Fluvial design guide*. [online] Available at: https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/fluvial-design-guide (Accessed 23 April 2024).
[9] Richard Hey, Malcolm, D. Newson and Colin Thorne (1997). *Applied Fluvial Geomorphology for River Engineering and Management*. Chichester, UK: John Wiley and Sons
[10] Scottish Environmental Protection Agency (2010). *Engineering in the water environment: good practice guide River crossings*. [online] Available at: https://www.sepa.org.uk/media/151036/wat-sg-25.pdf (Accessed 23 April 2024).
[11] Institute of Fisheries Management (2020), *Fish Pass Manual: Guidance notes on the legislation, selection and approval of fish passes In England and Wales*. Available at: https://ifm.org.uk/wp-content/uploads/2020/09/Fish-Pass-Manual.-GoodVersion-pdf.pdf (Accessed 24th April 2024).

Table 2 – Summary of relevant engagement undertaken for water resources.

Stakeholder	Date of consultation	Summary of engagement	Relevance to this Scoping Report
Central Bedfordshire Council	22/07/2021 Storyboard and Presentation	Matters Raised: Brogborough and Stewartby lakes need to be noted as strategic catchment management assets. Consultation should include Bedford Internal Drainage Boards (IDB) and Anglian Water. Other matters raised relate to flood risk.	Anglian Water and IDB included under stakeholder engagement.
Oxfordshire County Council	20/08/2021 Storyboard and Presentation	Matters raised relate to flood risk.	N/A
Bedford Borough	27/07/2021 Storyboard and Presentation	Matters raised: Consultees need to include IDB. Other matters raised relate to flood risk.	IDB included under stakeholder engagement.

5. Establishing the baseline

5.1. Introduction

5.1.1. This section sets out the method that will be taken to establish the water resources baseline.

5.1.2. Due to the spatial extent of the Project, compilation of baseline information will be broken down into eight route sections:

- Oxford to Bletchley;
- Fenny Stratford to Kempston;
- Bedford;
- Clapham Green to Colesden;
- Roxton to east of St Neots;
- Croxton to Toft;
- Comberton to Shelford; and
- Cambridge.

5.2. Documentary records

5.2.1. The following sources of information will be used to establish the baseline for the purpose of the water resources assessment:

- Contemporary aerial imagery and ordnance survey (OS) maps taken from multi agency geographic information for the countryside (MAGIC) maps (Natural England)[12];
- National receptor dataset (geospatial data available from the EA DataShare);
- Existing WER status and objectives for the 2021 and 2027 river basin management plans (RBMP) – catchment data explorer (EA)[13];
- Surface water quality data from the EA from water quality archive website[14];
- Designated areas taken from MAGIC maps (Natural England);
- Hydrological information (Centre for Ecology and Hydrology);
- British Geological Survey (BGS) mapping;
- Historical maps (National Library of Scotland);
- Geological data from the BGS, including geological maps, hydrogeological maps, and historical borehole records;

[12] Natural England (2024). *Multi Agency Geographic Information for the Countryside (MAGIC)*. [online] Available at: https://magic.defra.gov.uk/magicmap.aspx (Accessed 23 April 2024).
[13] Department for environment food and rural affairs, and Environment Agency (2023). *Explore catchment data*. [online] Available at: https://environment.data.gov.uk/catchment-planning/ (Accessed 23 April 2024).
[14] Environment Agency (2024). *Water Quality Archive*. [online] Available at: https://www.data.gov.uk/dataset/a0e6f23e-d631-4584-9ea2-7053620e4af2/water-quality-archive (Accessed 23 April 2024).

- Publicly available information from the EA, including abstraction licensing strategies, aquifer classification mapping, source protection zones (SPZ) and nitrate vulnerable zones;
- Detailed information regarding groundwater and surface water abstractions within the study area, including licensed public water supply sources and licensed private sources (from the EA) and unlicensed private water supplies (from local authorities);
- Reports and data interpretation from available ground investigation for the Project;
- OS mapping of springs and sinks within the study area;
- Groundwater level data from Project specific ground investigation;
- Groundwater level data from the EA located within the study area;
- Surface water quality sampling from watercourses likely to be impacted by drainage or run-off from the Project; and
- National vegetation classification surveys of GWDTE.

5.3. Stakeholder engagement

5.3.1. Further stakeholder engagement will be conducted and recorded as part of the water resources assessment including engagement with the following bodies to present the Project and develop mitigation measures (where appropriate):

- EA;
- IDB;
- Water companies including Anglian Water;
- Canal & River Trust;
- Natural England; and
- Local authorities (if private water supplies are present).

5.4. Surveys

5.4.1. Following a review of documentary evidence, targeted water feature surveys will be undertaken to assess receptors within the study area. A screening exercise will be carried out to exclude those that are clearly not connected to the Project (e.g. groundwater or surface water receptors where a clear hydraulic boundary exists between the Project and the receptor) and to identify data gaps.

5.4.2. The assessment will be informed by additional surveys including hydromorphological surveys, which are currently ongoing.

5.5. Modelling

5.5.1. The zone of influence of elements of the Project and the zones of contribution to water receptors will be assessed qualitatively in the first instance. Where it is

not possible to rule out a pathway to a receptor from a source of impact arising from the Project, and significant effects are likely, quantitative assessment (including modelling) may be required. Quantitative assessments are currently ongoing and take a tiered approach, with increasing levels of detail/complexity added incrementally where significant uncertainty in the assessment remains.

5.6. Study area

5.6.1. The study area as defined in Table 3 will be used to assess the baseline.

Table 3 – Extent of proposed study area.

Assessment	Study area
Temporary	**Groundwater:** 1km from the draft Order limits. **Surface Water:** 1km from the draft Order limits. **Hydromorphology:** 1km from the draft Order limits.
Permanent	**Groundwater:** 1km from the draft Order limits. **Surface Water:** 1km from the draft Order limits. **Hydromorphology:** 1km from the draft Order limits.

5.6.2. Where necessary, the study area will be extended (or reduced), for example (but not limited to):

- To account for hydraulic connectivity at a greater distance e.g. as a result of linear water course connections or groundwater connections over greater distances, for example where the study area covers areas of chalk aquifer;
- Where highly sensitive receptors (e.g. designated sites) are present; and
- Where major groundworks are present (tunnels or cuttings) or large scale dewatering is planned.

5.6.3. Where considering the potential effects arising from the Project on a watercourse or groundwater receptor, the assessment will consider the possible effects throughout the catchment of an effected watercourse or the wider aquifer extent. This will apply the principles of the source-pathway-receptor model.

5.7. Consultation

5.7.1. Consultation will be ongoing to inform the assessment of water resources as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

6. Preliminary baseline description

6.1. General description

6.1.1. This section presents a description of the preliminary baseline that has been compiled to support scoping and identifies gaps in the currently available data.

6.1.2. The following receptor types have been identified from documentary records and have informed the preliminary description of the baseline environment:

- Canals, Reservoirs, Lakes, and Ponds – OS mapping was studied to identify these receptors within the study areas;
- Watercourses – OS Open Rivers data was studied to identify watercourses within the study area;
- Aquifers – BGS bedrock and superficial geology maps were studied and compared to BGS aquifer designation maps; and
- GWDTE – the locations of designated sites were studied and are scoped in on a precautionary basis if their description indicates a potential groundwater dependence. These sites will be investigated further as the EIA progresses to confirm their groundwater dependency.

6.1.3. The following receptor types will be identified as the EIA progresses:

- Groundwater abstractions
- Surface water abstractions
- Groundwater – surface water interactions (springs and sinks)
- Discharges

6.1.4. Hydromorphological surveys are ongoing to inform the description of watercourse baseline characteristics.

6.1.5. An overview of the main environmental receptors of relevance to water resources identified to date within the eight route sections are summarised in the sections below. The full list of water resources elements that have been identified and classified by route section and feature type (as listed in paragraph 6.1.2), can be found in the water resources Method Statement technical appendix.

6.2. Oxford to Bletchley

6.2.1. Likely key receptors in the Oxford to Bletchley section are:

- The River Thames in Oxford and Oxford Canal as water environment regulations (WER) designated waterbodies;
- GWDTE near Oxford, including a site of special scientific interest (SSSI) and local nature reserve areas; and

- Secondary A superficial aquifers, in particular Alluvium which is the most extensive across the area.

6.3. Fenny Stratford to Kempston

6.3.1. Likely key receptors in the Fenny Stratford to Kempston section are:

- The River Ouzel as a main river and WER designated waterbody in east Bletchley;
- The Grand Union Canal as a WER designated artificial waterbody in east Bletchley; and
- The GWDTE Millbrook Marsh/Bramble Meadow Habitat Priority Inventory.

6.4. Bedford

6.4.1. Likely key receptors in the Bedford section are:

- River Great Ouse in central and north Bedford;
- Great Oolite Group (Principal aquifer) in central and north Bedford; and
- Licenced abstraction AN/033/0011/006 for which there are SPZ1, SPZ2 and SPZ3 within the study area.

6.5. Clapham Green to Colesden

6.5.1. Likely key receptors in the Clapham Green to Colesden section are:

- River Great Ouse in north Bedford and east Roxton;
- Six licenced abstractions currently identified within the study area:
  6/33/20/*S/0089 (Surface Water), 6/33/20/*S/0013 (Surface Water), 6/33/20/*G/0031 (Groundwater), 6/33/20/*G/0134 (Groundwater), 6/33/20/*S/0052 (Surface Water), and 6/33/20/*G/0039 (Groundwater).
- SPZ1, SPZ2 and SPZ3 defined for a public water groundwater abstraction licence AN/033/0011/006, used for process water in Breweries/wine industry; and
- SPZ1 and SPZ2 defined for abstraction licence 6/33/11/*G/0014, used for process water in the Breweries Industry.

6.6. Roxton to east of St. Neots

6.6.1. Potential key receptors in the Roxton to east of St. Neots section are:

- River Great Ouse, Hen Brook, River Ivel, and Stone Brook WER designated waterbodies;
- Begwary Brook Nature Reserve GWDTE, located east of Wyboston; and
- Two licenced abstractions currently identified within the study area: 6/33/20/*S/0013 (Surface Water) and 6/33/10/*S/0131/R01 (Surface Water).

6.7. Croxton to Toft

6.7.1. Likely key receptor in the Croxton to Toft section area is:

- Fen Drayton Drain and West Brook as WER designated water bodies.

6.8. Comberton to Shelford

6.8.1. Likely key receptors in the Cambourne to Harston section are:

- Bourn Brook, River Cam, and Hobson's Brook as WER designated waterbodies and chalk streams;
- Principal bedrock aquifer located between Cambourne and Childerley Gate (Woburn Sands Formation – Lower Greensand Group);
- Secondary A superficial aquifers, in particular Alluvium which is the most extensive across the area;
- Protected areas including Radio Astronomy Observatory (Lords Bridge Observatory) potential GWDTE and Barrington Chalk Pits SSSI;
- Five licenced abstractions currently identified within the study area under the following licences 6/33/32/*G/0017 (Groundwater) and 6/33/30/*S/0123 (Surface Water);
- SPZ3 defined for an unknown licenced abstraction covering a large area to the west of Highfields Caldecote; and
- SPZ1 and SPZ2 associated with a public water supply with the abstraction licence 6/33/32/*G/0008.

6.9. Cambridge

6.9.1. Likely key receptors in Harston to Cambridge section are:

- River Cam and Cherry Hinton Brook as WER designated waterbodies and chalk streams;
- Four identified springs within Nine Wells Nature Reserve;
- Principal bedrock aquifer underlying the proposed railway from Harston to Cambridge;
- Secondary A superficial aquifers, in particular Alluvium and River Terrace Deposits which is the most extensive across the area;
- Four licenced abstractions identified within the study area under the following licences 6/33/27/*G/0133/R02 (Groundwater), 6/33/33/*G/0003 (Groundwater) and 6/33/33/*G/0075/R02 (Groundwater); and
- Coldham's Common GWDTE, described as a chalk grassland.

6.10. Future baseline

6.10.1. The future baseline is defined as the future condition of the study area without the Project.

6.10.2. The physical impacts of climate change may impact the Project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards that may change weather related risks to the Project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and
- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

6.10.3. Refer to section 5 of the climate resilience Method Statement for further details on the current and projected future climate.

6.10.4. According to current climate projections[15], surface water flows/levels and groundwater levels will be influenced within the study area. As such, the assessment must consider how effects arising from the Project may interact with future changes to both water levels and flows (both high and low flows). For example:

- Heavy winter rainfall events may increase runoff and reduced infiltration in some areas leading to a decrease in recharge and an increase in surface water flows. Construction of the Project may also reduce recharge;
- Increases in average temperatures and the length of the growing season will increase evapotranspiration and reduce water available for recharge. Construction of the Project may also reduce recharge; and
- The increased occurrence of extreme droughts may reduce surface water flows and increase the impact of any water quality changes due to reduced dilution.

6.10.5. To define the future baseline, the current baseline will be extrapolated to take account of likely future changes including:

- Climate change;
- Demographic change;
- Proposed and committed development; and
- Anticipated policy and legislative changes.

6.10.6. Future baselines will be documented for the near future (construction) and far future (operation) and further details on the scope of these is given below.

Construction phase (near future)

6.10.7. The near future baseline will consider:

[15] CEH (2023) Enhanced Future Flows and Groundwater (eFLaG) Portal https://eip.ceh.ac.uk/hydrology/eflag/

- Committed development (approved consents, development allocations in adopted development plans); and
- Proposed development (either planning applications that are yet to be determined or land use allocations included in development plans yet to be adopted).

6.10.8. Climate change and demographic change will not be considered for the near future baseline.

Operation phase (far future)

6.10.9. The far future baseline will consider:

- Committed development (approved consents, development allocations in adopted development plans);
- Proposed development (either planning applications that are yet to be determined or land use allocations included in development plans yet to be adopted);
- The evolution of water environment receptors due to climate change. This will consider both direct effects (changes in water levels and flows) and indirect effects (water quality changes resulting from reduced low flows);
- The cumulation of climate change impacts (e.g. changes in water quality) and those from other predicted future changes (e.g. an increase in pollutant loading from demographic changes); and
- The groundwater future baseline will be derived qualitatively. eFlags data[16] will be used to inform an assessment of future changes to groundwater levels and flows resulting from climate change.

[16] CEH (2023) Enhanced Future Flows and Groundwater (eFLaG) Portal. Available at: https://eip.ceh.ac.uk/hydrology/eflag/

7. Potential impacts and effects

7.1. Introduction

7.1.1. For the purposes of reporting and assessment, construction and operational effects will be considered separately. Temporary effects will be those that last only for the duration of the construction phase or less than five years afterwards. Permanent effects will be those that last more than five years after construction ends.

7.1.2. Permanent and operational effects and temporary construction effects are discussed separately in the sections below. Likely sources of these impacts are also discussed.

7.2. Potential permanent and operational effects

7.2.1. The potential permanent effects from the operation of the Project are outlined in Table 4.

7.2.2. Changing climate conditions into the future, together with the impacts of the Project on water resources receptors may exacerbate (or occasionally ameliorate) the significance of the Project effects. For example, increased summer temperatures and drought risk may affect water levels and flows at waterbodies. These climatic changes, combined with the effects of the project upon surface or groundwater flows may cause potentially significant effects at a water body with the potential for an indirect effect on the habitat and species present.

7.2.3. The influence of climate change in exacerbating or ameliorating the significance of Project effects will be incorporated within the evaluation stage.

Table 4 – Potential permanent effects from the operation of the Project.

Relevant receptor types	Impact	Description of likely effect	Design element/Activity
Surface water receptors (including watercourses, ponds, canals, lakes and surface water abstractions)	Presence of new assets (and drainage from those assets) could cause change in flow regime and geodynamics.	Changes in flow regime and geodynamics could lead to changes in hydromorphological processes and damage to existing natural features, existing assets, and potentially pose a risk to new infrastructure.	Permanent infrastructure including (but not limited to): • New track; • Change in rail route; • New stations (including relocated stations); • New highways; • Re-aligned highways; • New highway overbridges/underpasses; • Drainage works; • Level crossing closures and traffic diversions; and • Subsurface structures such as cuttings and tunnels.
	Increases or changes in traffic flows due to diversion of traffic caused by permanent level-crossing closures or the construction of new stations may increase contamination risks from road runoff.	Deterioration in water quality at surface water receptors. Potential for indirect adverse ecological effects.	
	Changes to water quality caused by drainage for assets (rail, highways, and stations).	During operation, runoff and discharge of any sediment laden water and/or pollutants not mitigated for could cause deterioration to surface water receptors.	
	Where watercourses are crossed or diverted, this could lead to changes in channel cross-section and bed slope.	Changes in channel cross-section and bed slope may lead to localised changes in flow dynamics that could alter or lead to a funnelling effect on flow. Change in cross-section and bed slope could also result in change to reach function e.g. to a sediment sink if over-widened.	
	Where watercourses are crossed or diverted, this could lead to change in sediment transport dynamics.	Funnelling effect on flow at crossings could lead to localised scour of bed and banks and/or excessive deposition of sediment.	

Relevant receptor types	Impact	Description of likely effect	Design element/Activity
	Where watercourses are crossed or diverted, this could require replacement of natural bed and banks or the addition of bed and bank protection measures.	Loss of natural channel features and diversity, which could also lead to changes in hydromorphological processes.	
	Permanent below ground structures (e.g. impermeable barriers that extend below the groundwater table) may inhibit groundwater flow and reduce baseflow to water courses.	A reduction in baseflow may particularly impact low flows and could have indirect ecological impacts at dependent surface water receptors such as watercourses.	
Groundwater receptors (including Principal and Secondary aquifers, groundwater dependent ecosystems, groundwater abstractions)	Permanent below ground structures may alter groundwater flow for example wet cuttings (e.g. excavation that extends below groundwater table) will drawdown the surrounding groundwater or sheet piling below the water table will act as a barrier to flow.	Alteration of groundwater flow pathways may reduce availability of groundwater for dependent receptors such as water resources, groundwater dependent terrestrial ecosystems and watercourses. This may lead to a loss of yield at groundwater abstractions or ecological impacts at GWDTE.	Permanent infrastructure including (but not limited to): • New track; • Change in rail route; • New stations (including relocated stations); • New highways; • Re-aligned highways; • New highway overbridges/underpasses; • Cuttings and tunnels; and • Drainage works.
	Creation of voids (e.g. excavation below ground level) and/or changes in permeability (e.g. to the type of fill used) due to the construction of below ground structures or cuttings may alter groundwater flows,		
	During operation, runoff and any discharge to ground of drainage may contain elevated concentration of pollutants (for example organic compounds or metals) which may enter groundwater.	Groundwater contamination could lead to a reduction in groundwater quality at dependent receptors.	
	Below ground works (e.g. cutting, excavations or below ground structures) may create new contamination pathways.	New pathways may allow any surface contamination (e.g. from spills or accidents) to migrate to new groundwater receptors which may have previously been protected.	Sub surface works including piling and foundation work.

7.3. Potential temporary construction effects

7.3.1. The potential temporary impacts and effects from the construction of the Project are outlined in Table 5.

Table 5 – Potential temporary and construction effects from the Project.

Relevant receptor types	Impact	Description of likely effect	Design element/activity
Surface water receptors (including watercourses, ponds, canals, lakes and surface water abstractions)	Change in land use e.g. topsoil stripping, vegetation clearance	Change in land use during construction could result in various effects including (but not limited to): • Increased fine sediment input; • Loss of riparian vegetation; and • Increased runoff.	Construction of all new infrastructure including (but not limited to) • Temporary construction compounds; • Haul routes (within site); and • Demolition of existing infrastructure.
	Change in flow regime from discharge of construction drainage, construction infrastructure e.g. culverts for haul roads, or temporary water course diversions.	Constriction of flow by culverts or increase in peak flows by discharge from construction activities, could alter local hydromorphological processes and features.	
	Deposition or spillage of soils, sediment, fuels or other construction material or mobilisation through uncontrolled site runoff. Leakage from poorly maintained temporary welfare facilities.	Increased volumes of fine sediment entering watercourses could smother sensitive/important hydromorphological features. Degradation of water quality, which could affect surface water dependent receptors such as water resources and ecological receptors.	Construction of all new infrastructure including matters set out for change in land use and: • Temporary construction compounds; • Construction vehicle movements; and • Haul routes.
	Construction activities and infrastructure located in/near-channel could lead to bed and bank disturbance and/or bed substrate compaction.	Changes in morphological features and processes. Disturbance of bed substrate and channel banks could affect local sediment availability and geodynamics, altering	Construction of all new infrastructure and modification of existing infrastructure, including (but not limited to):

Relevant receptor types	Impact	Description of likely effect	Design element/activity
		channel/reach function and potentially impacting local erosion or deposition risk.	• Temporary construction compounds; • Enabling works – specifically vegetation clearance; • Haul routes (within site); • Construction vehicle movements, and • Demolition of existing infrastructure.
	In-channel (or near channel working) could result in accidental spillages or contamination.	Pollutants entering surface waters could lead to degradations in water quality, reduction in dilution capacity of water bodies, and impacts to surface water dependent receptors such as water resources and ecological receptors. Pollution of viable water resource through construction activities upstream of surface water abstraction.	Construction of all new infrastructure including (but not limited to): • Temporary construction compounds; • Haul routes (within site); • Demolition of existing infrastructure; and • Construction vehicle movements.
	Changes in baseflow to surface watercourses resulting from subsurface activities (e.g. temporary excavations and dewatering) or alteration of recharge (e.g. by extensive use of temporary areas of hard standing)	Reduction in water availability at surface water abstractions. Effects on water bodies that support habitats and ecosystems.	Construction of all new infrastructure. Temporary construction compounds.

Relevant receptor types	Impact	Description of likely effect	Design element/activity
Groundwater receptors (including Principal and Secondary aquifers, groundwater dependent ecosystems, groundwater abstractions)	Change in land use e.g. topsoil stripping.	Change in land use during construction could result in various effects including (but not limited to): • Direct disruption of shallow groundwater Mobilisation of sediment. • Alteration of recharge.	Construction of all new infrastructure. Temporary construction compounds. Haul roads.
	Physical disturbance of aquifer material may occur due to construction works (e.g. where dewatering, excavation or piling below the water table is required). Temporary changes in groundwater levels and flows may occur due to temporary construction dewatering.	Alteration of aquifer properties or temporary changes in groundwater level and flow may impact availability of groundwater to dependent receptors such as water resources and groundwater dependent ecological receptors. Sediment/turbidity impacts at groundwater receptors during piling.	Construction of all new infrastructure. Temporary construction compounds. Haul roads.
	Deposition or spillage of soils, sediment, fuels or other construction material or mobilisation through uncontrolled site runoff. Leakage from poorly maintained temporary welfare facilities. Particularly where groundwater vulnerability is high, pollutants may enter groundwater.	Adverse groundwater quality effects and potential for pollution of water resources receptors and/or at GWDTE.	Construction of all new infrastructure. Temporary construction compounds. Haul roads.

8. Assumed mitigation

8.1. Mitigation principles

8.1.1. The mitigation of potential impacts and effects is a central tenet of successful EIA. If it is effective, mitigation will reduce potentially likely significant effects of the Project. Mitigation can be achieved in a variety of ways: moving a scheme's alignment; revising its footprint; changing the timing or characteristics of certain activities and operations; introducing additional design elements, such as bunding, fencing or landscaping; repairing damaged environmental assets; or providing some kind of compensation for an adverse impact. The mitigation strategy is described in more detail in the EIA Scoping Report.

8.1.2. The EIA team will inform the design through successive stages and using a prescribed process about potential impacts on the natural environment, on people and communities, on cultural and heritage assets, or on global resources and issues such as climate change. They will seek the adoption of measures that avoid, reduce, or otherwise mitigate potentially likely significant effects. The Project will therefore have embedded within it various mitigation measures; and the environmental impacts will be evaluated on the basis that this mitigation is an integral part of the Project.

8.1.3. The draft Order limits will be defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation, and flood compensation.

8.1.4. For the assessment of impacts on the water environment, embedded mitigation may include:

- Amendment of bridge design to avoid or reduce as much as possible, in channel works;
- Complete removal or reduction as much as possible, of the depth of cuttings and tunnels near sensitive groundwater receptors;
- Sustainable drainage solutions embedded within the design, following key principles outlined in CIRIA SuDS Manual C753;
- Discharging of water from dewatering abstractions either to ground or to nearby water bodies down-hydraulic gradient of the dewatering works to maintain normal flows and levels in these water bodies. Water to be treated where required prior to discharge so that it does not cause pollution;
- Where groundwater or surface water is used as a resource for public drinking water then the Project should avoid or protect abstractions as far as reasonably practicable. This includes potential interactions with SPZs and Principal aquifers. Where protection is not reasonably practicable then replacement sources should be considered;

- Where cuttings, basements or structures are likely to be below groundwater level, groundwater ingress may be factored into the design of water collection drains, systems, and discharges;
- Scour and bank protection may be installed at locations where the discharge of water is due to occur because of the Project, to prevent erosion of the bed or banks of the receiving water body; and
- Excavations for watercourse crossings may be undertaken 'in the dry' with watercourses diverted or over-pumped to reduce as much as possible erosion or scour and reduce as much as possible the release of excessive suspended solids.

8.1.5. It is possible that future climate conditions may impede the effectiveness of assumed mitigation. For example, increased risk of extreme events such as heavy rainfall may exceed the capacity of SuDS or increase the risk of channel erosion, and any resultant changes in groundwater levels may impact groundwater ingress rates and could therefore exceed the capacity of recharge schemes for cuttings.

8.1.6. It is proposed that mitigation measures are designed which take climate change into account, for example through the design of the Project and required mitigation. Any effects on the design of the Project and mitigation will be identified and recorded within the ES.

8.2. Design principles

8.2.1. Best practice design will be applied for mitigation and enhancement of groundwater and surface water features.

8.2.2. The overarching principle is that designers shall apply best practice approaches to ensure that there are no significant residual impacts on the Project or residual significant effects on the water environment.

8.2.3. Best practice takes a hierarchical approach:

- Significant effects to receptors are avoided, as far as reasonably practicable;
- Where avoidance is not feasible, significant effects to receptors are reduced as much as possible through Project design; and
- Where significant effects remain, mitigation measures are employed to protect against potential significant residual effects.

8.2.4. A proactive approach will be taken in the design process to ensure the potential for significant effects is identified at the earliest possible stage, maximising the possibility of avoidance by design.

8.3. Code of construction practice

8.3.1. Construction work can be a major cause of environmental impact. A draft code of construction practice (CoCP) will be developed for the Project that sets out a range of measures and principles which future contractors will be required to abide by in undertaking their work.

8.3.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions in that it will outline the measures needed during construction to avoid or reduce likely significant adverse effects on people and on natural and historic assets. The environmental assessment of water resources impacts will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

8.3.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on the water environment may include the following generic categories:

- Site specific measures;
- Construction site layout and good ‘housekeeping’;
- Pollution prevention measures;
- Emergency preparedness and access;
- Site drainage and watercourse and groundwater protection;
- Extreme weather events;
- Pre-emptive environmental surveys to guide on-site activities;
- Demolition;
- Selection and management of materials;
- Protection and reinstatement of land and soils;
- Ground investigation and remediation; and
- Monitoring requirements.

8.3.4. A register of environmental actions and commitments will also be developed alongside the ES and the CoCP.

9. Evaluating significance

9.1. Methodology

9.1.1. The DMRB LA 113[2] will be used to guide the general approach to determining whether an impact would result in a likely significant effect. As the DMRB methodology is designed specifically for highways projects there may be modifications from this methodology where necessary to adequately assess the impacts of the Project.

9.1.2. The determination of significant effects will be derived through a combination of the sensitivity of a receptor and the magnitude of the impact. The significance of an effect is influenced by both variables. However, as the DMRB methodology is designed specifically for highways projects the methodology proposed here may deviate from this where necessary.

9.1.3. Surface water criteria for determining magnitude of impact does not directly reflect DMRB guidance for all proposed design elements. For example, the use of Highways England water risk assessment tool (HEWRAT) would not be appliable or appropriate for consideration of new railway elements. The method of assessment will be informed by qualitative means based on previous experience of linear infrastructure projects. For new highway elements, where appropriate, consideration will be given to the use of HEWRAT for water quality assessment and therefore the associated DMRB guidance shall be considered in those instances.

9.1.4. The DMRB does not outline a specific methodology for the evaluation of hydromorphological impacts. However, the DMRB provides guidance on the method of assessment and mitigations for hydromorphology. This guidance will be applied throughout the assessment.

9.1.5. The effects of climate change upon significance will be incorporated within the assessment through inclusion of climate change within the future baseline. Additional mitigation measures which are pertinent to addressing the repercussions of climate change will be identified and reported within the water resources chapter of the ES.

9.2. Sensitivity of receptors

9.2.1. Each receptor will be assigned a level of importance/sensitivity based on the methodology in ‘LA 113 Road Drainage and the Water Environment’. Table 6 adapted from this guidance, summarises how levels of sensitivity will be assigned to the identified receptors and provides relevant examples.

Table 6 – Sensitivity of receptors.

Sensitivity	Criteria	Examples	
Very High	Nationally significant attribute of high importance	Surface Water	Watercourse having a WFD classification shown in a RBMP and Q95* ≥ 1 m^3/s. Site protected/designated under EC or UK legislation: ▪ Special areas of conservation (SAC); ▪ Special Protection Areas; ▪ SSSI; ▪ Ramsar Sites; and ▪ Salmonid water. ▪ Chalk Streams Species protected by DMRB LA 108 (Highways England, 2020). Spring (or groundwater) baseflow contribution to: ▪ A watercourse of very high value; and ▪ A designated conservation site (SAC or SSSI) with water dependant ecosystems as a qualifying attribute.
		Groundwater	Principal aquifer providing a regionally important resource and/or supporting a site protected under European Commission and UK legislation. Groundwater locally supports GWDTE. Groundwater abstraction within SPZ1 (defined by EA or a minimum radius of 50 metres). Groundwater Drinking Water Safeguard Zone.

Sensitivity	Criteria	Examples	
			Spring or groundwater baseflow contribution to a designated conservation site (SAC or SSSI) with water dependant ecosystems as a qualifying attribute. Spring or groundwater baseflow contribution to a watercourse of very high value such as chalk streams.
		Hydromorphology	**Sediment Regime** Water feature sediment regime provides a diverse mosaic of habitat types suitable for species sensitive to changes in sediment concentration and turbidity, such as migratory salmon. Water feature appears to be in dynamic equilibrium with minimal erosion, transport, and depositional processes. The water feature has sediment processes reflecting the nature of the catchment and fluvial system. **Channel Morphology** Water feature includes varied morphological features (e.g. pools, riffles, bars, natural bank profiles) with no sign of artificial modification. **Natural Fluvial Processes** Water feature displays natural fluvial processes and natural flow regime, which would be highly vulnerable to change due to modification.
High	Locally significant attribute of high importance	Surface Water	Watercourse having a WFD classification shown in a RBMP with a Q95 flow <1.0 m^3/s. Species protected under EC or UK legislation LA 108. Industrial/agricultural water abstraction >100m^3/d.Private drinking water supply. Spring (or groundwater) baseflow contribution to a watercourse of high value.

Sensitivity	Criteria	Examples	
		Groundwater	Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports GWDTE. Within SPZ2 of a groundwater abstraction (defined by EA or a minimum radius of either 250 or 500 metres, depending on the size of the abstraction). Spring or groundwater baseflow contribution to a watercourse of very high value.
		Hydromorphology	**Sediment Regime** Water feature sediment regime provides habitats suitable for species sensitive to changes in sediment concentration and turbidity, such as migratory salmon. Water feature appears largely in dynamic equilibrium with areas of localised accelerated erosion and/or deposition caused by land use and/or modifications. Primarily the sediment regime reflects the nature of the natural catchment and fluvial system. **Channel Morphology** Water feature exhibiting a natural range of morphological features (e.g. pools, riffles, bars, varied natural riverbank profiles), with limited signs of artificial modifications or morphological pressures. **Natural Fluvial Processes** Predominantly natural water feature with a diverse range of fluvial processes that is highly vulnerable to change due to modification.
Medium	Of moderate quality and rarity	Surface Water	Watercourse not having a WFD classification shown in a RBMP and Q95* >0.001 m^3/s (where data is available). May have several anthropogenic pressures and/or pollutant inputs from discharges. Spring (or groundwater) baseflow contribution to a watercourse of moderate value.
		Groundwater	Aquifer providing water for agricultural or industrial use with limited connection to surface water.

Sensitivity	Criteria	Examples	
			Within SPZ3 of a groundwater abstraction (defined or default). Spring or groundwater baseflow contribution to a watercourse of moderate value.
		Hydromorphology	**Sediment Regime** Water feature sediment regime provides some habitat suitable for species sensitive to change in suspended sediment concentrations or turbidity. A water feature with natural processes occurring but modified, which causes notable alteration to the natural sediment transport pathways, sediment sources and areas of deposition. **Channel Morphology** Water feature exhibiting some morphological diversity (e.g. pools, riffles and depositional bars). The channel cross-section is partially modified in places, with indications of modification to the channel morphology. Natural recovery of channel form may be apparent (e.g. eroding cliffs, depositional bars). **Natural Fluvial Processes** Water feature with some natural fluvial processes, including varied flow types. Modifications and anthropogenic influences having an overt impact on natural flow regime, flow pathways and fluvial processes.
Low	Lower quality	Surface Water	Watercourse not having a WFD classification shown in a RBMP and Q95* >0.001 m^3/s (where data is available). May have many anthropogenic pressures and/or pollutant inputs from discharges. Surface water sewer (including sewer discharge and septic tanks). Minor ditch. Spring (or groundwater) baseflow contribution to a watercourse of low value
		Groundwater	Unproductive strata.

Sensitivity	Criteria	Examples	
		Hydromorphology	**Sediment Regime** Water feature sediment regime which provides very limited physical habitat for species sensitive to changes in suspended solids concentration or turbidity. Highly modified sediment regime with limited/no capacity for natural recovery. **Channel Morphology** Water feature that has been extensively modified (e.g. by culverting, addition of bank protection or impoundments) and exhibits limited to no morphological diversity. The water feature is likely to have uniform flow, uniform banks and absence of bars. Insufficient energy for morphological change. **Natural Fluvial Processes** Water feature which shows no or limited evidence of active fluvial processes with an unnatural flow regime or/and uniform flow types and minimal secondary currents.

Source: (Highways England, 2020) – adapted.

**Q_{95} – The flow equalled or exceeded in a watercourse for 95% of the flow record.*

9.3. Magnitude of impact

9.3.1. The potential impact on each receptor will be assessed using a methodology based on DMRB ‘LA 113 Road Drainage and the Water Environment’. Table 7, adapted from this guidance, summarises the criteria used for surface water and groundwater receptors and provides examples of impacts of different magnitudes, which are reported as either ‘beneficial’ or ‘adverse’.

Table 7 – Magnitude of impact.

Impact	Criteria	Example	
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface Water	Failure of both acute-soluble and chronic-sediment related pollutants in HERWAT and compliance failure with environmental quality standards (EQS) values. Loss of regionally important public water supply. Loss or extensive change to a fishery. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.
		Groundwater	Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff – risk score >250 (Groundwater quality and runoff assessment). Calculated risk of pollution from spillages ≥2% annually (Spillage assessment). Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.

Impact	Criteria	Example	
		Hydromorphology	**Sediment Regime** Extensive impacts on the water feature bed, banks and vegetated riparian corridor resulting in changes to sediment characteristics, transport processes, sediment load and turbidity. This includes extensive input of sediment from the wider catchment due to modifications. Impacts would be at the water body scale. **Channel Morphology** Extensive alteration to channel planform and/or cross section, including modification to bank profiles or the replacement of a natural bed. This could include significant channel realignment (negative); extensive loss of lateral connectivity due to new/extended embankments; and/or, significant modifications to channel morphology due to installation of culverts or outfalls. Impacts would be at the water body scale. **Natural Fluvial Processes** Major shift away from baseline conditions with potential to alter processes at the catchment scale.
Moderate adverse	Results in effect of integrity of attribute, or loss of part of an attribute	Surface Water	Failure of acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and <2% annually. Temporary disruption or deterioration to water supply. Degradation of regionally important public water supply or loss of major commercial/ industrial/ agricultural supplies. Contribution to measurable decrease in surface water ecological or chemical quality or flow with potential for deterioration in WFD element status.

Impact	Criteria	Example	
		Groundwater	Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/industrial/agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff – risk score 150-250. Calculated risk of pollution from spillages ≥1% annually and <2% annually. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures.
		Hydromorphology	**Sediment Regime** Some changes and impacts on the water feature bed, banks and vegetated riparian corridor resulting in some changes to sediment characteristics, transport processes, sediment load and turbidity. Impacts would extend beyond reach scale. **Channel Morphology** Some alteration to channel planform and/or cross section, including modification to bank profiles or the replacement of a natural bed. Activities could include channel realignment, new/extended embankments, modified bed and/bank profiles, replacement of bed and/or banks with artificial material and/or installation of culverts. Impacts would extend beyond reach scale. **Natural Fluvial Processes** A shift away from baseline conditions with potential to alter processes at the reach or general scale.

Impact	Criteria	Example	
Minor adverse	Results in some measurable change in attributes, quality, or vulnerability	Surface Water	Failure of either acute-soluble or chronic-sediment related pollutants in HEWRAT. Measurable decrease in surface water ecological or chemical quality or flow. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. Minor effects on water supply.
		Groundwater	Potential low risk of pollution to groundwater from routine runoff – risk score <150. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. Minor effects on an aquifer, GWDTEs, abstractions and structures
		Hydromorphology	**Sediment Regime** Limited impacts on the water feature bed, banks and vegetated riparian corridor resulting in local (but notable) changes to sediment characteristics, transport processes, sediment load and turbidity at the reach scale. **Channel Morphology** A small change or modification in the channel planform and/or cross section. Includes upgrade to and/or extension of existing watercourse crossing and/or structure with associated minor channel realignments with localised impacts. **Natural Fluvial Processes** Minimal shift away from baseline conditions with typically localised impacts up to the reach scale
Negligible		The Project is unlikely to affect the integrity of the water environment.	

Impact	Criteria	Example	
	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	Surface Water	No measurable impact on surface water receptors. Risk of pollution from spillages <0.5%.
		Groundwater	No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
		Hydromorphology	Minimal or no measurable change from baseline conditions in terms of sediment transport, channel morphology and natural fluvial processes. Any impacts are likely to be highly localised and not have an effect at the reach scale.
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface Water	Measurable increase in surface water ecological or chemical quality or flow.
		Groundwater	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). Reduction of groundwater hazards to existing structures.
		Hydromorphology	**Sediment Regime** Partial improvement to sediment processes at the reach scale, including reduction in siltation and localised recovery of sediment transport processes. **Channel Morphology** Partial improvements include enhancements to in-channel habitat, riparian zone and morphological diversity of the bed and/or banks. **Natural Fluvial Processes** Slight improvement on baseline conditions with potential to improve flow processes at the reach scale.

Impact	Criteria	Example	
Moderate beneficial	Results in moderate improvement of attribute quality	Surface Water	Measurable increase in surface water ecological or chemical quality or flow with potential for WER element status to be improved. Reduction in the likelihood of polluted waters discharging to a watercourse and improvement of surface water, e.g., quality, volume, flow pathways and resource availability, through improvements in a watercourse.
		Groundwater	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management strategy (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Hydromorphology	**Sediment Regime** Reduction in siltation and recovery of sediment transport processes at the reach or multiple reach scale. **Channel Morphology** Partial creation of both in-channel and vegetated riparian habitat. Improvement in morphological diversity of the bed and/or banks at the reach or multiple reach scale. Includes partial or complete removal of structures and/or artificial materials. **Natural Fluvial Processes** Notable improvements on baseline conditions and recovery of fluvial processes at the reach or across multiple reaches.
Major beneficial		Surface Water	Improvement in surface water ecological or chemical WFD element status.

Impact	Criteria	Example	
	Results in major improvement of attribute quality		Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse.
		Groundwater	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WER classification.
		Hydromorphology	**Sediment Regime** Improvement to sediment processes at the catchment scale, including recovery of sediment supply and transport processes. **Channel Morphology** Extensive creation of both in-channel habitat and riparian zone. Morphological diversity of the bed and/or banks is restored, such as natural planform, varied natural cross-sectional profiles, recovery of fluvial features (e.g. cascades, pools, riffles, and bars) expected for river type. Removal of modifications, structures, and artificial materials. **Natural Fluvial Processes** Substantial improvement on baseline conditions at catchment scale. Recovery of flow and sediment regime.
No change	No observable impacts in either direction	No loss or alteration of characteristics, features, or elements; no observable impact in either direction. No change to groundwater conditions at the relevant groundwater receptor. Discharges or changes to watercourses which lead to no change in the attribute's integrity.	

Source: LA 113 Road Drainage and the Water Environment [2] - adapted.

9.3.2. The assessment of the potential impacts of the Project will involve a description/assessment of the impacts that are planned to take place or can be reasonably foreseen. Impacts will be categorised as one of the three types:

- **Direct Impact** where the existing geological, hydrological, and hydrogeological environment along or near the route is altered, in whole or in part, due to construction and/or operation;
- **Indirect Impact** where the geological, hydrological, and hydrogeological environment beyond the proposed route is altered by activities related to construction and/or operation; and
- **No Predicted Impact** where the proposed route has neither a negative nor a positive impact on the geological, hydrological, or hydrogeological environment.

9.3.3. The duration of impacts will also be identified. Impacts may be categorised as:

- Temporary and construction effects - those that last only for the duration of the construction phase or less than five years afterwards;
- Permanent effects will be those that last more than five years after construction ends.

9.4. Criteria for determining significance of effects

9.4.1. The significance of an effect is defined by combining the magnitude of the impact with the overall sensitivity of the relevant water body or receptor using the criteria outlined in Table 6 and Table 7 respectively.

9.4.2. Significant effects on the water environment are those that have a ‘Moderate’ or greater magnitude of effect.

9.4.3. The criteria used to describe significance of effects are outlined in Table 8.

Table 8 – Effect significance.

		Magnitude of impacts (degree of change)				
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
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

Source: LA 113 Road Drainage and the Water Environment [2]- adapted.

9.5. Cumulative effects

9.5.1. Consideration will be given to cumulative effects when evaluating the significance of an effect. Cumulative effects occur when the combination of more than one effect (including effects arising from other projects) creates a larger, more significant effect. Examples of cumulative effects relevant to the water environment include:

- Accumulation of insignificant hydromorphological effects along a water course that together constitute a significant effect;
- An individual cutting with a non-significant effect on baseflow to a watercourse, when considered in combination with the non-significant effect of a second cutting from another scheme, leads to a change in baseflow to the watercourse that has is significant; and
- Cumulative effects may arise from more than one aspect. Water quality effects at a canal (which has amenity/social value) and loss of a historic environment asset (which also has amenity/social value) could cumulatively lead to human health and wellbeing effects.

10. Proposed scope

10.1.1. The scope of the water resources assessment is summarised in Table 9. Appendix A lists items that have been proposed to be scoped out from assessment.

Table 9 – Summary of scope of water resources assessment.

Assessment item (aspect or impact)	Potential significant effects	Duration	Scoped in/out	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Groundwater receptors	Change in groundwater quantity and quality arising from new infrastructure	Permanent	In	✓	✓	✓	✓	✓	✓	✓	✓
	Disruption of groundwater dependent terrestrial ecosystems arising changes in groundwater quantity or quality			✓	✓	✓	✓	✓	✓	✓	✓
	Change in groundwater quantity and quality arising from construction activities	Temporary	In	✓	✓	✓	✓	✓	✓	✓	✓
Surface water receptors	Change to (or loss of) hydromorphologica	Operation	In	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item (aspect or impact)	Potential significant effects	Duration	Scoped in/out	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
	l features and processes arising from new assets										
	Changes to baseflow to watercourses			✓	✓	✓	✓	✓	✓	✓	✓
	Changes in water quality arising from discharges from the Project			✓	✓	✓	✓	✓	✓	✓	✓
	Increase in fine sediment (arising from construction activities) causing loss of hydromorphological features and reduction in water quality	Construction	In	✓	✓	✓	✓	✓	✓	✓	✓
	Changes to hydromorphological features and processes arising from construction			✓	✓	✓	✓	✓	✓	✓	✓

Assessment item (aspect or impact)	Potential significant effects	Duration	Scoped in/out	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
	assets and discharges										
	Changes to water quality arising from discharge of construction water and surface runoff			✓	✓	✓	✓	✓	✓	✓	✓
	Changes to baseflow in watercourses			✓	✓	✓	✓	✓	✓	✓	✓
Effects from changes in service pattern, changes in train speeds, station closures	None	Operation	Out for all aspects of the water environment.	×	×	×	×	×	×	×	×
Change in traffic movements arising from alterations to the roads network (e.g. Highways level crossing closures)	None	Operation	Out for groundwater and hydro-morphology.	×	×	×	×	×	×	×	×
	Changes in water quality	Operation	In for surface water (excluding hydro-morphology)	✓	✓	✓	✓	✓	✓	✓	✓

Assessment item (aspect or impact)	Potential significant effects	Duration	Scoped in/out	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
Effects from highway underpasses	None	Operation	Out for hydro-morphology	×	×	×	×	×	×	×	×
	Changes in surface and groundwater quality	Operation	In for groundwater, and surface water (excluding hydro-morphology)	✓	✓	✓	✓	✓	✓	✓	✓
	Changes in groundwater quantity			✓	✓	✓	✓	✓	✓	✓	✓
Unproductive aquifers	None	All	Out for all aspects of the water environment	×	×	×	×	×	×	×	×
Surface water receptors not hydraulically connected to Project	None	All	Out for all aspects of the water environment	×	×	×	×	×	×	×	×
Groundwater receptors not hydraulically	None	All	Out for all aspects of the water environment	×	×	×	×	×	×	×	×

Assessment item (aspect or impact)	Potential significant effects	Duration	Scoped in/out	Oxford to Bletchley	Fenny Stratford to Kempston	Bedford	Clapham Green to Colesden	Roxton to east of St Neots	Croxton to Toft	Comberton to Shelford	Cambridge
connected to Project											
Maintenance activities	None	Operation/ Maintenance	Out for all aspects of the water environment	×	×	×	×	×	×	×	×

11. Assumptions and risks

11.1. Assumptions

11.1.1. The EIA will document any limitations and assumptions made throughout the assessment process. At this stage, the following limitations and assumptions have been identified for the purposes of the proposed scope and methodology for the water resources assessment:

- Unlicensed private water supply data (abstractions less than 20 m^3/day) had not been received from local authorities at the time of writing this Method Statement, and there are no open source data available to allow for a review of private water supplies within the study area. Therefore, at this stage, the presence of these within the study area is not known. Assessment of this receptor is anticipated to occur in more detail as the EIA progresses;
- Further data is anticipated regarding non-public licenced private water abstractions (abstractions greater than 20 m^3/day) and licensed public water supplies. The data received to date (from the EA) has been used to assist the writing of the scoping report in combination with open source data (Rivers Trust, 2021) where there are uncertainties regarding an SPZ. Open source data show a surface water abstraction used for potable water supply, but the presence of an SPZ in the Bedford area suggests a groundwater abstraction could also be present. Neither the open source nor the EA data received indicate a groundwater source for public water supply, only several boreholes used for brewery purposes. It is scoped into the groundwater assessment at this time and will be investigated further during the EIA process;
- The hydromorphological assessment is based on desk studies at this stage. Hydromorphological surveys are underway and will continue as the EIA process progresses. These surveys will further inform the assessment of baseline characteristics and importance of hydromorphological receptors;
- Regarding surface water quality, currently there are no applicable quantitative assessments available to assess the impacts of the Project. Quantitative assessments tools contained within DMRB, e.g., HEWRAT, CIRIA's Simple Index Approach and The SuDS Manual[4], are commonly used on highways schemes. These tools will be applied as indicated in the DMRB to existing or new roads and other ancillary infrastructure being constructed as part of the Project. As a result, where no quantitative assessment methods are available, qualitative techniques will be used to assess water quality impacts for the Project; and
- Where there is no information to suggest an alternative interpretation (groundwater level data, conceptual understanding from the geology), groundwater flow directions will be assumed to follow the surface topography.

11.2. Risks

11.2.1. The following risks have been identified:

- It is likely that land access issues will limit data collection in some areas. Where there is an absence of desk study or field data the assessment will take a precautionary approach and assume a reasonable worst case with respect to the sensitivity of receptors and the impacts and effects arising from the Project. Any such limitations or assumptions will be documented as part of the assessment process; and
- Water management measures resulting from the Project design and mitigation measures may conflict with other strategic water management plans in the region.

11.3. Opportunities

11.3.1. The Project offers the opportunity to improve and enhance the existing water environment. For example:

- Improving drainage design and reducing pollution risk along existing sections of rail track;
- Creation of new wetland habitats within areas of landscaping;
- Improvements in the quality of diverted or realigned water courses;
- Opportunities to contribute to wider water management and improvement plans in the region; and
- Where practicable, the water resources assessment will identify opportunities for improvement.

APPENDIX A Aspects and matters proposed to be scoped out

Table 10 – Aspects and matters proposed to be scoped out of water resources.

Aspects/ matters to be discussed	1. Is there an impact pathway from the Project to the aspect/matter ?	2. Is the aspect/ matter sensitive to the impact concerned?	3. Is the impact likely to be on a scale that may result in significant effects to the aspect/matter ?	4. Could the impact contribute cumulatively with other impacts to result in significant effects to the aspect/matter ?	5. Is there a method of avoidance or mitigation that would reduce the impact on the aspect/matter to a level where significant effects would not occur?	6. Is there sufficient confidence in the avoidance or mitigation method in terms of deliverability and efficacy to support the request?	7. Is there empirical evidence available to support the request?	8. Do relevant statutory consultees agree with the request?	9. Have you had regard to (a) relevant national policy statement(s) (NPS) and specifically any requirement stated in the NPS(s) in respect of the assessment of this aspect/matter ?
Operation - Effects from change in service pattern	No – these changes would not result in impacts	No – aspects of the water environment not sensitive to changes	No	No as there would be no impacts	N/A	N/A	No	No consultation has been undertaken	Yes, no relevant requirements identified in NNNPS or

Operation - Effects from change in train speeds Operation - Effects from station closures	which would be transmissible to water environment receptors.	related to these matters						regarding this matter.	NPS Advice Note 7.
Operation - Effects from level crossing closures (Highway) Operation - Effects from level crossing closures (Public Rights of Way)	No – these changes would not result in impacts which would be transmissible to water environment receptors. The assessment of alternative crossing methods i.e. overbridges or underpasses, however, would be assessed.	No – aspects of the water environment not sensitive to changes related to these matters	No	No as there would be no impacts	N/A	N/A	No	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

Operation - Effects from modification to stations (internal)	No –as modifications are internal there would be no clear impact pathway water environment receptors.	Yes, however, there is no clear impact pathway.	No	No, as there is no clear impact pathway	N/A	N/A	No	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.
Operation - Effects from modification to stations (external)	There is potential for impact pathways to develop between the matter and water environment receptors to exist.	Yes – there would be potential for surface water, groundwater, and hydromorphology receptors to be impacted, for example through increased surface run-off volumes and rates or watercourse modifications.	No, as it is likely that modifications will require modest works which would be able to be managed through the design process. However, if as the design is refined potential issues become apparent this assumption would be revisited.	No as the scale of the impacts would be sufficiently small so as not to further increase the magnitude of another impact.	Avoiding direct interactions with surface water receptors e.g. watercourse diversions or new assets would significantly reduce impacts. Indirect interactions (such as discharge of run-off) would be managed to have negligible	Yes	No	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

					impacts e.g. attenuation and treatment of discharge, re-use of existing assets.				
Operation - Effects from new highway underpasses on hydromorphology	Yes – whilst the aspect would likely have no direct interaction with watercourses, there is potential for indirect pathways to form e.g. disruption of shallow groundwater flows.	This would depend on the reliance of a watercourse on baseflow derived from groundwater.	No, as the nature of the works are relatively discrete and likely to have a small zone of influence.	No as the nature of the impacts would be sufficiently small so as not to further increase the magnitude of another impact.	Construction of overbridges would significantly reduce impacts on groundwater, and therefore on baseflows in surrounding watercourses.	Yes	No	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

Track maintenance and associated activities	Yes, where surface and groundwater receptors are in proximity to the track or hydraulically connected to related assets	The quality of surface water and groundwater receptors could be sensitive to impacts arising from maintenance e.g. through the discharge of suboptimal water to watercourses or to ground.	No, as the infrequent nature of the works and the type of activities to be undertaken, combined with standard operating procedures for maintenance activities would mean that there would not be likely to be a significant effect on the environment.	No	Mitigation would be achieved through adherence to standard best practice.	Yes	No	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

Unproductive Aquifers	Yes - where sub-surface construction or assets are required	No as the receptor is unlikely to support any significant groundwater receptors due to its physical properties which limit its capacity as a viable aquifer	No – there is potential for sub-surface construction activities and/or assets to result in impacts of a large magnitude or scale, however, the sensitivity of the receptor would limit the significance of any effect so as to be negligible.	No as the significance of effect would be negligible	N/A	N/A	N/A	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

De-commissioning of the railway and associated infrastructure	Yes	Yes	Yes	No	The Project is not expected to be de-commissioned. In the event that a decision is taken to de-commission the railway this would be a separate project and subject to a separate EIA at that time. However, any potential effects on the water environment associated with de-commissioning would be of similar nature and magnitude as those assessed during construction.	N/A	N/A	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

Groundwater receptors not hydraulically connected to the Project	No – if the receptor can be demonstrated to be hydraulically disconnected	Yes – receptors may be sensitive to an impact but if there is not pathway an effect will not occur	No - without a pathway no effect at a receptor will occur	No – no effects will occur	No required	The data relied up on and the assumptions made will be clearly documented when demonstrating hydraulic disconnection.	N/A	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.
Surface water receptors not hydraulically connected to the Project	No – if the receptor can be demonstrated to be hydraulically disconnected	Yes – receptors may be sensitive to an impact but if there is not pathway an effect will not occur	No - without a pathway no effect at a receptor will occur	No – no effects will occur	No required	The data relied up on and the assumptions made will be clearly documented when demonstrating hydraulic disconnection.	N/A	No consultation has been undertaken regarding this matter.	Yes, no relevant requirements identified in NNNPS or NPS Advice Note 7.

EWR-MWJV Technical Partner

Routewide – Environment - EIA Scoping Method Statement Technical Appendix – Water Resources

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1. Introduction

1.1. Purpose

1.1.1. This technical appendix supports the water resources Method Statement.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
EIA	Environmental impact assessment
GWDTE	Groundwater dependant terrestrial ecosystem
HPI	Habitat priority inventory
LNR	Local nature reserve
SPZ	Source protection zone
SSSI	Site of special scientific interest
WER	Water Environment Regulations
WFD	Water Framework Directive

3. Water resources elements

Table 2 – Summary of water resource elements identified to date by route section.

Baseline features/ relevant receptors	Sub-aspect	Description
Oxford to Bletchley		
Canals, Reservoirs, Lakes, and Ponds	Hydromorphology Surface Water	**Overview** Several ponds are present within the study area of the Project between Oxford and Bletchley. It is not clear based on available desk study data whether the ponds are natural or artificial in nature. A canal is also present within part of the study area of the Project between Oxford and Bletchley. **Likely Key Receptors** ▪ Oxford Canal – water environment regulations (WER) designated (artificial) water body in proximity to Oxford Station; and ▪ Grebe Lake – located between Bicester and Bletchley.
Watercourses	Hydromorphology Surface Water	**Overview** There are several Main Rivers and Ordinary Watercourses present within the study area in this section. **Likely Key Receptors** ▪ River Thames (or Isis) – Main River and WER designated waterbody in proximity to Oxford Station, which crosses the study area in Oxford; ▪ Fiddlers Stream and Castle Mill Stream – Main Rivers in proximity to Oxford Station; ▪ Hinksey Stream – Main River in proximity to the A423 Southern Bypass at Oxford; ▪ Town Brook - Main River and WER designated waterbody which crosses the study area in proximity to Bicester Station; and

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Langford Brook – Main River and WER designated waterbody which crosses the study area in proximity to Bicester Station.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The dominant aquifer type present within the study area and covers a wider and more consistent area than other aquifer types. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Kellaways Clay Member (Kellaways Formation); ▪ Oxford Clay Formation; and ▪ West Walton Formation.
Principal Aquifer - Bedrock		**Overview** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. These are extremely limited in area in the study area, confined to small outcrops around Islip and Marsh Gibbon. **Likely Key Receptors** ▪ White Limestone Formation (Great Oolite Group); and ▪ Forest Marble Formation – Limestone (Great Oolite Group).
Secondary A Aquifer - Bedrock		**Overview** These are defined as 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. Limited in area and location within the study area; with outcrop in Islip, Bicester and Marsh Gibbon. **Likely Key Receptors** ▪ Kellaways Sand Member (Kellaways Formation);

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Cornbrash Formation (Great Oolite Group); and ▪ Forest Marble Formation – Mudstone (Great Oolite Group).
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Sporadic outcrops of River Terrace Deposits can be found to the north of Oxford, while alluvium can be found extensively local to watercourses between Oxford and Bicester. Small sporadic outcrops of glaciofluvial deposits can be found to the west of Bletchley. **Likely Key Receptors** ▪ River Terrace Deposits, including the Northmoor Sand and Gravel Member and Summertown-Radley Sand and Gravel Member; ▪ Alluvium; and ▪ Glaciofluvial deposits.
Secondary (Undifferentiated) Aquifer - Superficial Drift		**Overview** This aquifer classification has been assigned in cases where it has not been possible to attribute either category A or B to a rock type, due to variable characteristics of the rock type. Outcrops of these deposits are generally confined to the area between Winslow and Bletchley **Likely Key Receptors** ▪ Till – Diamicton, including the Oadby Member.
Groundwater dependent terrestrial ecosystem.		**Overview** These have been identified by the Environment Agency for the second River Basin cycle of the WER (formerly water framework directive (WFD)). They are based on sites of specific scientific interest (SSSI) outlines from Natural England, filtered to include only those sites with wetland vegetation communities. Local nature reserves (LNR) with a potential groundwater dependence are also included. **Likely Key Receptors**

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Port Meadow with Wolvercote Common and Green (SSSI); ▪ Hook Meadow and The Trap Grounds (SSSI); ▪ Wendlebury Meads & Mansmoor Closes (SSSI); and ▪ Blue Lagoon (LNR).
Licenced groundwater abstractions		**Overview** These are locations licenced to abstract groundwater by the Environment Agency, i.e. abstractions >20m^3 per day, between Oxford and Bletchley. **Likely Key Receptors** Two abstractions are present: 28/39/14/0295, for general agriculture and domestic use, and 28/39/16/0070, used for spray irrigation. The source of these abstractions is recorded as groundwater, but the aquifers from which they abstract are not known, nor any details regarding the borehole constructions and depths.
Groundwater – Surface Water interactions (springs and sinks)		It is not thought that there are any springs or sinks within the study area, however a this will be reviewed during the assessment of the baseline for the environmental impact assessment (EIA) and when superior digital data becomes available.
Discharges	Groundwater Surface Water	There is no information currently available on the presence of discharges to groundwater or surface water within the study area.
Fenny Stratford to Kempston		
Watercourses	Hydromorphology Surface Water	**Overview** There are several Main Rivers and Ordinary Watercourses present within the study area in this section. **Likely Key Receptors** ▪ River Ouzel – Main River and WER designated waterbody which crosses study area east of Fenny Stratford Station;

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Broughton Brook – Ordinary Watercourse and WER designated waterbody which crosses the study area between Aspley Guise Station and Ridgmont Station; ▪ Elstow Brook – Ordinary Watercourse and designated WER waterbody crossed by the Project south of Bedford; and, ▪ Caldecotte Brook – Ordinary Watercourse which crosses the study area between Bow Brickhill and Woburn Sands Stations.
Canals, Reservoirs, Lakes and Ponds	Hydromorphology Surface Water	**Overview** Several ponds and lakes are present within the study area of the Project between Bletchley and south Bedford (approximately 100). A canal is also present within the study area. **Likely Key Receptors** ▪ The Grand Union Canal – WER designated (artificial) water body, located east of Fenny Stratford Station; ▪ Brogborough Lake – WER designated water body, located north-east of Ridgmont Station; and ▪ Stewartby Lake – WER designated water body, located north-east of Millbrook Station.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. This is the dominant aquifer type present within the study area and covers a wider and more consistent area than other aquifer types. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Kellaways Clay Member (Kellaways Formation); and ▪ Oxford Clay Formation.
Principal Aquifer - Bedrock		**Overview** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic

Baseline features/ relevant receptors	Sub-aspect	Description
		scale. These are situated to the south-east of the study area and are not crossed by the rail route, however, are present in the study area. They are closest to the rail alignment at Woburn Sands. **Likely Key Receptors** ▪ Woburn Sands Formation (Lower Greensand Group).
Secondary A Aquifer - Bedrock		**Overview** These are defined as 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. Limited in area and location within the study area to small outcrop in south Bedford. **Likely Key Receptors** ▪ Kellaways Sand Member (Kellaways Formation).
Secondary B Aquifer - Bedrock		**Overview** These are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. Limited in area and location within the study area; very small and sporadic outcrop surrounding Stewartby, south-west of Bedford. **Likely Key Receptors** ▪ Stewartby Member (Oxford Clay Formation).
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Limited in area and location within the study area; very small and sporadic outcrops with River Terrace deposits and Alluvium local to watercourses to the east of Bletchley and in south Bedford, and Glaciofluvial deposits to the north-east of Bletchley. **Likely Key Receptors** ▪ River Terrace Deposits; ▪ Alluvium; and

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Glaciofluvial Deposits.
Secondary (Undifferentiated) Aquifer - Superficial Drift		**Overview** This aquifer classification has been assigned in cases where it has not been possible to attribute either category A or B to a rock type, due to variable characteristics of the rock type. Dominant superficial aquifer type present within the study area; covers a wider and more consistent area than other aquifer types, with Till generally found in the area between Bletchley and Lidlington. **Likely Key Receptors** ▪ Till – Diamicton, including the Oadby Member; and ▪ Head deposits of clay, silt, sand and gravel.
Groundwater Dependant Terrestrial Ecosystems		**Overview** One habitat priority inventory (HPI) site has been identified in the study area as being potentially groundwater dependant. Millbrook Marsh/Bramble Meadow, located between Morteyne House and Stewartby stations, is described as reedbeds and lowland fens, and therefore could be groundwater dependant. This is located immediately adjacent to the Project alignment and is crossed by construction compounds. **Likely Key Receptors** ▪ Millbrook Marsh/Bramble Meadow (HPI).
Public water supply groundwater abstraction with a defined source protection zones (SPZs)		**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment. **Likely Key Receptors** ▪ SPZ3 defined for a public water groundwater abstraction south of Woburn Sands. Environment Agency data indicates the SPZ is associated with abstraction licence: 6/33/09/*G/0003, used for public drinking water supply.

Baseline features/ relevant receptors	Sub-aspect	Description
Licenced Abstractions		No licenced abstractions have currently been identified in the study area.
Groundwater – Surface Water interactions (springs and sinks)		It is not thought that there are any springs or sinks within the study area, however a this will be reviewed during the assessment of the baseline for the EIA and when superior digital data becomes available.
Discharges	Groundwater Surface Water	There is no information currently available on the presence of discharges to groundwater or surface water within the study area.
Bedford		
Watercourses	Hydromorphology Surface Water	**Overview** There are few watercourses in the Bedford area, however this area contains One Main River. **Likely Key Receptors** River Great Ouse – Main River and WER designated waterbody which is crossed twice by the Project in this area; between Bedford St Johns and Bedford stations and in north Bedford, north of the A6
Reservoirs, Lakes and Ponds	Hydromorphology	**Overview** There are few lakes and ponds in this study area. Bromham Lake, located to the west of the alignment between Paula Radcliffe Way and the River Great Ouse is not a WER designated water body, however it is classified as a LNR and is therefore included in the scope. **Likely Key Receptors** ▪ Bromham Lake (LNR).
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Outcropping of this type of strata is intermittent in the study area.

Baseline features/ relevant receptors	Sub-aspect	Description
		Likely Key Receptors ▪ Kellaways Clay Member (Kellaways Formation); and ▪ Oxford Clay Formation.
Principal Aquifer - Bedrock		**Overview** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. Outcrops in central Bedford, approximately between Bedford St Johns and Bedford stations. **Likely Key Receptors** ▪ Great Oolite Group.
Secondary A Aquifer - Bedrock		**Overview** These are defined as 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. Limited in area and location within the study area, with small outcrops in south Bedford and in the north of the study area. **Likely Key Receptors** ▪ Kellaways Sand Member (Kellaways Formation); and ▪ Cornbrash Formation (Great Oolite Group).
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Extensively located throughout the study area, with Alluvium located in the areas around the River Great Ouse. **Likely Key Receptors** ▪ Fluvial sands and gravel; and ▪ Alluvium.

Baseline features/ relevant receptors	Sub-aspect	Description
Groundwater dependent terrestrial ecosystem		**Overview** Two potential groundwater dependant terrestrial ecosystem (GWDTE) have been identified within the study area. Clapham Floodplain HPI is located on the western bank of the River Great Ouse, mostly to the north of Paula Radcliffe Way. The site is described as coastal floodplain and grazing marshland, with the potential to be groundwater dependant. Bromham Lake LNR is a former quarry which is likely to be filled, at least in part, by groundwater. **Likely Key Receptors** ▪ Clapham Floodplain (HPI); and ▪ Bromham Lake (LNR).
Public water supply groundwater abstraction with a defined SPZs		**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment. **Likely Key Receptors** ▪ SPZ1, SPZ2 and SPZ3 defined for a public water groundwater abstraction in Bedford. This is associated with abstraction licence AN/033/0011/006.
Licenced groundwater abstractions		Environment Agency data suggests abstraction licence present are: AN/033/0011/006, used for process water in Breweries/wine industry, but this is not a public drinking water supply. No other licenced abstractions have currently been identified in the study area.
Groundwater – Surface Water interactions (springs and sinks)		It is not thought that there are any springs or sinks within the study area, however a this will be reviewed during the assessment of the baseline for the EIA and when superior digital data becomes available.

Baseline features/ relevant receptors	Sub-aspect	Description
Discharges	Groundwater Surface Water	There is no information currently available on the presence of discharges to groundwater or surface water within the study area.
Clapham Green to Colesden		
Watercourses	Surface Water Hydromorphology	**Overview** There are numerous main watercourses and smaller streams/drains present with the study area in this section. **Likely Key Receptors** ▪ River Great Ouse – Main watercourse and WER designated water body in proximity to Bedford Station which also crosses study area north of Tempsford; ▪ Ravensden Brook – An Ordinary Watercourse which is a tributary to Renhold Brook; ▪ South Brook – An Ordinary Watercourse at Collesden Lodge Farm; ▪ and ▪ Renhold Brook – a WER designated waterbody.
Groundwater – Surface Water Interactions (Springs & Sinks)	Groundwater – Surface Water Interactions	Since the Peterborough Member (Oxford Clay Formation) underlies the majority of the route from north Bedford to Tempsford, it is not thought that there are many springs or sinks within the study area. Springs are likely to be present in the west of the study area, where the limestone of the Great Oolite Group outcrops from underneath the Oxford Clay Formation. The exact location of these springs will be reviewed when the baseline is compiled for the EIA and superior digital data becomes available.
Reservoirs, Lakes and Ponds	Surface Water	**Overview** Numerous ponds are present within the study area of the Project between north Bedford and Tempsford. It is not clear based on available desk study data whether the ponds are natural or artificial in nature. A more detailed baseline is anticipated to be completed on these receptors as the EIA progresses and a water feature survey is carried out. **Likely Key Receptors**

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Reservoir north-east of East End Farm – ~60m from the proposed alignment; and ▪ Three large lakes located south-east of Roxton.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The dominant aquifer type present within the study area and covers a wider and more consistent area than other aquifer types. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Peterborough Member – Mudstone – underlying the majority of the route from Clapham to Tempsford; and ▪ Kellaways Clay Member – Mudstone – located to the west of the study area.
Principal Aquifer - Bedrock		**Overview** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. Limited in area and location within the study area; very small and sporadic outcrop around Bedford. The Woburn Sands Formation outcrops nearer to Cambridge. The Chalk Group formations outcrop nearer to Cambridge. **Likely Key Receptors** ▪ Great Oolite Group – Limestone and (Subequal/Subordinate) Argillaceous Rocks, Interbedded.
Secondary A Aquifer - Bedrock		**Overview** These are defined as 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. Limited in area and location within the study area; very small and sporadic outcrop around Bedford. **Likely Key Receptors** ▪ Kellaways Sand Member (Kellaways Formation); and ▪ Cornbrash Formation – Limestone.

Baseline features/ relevant receptors	Sub-aspect	Description
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Limited in area and location within the study area; very small and sporadic outcrop, with River Terrace deposits and Alluvium local to watercourses to the east and west of Bedford, particularly around the River Great Ouse. **Likely Key Receptors** ▪ Stoke Goldington Member and Felmersham Member (Undifferentiated) – Sand and Gravel; ▪ Alluvium – Clay and Silt; and ▪ Glaciofluvial Deposits, Mid Pleistocene – Sand and Gravel.
Secondary (Undifferentiated) Aquifer - Superficial Drift		**Overview** This aquifer classification has been assigned in cases where it has not been possible to attribute either category A or B to a rock type, due to variable characteristics of the rock type. Dominant superficial aquifer type present within the study area; covers a wider and more consistent area than other aquifer types. Generally focussed centrally between Bedford and Tempsford. **Likely Key Receptors** ▪ Till – Diamicton, including the Oadby Member; and ▪ Head deposits of clay, silt, sand and gravel.
Groundwater dependent terrestrial ecosystem	Groundwater Surface Water	**Overview** These have been identified by the Environment agency for the second River Basin cycle of the WER (formerly WFD). They are based on SSSI outlines from Natural England, filtered to include only those sites with wetland vegetation communities. No GWDTE's have been identified within the study area.
Licenced groundwater/surface water abstractions	Groundwater Surface Water	**Overview** These are locations licenced to abstract groundwater by the Environment Agency i.e. abstractions >20m^3 per day. Abstractions are likely, particularly to the west of the zone in the Great Oolite Group.

Baseline features/ relevant receptors	Sub-aspect	Description
		Likely Key Receptors There are six licenced abstractions currently identified within the study area: ▪ 6/33/20/*S/0089 – Surface Water – Spray Irrigation (Storage); ▪ 6/33/20/*S/0013 – Surface Water – Spray Irrigation (Direct); ▪ 6/33/20/*G/0031 – Groundwater – General Farming & Domestic Use; ▪ 6/33/20/*G/0134 – Groundwater – General Farming & Domestic Use; ▪ 6/33/20/*S/0052 – Surface Water – General Use Relating To Secondary Category (Medium Loss); and ▪ 6/33/20/*G/0039 – Groundwater – General Farming & Domestic Use.
Public water supply groundwater abstraction with a defined SPZs	Groundwater	**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment. **Likely Key Receptors** ▪ SPZ1, SPZ2 and SPZ3 defined for a public water groundwater abstraction in Bedford. Environment Agency data suggests abstraction licence present are: AN/033/0011/006, used for process water in Breweries/wine industry, but this is not a public drinking water supply. The SPZ's cover a large area and numerous settlements including Clapham, Oakley, Stevington, Bromham and Great Denham. ▪ There is also an SPZ1 and SPZ2 in the residential area west of Bedford Park (NGR 504585 251061). Environment Agency data suggest the abstraction licence present is: 6/33/11/*G/0014, used for process water in the Breweries Industry. The maximum daily quantity is 716m^3.
Discharges	Groundwater Surface Water	There is no information currently available on the presence of discharges to groundwater or surface water within the study area. This will be reviewed when the baseline is compiled for the EIA.
Roxden to east of St. Neots		

Baseline features/ relevant receptors	Sub-aspect	Description
Watercourses	Surface Water Hydromorphology	**Overview** There are numerous main watercourses and smaller streams/drains present with the study area in this section **Likely Key Receptors** ▪ River Great Ouse – Main watercourse and WER designated water body crosses study area north of Tempsford; ▪ Rockham Ditch – An Ordinary Watercourse draining from higher land south of High Barns to the River Great Ouse; ▪ Hen Brook – Ordinary Watercourse and WER designated waterbody which cross the study area south-east of St Neots; and, ▪ Stone Brook – Ordinary Watercourse and WER designated waterbody which crosses study area near Tempsford.
Springs	Groundwater – Surface Water Interactions	Few springs have been identified within the study area using OS 1:25K mapping. Further details about these springs will be reviewed when a more detailed baseline is compiled for the EIA and superior digital data becomes available.
Reservoirs, Lakes and Ponds	Surface Water	**Overview** Numerous ponds are present within the study area of the Project between Roxdenand St. Neots. It is not clear based on available desk study data whether the ponds are natural or artificial in nature. **Likely Key Receptors** ▪ Lakes/ponds within Begwary Brook Nature Reserve.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The dominant aquifer type present within the study area and covers a wider and more consistent area than other aquifer types. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Oxford Clay Formation – Mudstone; and ▪ Kimmeridge Clay Formation and West Walton Formation and Ampthill Clay Formation (Ancholme Group).

Baseline features/ relevant receptors	Sub-aspect	Description
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Limited in area and location within the study area; very small and sporadic outcrop, with River Terrace deposits and Alluvium local to watercourses. More extensive deposits associated with the River Great Ouse. Glaciofluvial deposits are present to the south of St Neots. **Likely Key Receptors** ▪ River Terrace Deposits – Sand and Gravel; ▪ Alluvium – Clay, Silt, Sand and Gravel; and ▪ Glaciofluvial Deposits, Mid Pleistocene – Sand and Gravel.
Secondary (Undifferentiated) Aquifer - Superficial Drift		**Overview** This aquifer classification has been assigned in cases where it has not been possible to attribute either category A or B to a rock type, due to variable characteristics of the rock type. Dominant superficial aquifer type present within the study area; covers a wider and more consistent area than other aquifer types. Generally focussed centrally between St Neots and Cambourne. **Likely Key Receptors** ▪ Till – Diamicton, including the Oadby Member.
Groundwater dependent terrestrial ecosystem		**Overview** These have been identified by the Environment agency for the second River Basin cycle of the WER (formerly WFD). They are based on SSSI outlines from Natural England, filtered to include only those sites with wetland vegetation communities. **Likely Key Receptors** ▪ One baseline Groundwater Dependent Terrestrial Ecosystem is present within the study area, Begwary Brook Nature Reserve, located east of Wyboston.

Baseline features/ relevant receptors	Sub-aspect	Description
Licenced groundwater/surface water abstractions	Groundwater Surface Water	**Overview** These are locations licenced to abstract groundwater by the Environment Agency i.e. abstractions >20m^3 per day. **Likely Key Receptors** There are two licenced abstractions currently identified within the study area: ▪ 6/33/20/*S/0013 – Surface Water – Spray Irrigation (Direct); and ▪ 6/33/10/*S/0131/R01 – Surface Water – Spray Irrigation (Direct).
Public water supply groundwater abstraction with a defined SPZs	Groundwater	**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment. No public water supply source protection zones have been identified within the study area.
Discharges	Groundwater Surface Water	There is no information currently available on the presence of discharges to groundwater or surface water within the study area. This will be reviewed when a more detailed baseline is compiled for the EIA.
Croxton to Toft		
Watercourses	Surface Water Hydromorphology	**Overview** There are numerous main watercourses and smaller streams/drains present with the study area in this section. Generally, these watercourses exhibit sinuous planforms, largely flow through pastoral agricultural land and have a vegetated riparian zone, the structure and complexity of which varies with each watercourse. There are also a number of land drains present, which are typically straight, artificial ditches associated with agricultural land. **Likely Key Receptors** ▪ Fox Brook – Small stream draining westwards from North Farm to St Neots;

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Gallow Brook - Small stream/tributary of the River Great Ouse. Drains from agricultural land and an issue in North Lodge Plantation; ▪ Callow Brook – Located in Hardwick ~850m north-east of the route alignment. The watercourse flows away from the proposed route alignment; ▪ Tit Brook – Flows to the east, away from the proposed route alignment, through Comberton; ▪ Fen Drayton Drain – Ordinary Watercourse and designated WER river water body crossing the proposed route alignment south of Elsworth Wood; and, ▪ West Brook – Ordinary Watercourse and designated WER river water body crossing the proposed route alignment south of Elsworth Wood. ▪
Springs	Groundwater – Surface Water Interactions	Few springs have been identified from Croxton to Toft within the study area using OS 1:25K mapping. Further details about these springs will be reviewed when a more detailed baseline is compiled for the EIA and superior digital data becomes available.
Reservoirs, Lakes and Ponds	Surface Water Hydromorphology	**Overview** Numerous ponds are present within the study area of the Project between Croxton and Toft. It is not clear based on available desk study data whether the ponds are natural or artificial in nature.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The aquifer type present within the study area and covers a significant area. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Gault Formation (Selbourne Group); and ▪ Kimmeridge Clay Formation – Mudstone.

Baseline features/ relevant receptors	Sub-aspect	Description
Principal Aquifer - Bedrock		**Overview** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. Smaller in area and location within to the west of the study area but extensive east of Hasingfield. **Likely Key Receptors** ▪ Woburn Sands Formation (Lower Greensand Group) – located south-east of Cambourne and south-east of Longstowe; ▪ West Melbury Marly Chalk Formation (Grey Chalk Subgroup) – south-east of the study area; ▪ Zig Zag Chalk Formation – Chalk; and ▪ Totternhoe Stone Member – Chalk.
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Limited in area and location within the study area; with River Terrace deposits and Alluvium local to watercourses, particularly the Bourn Brook and the River Cam. **Likely Key Receptors** ▪ River Terrace Deposits; and ▪ Alluvium.
Secondary (Undifferentiated) Aquifer - Superficial Drift		**Overview** This aquifer classification has been assigned in cases where it has not been possible to attribute either category A or B to a rock type, due to variable characteristics of the rock type. Dominant superficial aquifer type present within the north-west of the study area. Smaller outcrops of till to the south of Harlton and Hasingfield. **Likely Key Receptors** ▪ Till – Diamicton, including the Oadby Member; and ▪ Head deposits of clay, silt, sand and gravel.

Baseline features/ relevant receptors	Sub-aspect	Description
Groundwater dependent terrestrial ecosystem		**Overview** These have been identified by the Environment agency for the second River Basin cycle of the WER (formerly WFD). They are based on SSSI outlines from Natural England, filtered to include only those sites with wetland vegetation communities. **Likely Key Receptors** ▪ Radio Astronomy Observatory (Lords Bridge Observatory). The site is also located within close proximity to the site compound and could be affected by potential below ground workings and/or leaks and spills. The County Wildlife Site has been highlighted by Arup as a potential GWDTE; and ▪ Barrington Chalk Pits SSSI. The site is located adjacent to a significant cutting, and therefore could be affected by potential dewatering. The site is also located within close proximity to the site compound and could be affected by potential below ground workings and/or leaks.
Licenced groundwater/surface water abstractions	Groundwater	**Overview** These are locations licenced to abstract groundwater by the Environment Agency i.e. abstractions >20m^3 per day. The source for these groundwater abstractions is recorded as groundwater, but the aquifers from which they abstract is not known, nor any details regarding the borehole constructions and depths. A more detailed baseline is anticipated to be completed on these receptors as the EIA progresses. **Likely Key Receptors** There are 5 licenced abstractions currently identified within the study area. ▪ 6/33/32/*G/0017 – General farming & domestic; and ▪ 6/33/30/*S/0123 – Spray Irrigation (Direct) – Four abstraction locations under the same license.
Public water supply groundwater abstraction with a defined SPZs	Groundwater	**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment.

Baseline features/ relevant receptors	Sub-aspect	Description
		Likely Key Receptors ▪ SPZ3 (WR baseline ID: WR_SPZ3_Cambourne). The SPZ is associated with a licensed abstraction (information pending), which is likely to be a very high value receptor. The SPZ covers a large area to the west of Highfields Caldecote; and ▪ SPZ1 and SPZ2 are located north of Harlton and are associated with abstraction licence 6/33/32/*G/0008. The SPZ is associated with a licensed abstraction used for public water supply, a very high value receptor.
Discharges	Groundwater Surface Water	There is no information currently available on the presence of discharges to groundwater or surface water within the study area. This will be reviewed when a more detailed baseline is compiled for the EIA.
Comberton to Shelford		
Watercourses	Surface Water Hydromorphology	**Overview** There are numerous main watercourses and smaller streams/drains present with the study area in this section. **Likely Key Receptors** ▪ Bourn Brook – Ordinary Watercourse and WER designated waterbody which crosses study area north of Little Eversden; ▪ Long Brook – Ordinary Watercourse crossed by the proposed route alignment. The watercourse flows north-east to join the Bourn Brook; ▪ River Cam – Main River and WER designated waterbody flowing northwards to Cambridge. After leaving Cambridge, it flows north and east before joining the River Ouse to the south of Ely; ▪ Hobson's Brook – Ordinary Watercourse and WER designated waterbody which crosses study area north of Great Shelford. Watercourse is also underlain by chalk bedrock suggesting this could be a chalk stream, which would likely be of significant hydromorphological importance.
Springs	Groundwater – Surface Water Interactions	Multiple springs have been identified from Comberton to Shelford within the study area using OS 1:25K mapping. Further details about these springs will be reviewed when a more detailed baseline is compiled for the EIA and superior digital data becomes available.

Baseline features/ relevant receptors	Sub-aspect	Description
		Likely Key Receptors ▪ Nine Wells Nature Reserve – Four springs located within Nine Wells Nature Reserve, west of White Hill.
Reservoirs, Lakes and Ponds	Hydromorphology	**Overview** Numerous ponds are present within the study area of the Project between Cambourne and Harston. It is not clear based on available desk study data whether the ponds are natural or artificial in nature. A more detailed baseline is anticipated to be completed on these receptors as the EIA progresses and a water feature survey is carried out. **Likely Key Receptors** ▪ Five lakes within Milton Country Park.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Minor unproductive strata present within the study area, located west of Coldham's Common and north of Cambridge North Station. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Gault Formation (Selbourne Group).
Principal Aquifer - Bedrock		**Overview** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. Dominant aquifer type present in the study area and underlies majority of the route from Harston to Cambridge. **Likely Key Receptors** ▪ West Melbury Marly Chalk Formation (Grey Chalk Subgroup); ▪ Zig Zag Chalk Formation; ▪ Totternhoe Sand Member; and

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Holywell Nodular Chalk Formation.
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Limited in area and location within the study area; with River Terrace deposits and Alluvium local to watercourses, particularly the River Cam and Hobson's Brook **Likely Key Receptors** ▪ River Terrace Deposits; and ▪ Alluvium.
Groundwater dependent terrestrial ecosystem		**Overview** These have been identified by the Environment agency for the second River Basin cycle of the WER (formerly WFD). They are based on SSSI outlines from Natural England, filtered to include only those sites with wetland vegetation communities. Local Nature Reserves that may be groundwater dependent are also included. **Likely Key Receptors** ▪ Coldhams Common - The site is located within proximity to the site compound and could be affected by construction activities such as potential below ground workings and/or leaks and spills. The LNR site is described as chalk grassland; ▪ Nine Wells Nature reserve – the site used to be a SSSI but was downgraded to a nature reserve. Anglian Water have a groundwater recharge point within the site. Contains a chalk stream and four springs; and ▪ Whittlesford - Thriplow Hummocky Fields SSSI – located c. 1 km east of the study are but groundwater likely to be in continuity. The nationally uncommon fairy shrimp Chirocephalus diaphanus, occurs in groundwater fed temporary freshwater pools.
Licenced groundwater abstractions	Groundwater	**Overview**

Baseline features/ relevant receptors	Sub-aspect	Description
		These are locations licenced to abstract groundwater by the Environment Agency i.e. abstractions >20m^3 per day. Where the source for these abstractions is recorded as groundwater, the aquifers from which they abstract is not known, nor any details regarding the borehole constructions and depths. **Likely Key Receptors** There are four licenced abstractions currently identified within the study area: ▪ 6/33/27/*G/0133/R02 – Spray Irrigation (Direct); ▪ 6/33/33/*G/0003 – Laundry Use; ▪ 6/33/33/*G/0075/R02 – Horticultural Watering; and ▪ 6/33/33/*G/0075/R02 – Spray Irrigation (Direct).
Public water supply groundwater abstraction with a defined SPZs	Groundwater	**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment. There are no identified SPZs within the study area.
Discharges	Groundwater Surface Water	Anglian Water reportedly have a groundwater recharge point located in Nine Wells Nature Reserve. There is no other information currently available on the presence of discharges to groundwater or surface water within the study area.
Cambridge		
Watercourses	Surface Water Hydromorphology	**Overview** There are numerous main watercourses and smaller streams/drains present with the study area in this section. **Likely Key Receptors** ▪ River Cam – Main River and WER designated waterbody flowing northwards to Cambridge. After leaving Cambridge, it flows north and east before joining the River Ouse to the south of Ely;

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Coldham's Brook – Ordinary Watercourse which crosses the study area east of Stourbridge Common and flows north-west to join the River Cam; and, ▪ Cherry Hinton Brook – Ordinary Watercourse and WER designated waterbody flowing northwards through Stourbridge Common to the River Cam.
Springs	Groundwater – Surface Water Interactions	Multiple springs have been identified from Harston to Cambridge within the study area using OS 1:25K mapping. Further details about these springs will be reviewed when a more detailed baseline is compiled for the EIA and superior digital data becomes available. **Likely Key Receptors** ▪ Nine Wells Nature Reserve – Four springs located within Nine Wells Nature Reserve, west of White Hill.
Reservoirs, Lakes and Ponds	Hydromorphology	**Overview** Numerous ponds are present within the study area of the Project at Cambridge. It is not clear based on available desk study data whether the ponds are natural or artificial in nature. A more detailed baseline is anticipated to be completed on these receptors as the EIA progresses and a water feature survey is carried out. **Likely Key Receptors** ▪ Five lakes within Milton Country Park.
Unproductive Strata - Bedrock	Groundwater	**Overview** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Minor unproductive strata present within the study area, located west of Coldham's Common and north of Cambridge North Station. Locally overlain by superficial aquifers. **Likely Key Receptors** ▪ Gault Formation (Selbourne Group).
Principal Aquifer - Bedrock		**Overview**

Baseline features/ relevant receptors	Sub-aspect	Description
		These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. Dominant aquifer type present in the study area and underlies majority of the route from Harston to Cambridge. **Likely Key Receptors** ▪ West Melbury Marly Chalk Formation (Grey Chalk Subgroup); ▪ Zig Zag Chalk Formation; ▪ Totternhoe Sand Member; and ▪ Holywell Nodular Chalk Formation.
Secondary A Aquifer - Superficial Drift		**Overview** These are defined as 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. Limited in area and location within the study area; with River Terrace deposits and Alluvium local to watercourses, particularly the River Cam and Hobson's Brook **Likely Key Receptors** ▪ River Terrace Deposits; and ▪ Alluvium.
Groundwater dependent terrestrial ecosystem		**Overview** These have been identified by the Environment agency for the second River Basin cycle of the WER (formerly WFD). They are based on SSSI outlines from Natural England, filtered to include only those sites with wetland vegetation communities. Local Nature Reserves that may be groundwater dependent are also included. **Likely Key Receptors** ▪ Coldhams Common - The site is located within proximity to the site compound and could be affected by construction activities such as potential below ground workings and/or leaks and spills. The LNR site is described as chalk grassland;

Baseline features/ relevant receptors	Sub-aspect	Description
		▪ Nine Wells Nature reserve – the site used to be a SSSI but was downgraded to a nature reserve. Anglian Water have a groundwater recharge point within the site. Contains a chalk stream and four springs; and ▪ Whittlesford - Thriplow Hummocky Fields SSSI – located c. 1 km east of the study are but groundwater likely to be in continuity. The nationally uncommon fairy shrimp Chirocephalus diaphanus, occurs in groundwater fed temporary freshwater pools.
Licenced groundwater abstractions	Groundwater	**Overview** These are locations licenced to abstract groundwater by the Environment Agency i.e. abstractions >20m^3 per day. Where the source for these abstractions is recorded as groundwater, the aquifers from which they abstract is not known, nor any details regarding the borehole constructions and depths. **Likely Key Receptors** There are four licenced abstractions currently identified within the study area: ▪ 6/33/27/*G/0133/R02 – Spray Irrigation (Direct); ▪ 6/33/33/*G/0003 – Laundry Use; ▪ 6/33/33/*G/0075/R02 – Horticultural Watering; and ▪ 6/33/33/*G/0075/R02 – Spray Irrigation (Direct).
Public water supply groundwater abstraction with a defined SPZs	Groundwater	**Overview** Source protection zones are a tool for considering the risk from any activities that might cause pollution in the area surround boreholes, wells and springs which are used for public drinking water supply. The closer the activity, the greater the risk. There are three main zones: SPZ1 - Inner zone, SPZ2 - outer zone and SPZ3 - total catchment. There are no identified SPZs within the study area.
Discharges	Groundwater Surface Water	Anglian Water reportedly have a groundwater recharge point located in Nine Wells Nature Reserve. There is no other information currently available on the presence of discharges to groundwater or surface water within the study area.

EWR-MWJV Technical Partner

Routewide – Environmental - EIA Scoping: Approach to achieve Biodiversity Net Gain

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) under the Planning Act 2008 to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. More detailed descriptions of the proposals that make up the Project are contained in the EIA Scoping Report.

1.1.3. There are aspects of the Project that, while outside the scope of EIA, are related to the EIA process and are required for the DCO application. One such aspect is biodiversity net gain (BNG) which, although not part of the EIA, sits alongside it.

1.1.4. BNG is a way of creating and improving biodiversity by requiring development to have a positive impact ("net gain") on biodiversity[1]. EWR Co is committed to "delivering 10% BNG across the whole EWR project".

1.1.5. This document sets out the proposed approach to how EWR Co will design, implement, achieve, and demonstrate BNG for the Project. Fundamental to the approach are the following: applying the mitigation hierarchy, contributing to local nature conservation priorities, and creating wildlife-rich habitats in ways that are resilient to climate change and, where possible, increase carbon sequestration.

1.1.6. At present the mandatory BNG requirements do not apply to NSIPs, as such EWR Co's approach has been developed with consideration of the statutory framework for BNG under which, subject to some exemptions, every grant of planning permission is deemed to have been granted subject to the condition that BNG is delivered[2], and with regard to the BNG requirements outlined in the National Networks National Policy Statement (NNNPS)[3]. The NNNPS states that applicants should show how their proposal will deliver BNG in line with the requirements of the Biodiversity Gain Statement. The Biodiversity Gain

[1] Department for Environment, F.& R.A. (2024) *Biodiversity net gain, GOV.UK*. Available at: https://www.gov.uk/government/collections/biodiversity-net-gain.
[2] Team, L.U.P. (2023) *The Biodiversity Net Gain Statutory Instruments - explained*, *Environment*. Available at: https://defraenvironment.blog.gov.uk/2023/11/29/the-biodiversity-net-gain-statutory-instruments-explained/.
[3] Department for Transport (2024) *National Networks – National Policy Statement, March 2024*. Available at: National Networks - National Policy Statement (publishing.service.gov.uk).

Statement, setting out how BNG will apply to NSIPs does not yet exist but a draft is expected to be published for consultation shortly. EWR Co's approach for BNG will be kept under review and updated if necessary, particularly when the draft and then final Biodiversity Gain Statement and then the statutory BNG requirements for NSIP projects are published.

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
BNG	Biodiversity net gain
BS	British standard
DCO	Development consents order
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental impact assessment
ENCA	Enabling a natural capital approach
EWR Co	East West Rail Company
HMMP	Habitat management and monitoring plan
NE	Natural England
NNNPS	National networks national policy statement
NSIPs	Nationally significant infrastructure projects

3. Relevant standards and guidance

3.1. Standards and guidance

3.1.1. Standards and guidance that will be used for the design and implementation of BNG include:

- British Standard 8683 (2021) Process for designing and implementing BNG: Specification. British Standards Institute (hereafter referred to as BS8683);
- CIEEM, IEMA, CIRIA, (2016) BNG: Good Practice Principles for development, UK;
- UK Habitat Classification Working Group (2018) UK Habitat Classification User Manual;
- UK Habitat Classification Working Group (2018) The UK Habitat Classification Habitat. Descriptions Version 1.0;
- UKHab Ltd (2023) UK Habitat Classification Version 2.0 [https://www.ukhab.org];
- Natural England and the RSPB (2019) Climate Change Adaption Manual - Evidence to support nature conservation in a changing climate. 2nd Edition. Natural England, York, UK;
- R Gregg, J. L. Elias, I Alonso, I.E. Crosher and P Muto and M.D. Morecroft (2021) Carbon storage and sequestration by habitat: a review of the evidence (second edition) Natural England Research Report NERR094. Natural England, York; and
- Department for environment, food and rural affairs (Defra). Enabling a Natural Capital Approach (ENCA) (2023) [Enabling a Natural Capital Approach (ENCA) - GOV.UK (www.gov.uk)].

3.1.2. In addition to the above references, publications on the creation, enhancement and restoration of habitats for biodiversity conservation (such as the guidance published by Natural England) will inform the design of BNG.

3.1.3. This document was prepared with consideration to Defra (2023a) “Irreplaceable habitats and BNG: what you need to know”[4],[5], and Defra (2024) “What you can count towards a development’s BNG”[6].

3.1.4. Implementation of BNG could be supported by a habitat management and monitoring plan (HMMP), for example the Natural England HMMP template (or a HMMP template for NSIPs if published by Natural England).

[4] *Irreplaceable habitats and bng what you need to know* (2024) *GOVUK blogs.* Available at: http://defralanduse.blog.gov.uk/2023/10/05/irreplaceable-habitats-and-bng-what-you-need-to-know/ (Accessed 6 October 2023).
[5] Irreplaceable habitat - GOV.UK
[6] *What you can count towards a developments biodiversity net gain* (2024) *GOVUK.* Available at: https://www.gov.uk/guidance/what-you-can-count-towards-a-developments-biodiversity-net-gain-bng (Accessed 18th October 2023).

3.1.5. There is reference to a Biodiversity Metric[7] throughout this document. This document was prepared with consideration to the main sites statutory Biodiversity Metric for mandatory BNG through the planning system. This approach to BNG for the Project will be updated if necessary should a statutory Biodiversity Metric specifically for NSIPs be published.

3.1.6. EWR Co seeks to achieve route wide BNG.

3.1.7. This approach to BNG closely aligns with the EIA Scoping Method Statements for other environmental aspects, particularly biodiversity, landscape, historic environment, and climate resilience.

[7] Statutory biodiversity metric tools and guides - GOV.UK

4. Approach to establishing the BNG baseline

4.1. Scope

4.1.1. The baseline for BNG will be a static baseline established for the EIA of the Project. This baseline will be used to measure BNG outcomes against. The baseline will comprise all land within the draft Order Limits. Where draft Order Limits of the Project lie within a riparian zone of a watercourse habitat (as defined in the Biodiversity Metric User Guide), that watercourse habitat shall be included in the baseline assessment for BNG.

4.1.2. If off-site provision of BNG is required (i.e. habitat creation and enhancement to achieve BNG that is outside of draft Order Limits), the off-site baseline will be assessed to calculate the net change in habitat units from off-site habitat creation or enhancement only.

4.2. Habitat type and area

4.2.1. Habitat types will be identified from survey methodologies described in the biodiversity Method Statement.

4.2.2. The area (hectares or km) of habitat parcels will be measured using survey methodologies described in the biodiversity Method Statement. Measuring adjacent area-based, linear and watercourse habitats will follow methods set out in the Biodiversity Metric User Guide.

4.2.3. Data from arboricultural surveys will be used together with habitat survey data to categorise rural and urban individual trees and inform 'habitat area' of individual trees for entry into the Biodiversity Metric calculation.

4.2.4. Presence of irreplaceable habitats within the draft Order Limits, and within the zone of influence (as described in the biodiversity Method Statement, for example a 30m buffer around ancient woodland) where they may be subject to loss or deterioration from construction and/or operation of the Project, will initially be recorded within the baseline for BNG. Through an iterative BNG design process and application of the mitigation hierarchy, irreplaceable habitats outside of draft Order Limits and not subject to loss or deterioration from the Project, would only be included in the baseline if enhanced as part of the Project's BNG design.

4.2.5. Very High Distinctiveness habitats will be recorded following the same approach as for irreplaceable habitats.

4.3. Habitat condition

4.3.1. Habitat condition assessments for area-based habitats, linear habitats (hedgerows and lines of trees), and watercourses, will be undertaken in accordance with the habitat condition methodology for the Biodiversity Metric. The data will be collected with sufficient details to identify enhancement opportunities as part of BNG design.

4.3.2. Reconnaissance surveys on watercourses will be undertaken to delineate watercourses into distinct sections of consistent river condition, and watercourse and riparian encroachment, for data collection for the Biodiversity Metric calculation.

4.3.3. Data from arboricultural surveys including maturity, impacts on tree health, and presence of ecological niches, will also inform the condition assessment of individual trees.

4.3.4. The condition of irreplaceable habitats will be collected where required to inform application of the mitigation hierarchy and the design of BNG.

4.4. Strategic significance

4.4.1. Examples of local strategies used to inform strategic significance include Local Nature Recovery Strategies; Bedfordshire Natural Capital Assessment in Bedford; the emerging Nature Recovery Network and Local Nature Recovery Strategy in Central Bedfordshire; Cambridgeshire Strategic Green Infrastructure Network Priority Areas in Huntingdon; Cambridge Nature Network Priority Areas in Cambridgeshire; Thames and Anglian River Basin Management Plans; Biodiversity Opportunity Areas in Milton Keynes; and Conservation Target Areas in Cherwell and Oxford, as well as River Basin Management Plans and Catchment Plans.

4.5. Baseline biodiversity units

4.5.1. Baseline information from other environmental aspects including arboriculture, historic environment, landscape, water resources, geomorphology, carbon, communities and the built environment (such as utilities and structures) will be incorporated into a qualitative BNG baseline assessment that will accompany the Biodiversity Metric baseline calculation. This information will be used to identify constraints to, and opportunities for, achieving BNG from other environmental aspects, so these are recorded as considerations for the BNG design.

5. Embedding mitigation in the design

5.1.1. Applying the mitigation hierarchy is fundamental to achieving BNG, especially the first steps of avoiding and reducing negative impacts on biodiversity. Only after all possible steps have been taken to avoid and reduce negative impacts, will mitigation and then compensation be considered.

5.1.2. For the assessment of impacts on biodiversity, examples of embedded mitigation are described in the biodiversity Method Statement.

5.1.3. Mitigation will count towards BNG where it meets the requirements of Defra's current guidance on "What you can count towards a development's BNG"[6], but this approach will be adapted if necessary to comply with any specific statutory requirements and guidance for BNG for NSIPs that are made.

6. Considerations

6.1.1. Achieving BNG on the Project could be affected by the following, if caused by construction and operation of the Project:

- Route-wide BNG will not be achieved if construction or operation of the Project causes the loss or deterioration of irreplaceable habitats;
- Bespoke compensation will be required for any unavoidable loss of very high distinctiveness habitats, as net gain outcomes are not possible for such losses;
- Decline in the type, area (ha or km), condition or strategic significance of habitats;
- Worsening of encroachment within watercourses or their riparian zones; and
- Negative impacts on the natural environment's resilience to climate change.

6.1.2. In addition, extreme weather events and a change in climatic conditions could affect the long-term viability of the BNG design.

6.1.3. Method Statements for biodiversity, landscape, historic environment and climate resilience contain descriptions of the Project's future baseline. It is noted that pre-existing nature conservation activities and funds will be assessed with regards to meeting the additionality principle (as described in BS 8683[8]) if these are part of the BNG design for the Project.

[8] British Standards Institution (2021) *BS 8683:2021 Process for designing and implementing Biodiversity Net Gain. Specification.*

7. Designing BNG

7.1. Design approach

7.1.1. The design of BNG for the Project will be undertaken as a collaborative design approach, especially with engineering and earth works, biodiversity, landscape, historic environment and climate resilience (please refer to the relevant sections in these Method Statements).

7.1.2. Key aspects for designing BNG include:

- Designing habitat retention, creation and enhancement based on sound ecological principles including consideration of soil types, the size of habitat parcels to maintain ecological functionality and suitable environmental conditions;
- Creating and enhancing habitats in ways that contribute towards local nature conservation objectives;
- Creating and enhancing habitats in ways that are resilient to climate change and, where possible, increase carbon sequestration of habitats;
- Generating a minimum 10% increase in habitat units (separately for area units, hedgerow units and watercourse units) through habitat retention, creation and enhancement;
- Reducing time-lags between habitat clearance for construction and the start of habitat creation and enhancement for BNG, and commencing BNG activities before habitat clearance; and
- Accommodating maintenance and management activities, for example access and storage areas.

7.1.3. The design of habitat retention, creation and enhancement for BNG will be integrated in the landscape design outputs including landscape drawings and planting schedules.

7.1.4. The design of BNG will consider maintenance requirements, as well as management activities and an associated programme, a process for adaptive management and the monitoring of habitats.

7.2. Spatial risk

7.2.1. Spatial risk in the Biodiversity Metric represents the distance between the location of habitat clearance for a development, and the location of off-site habitat creation or enhancement for the development to achieve BNG (off-site being outside the draft Order Limits). Spatial risk will be set for each parcel of habitat creation and enhancement in the Biodiversity Metric post-development calculation according to the requirements for BNG for NSIPs.

7.3. Integrating climate resilience

7.3.1. The climate resilience Method Statement contains details on methods to establish the climate baseline, attain climate projection data; assess climate risks to railway infrastructure; and identify resilience measures for the engineering design. This information will be used to assess climate risks to habitat retention, enhancement and creation proposals to achieve BNG. From these climate risks, appropriate resilience measures will be incorporated into the BNG design, with the aim to also support resilience of the rail infrastructure.

7.4. Carbon sequestration

7.4.1. Change in carbon sequestration rates of habitats from baseline to post-development will be assessed with the aim for BNG to be designed to also achieve carbon neutrality as a minimum, and to increase carbon sequestration where possible. Carbon sequestration is defined as the capture of carbon by habitats that would otherwise be emitted to, or remain in, the atmosphere.

7.4.2. The assessment will follow Defra's enabling a natural capital approach (ENCA)[9], as well as guidance set out by His Majesty's Treasury's Green Book: appraisal and evaluation in central government (2022)[10]. It will also use data from Natural England's Carbon Storage and Sequestration by Habitat 2021 (NERR094).

7.5. Post-development biodiversity units

7.5.1. Post-development Biodiversity Metric calculations will be undertaken as part of an iterative process during the design development process, for BNG to be fully incorporated into decision-making. These calculations include risk multipliers already set within the Biodiversity Metric, for example time to target condition and difficulty risk.

7.5.2. BNG will be achieved when the Biodiversity Metric post development calculation (as based on the Project's BNG design) demonstrates a minimum 10% increase in each type of unit.

7.6. Stakeholder engagement

7.6.1. Wherever possible, opportunities to achieve BNG will be identified and taken forward through working with local and regional stakeholders.

[9] *Enabling a Natural Capital Approach (ENCA)* (2023) *GOVUK.* Available from: Enabling a Natural Capital Approach (ENCA) - GOV.UK (www.gov.uk) (Accessed 17th January 2023).
[10] *The Green Book: appraisal and evaluation in central government* (2022). *GOVUK.* Available from: https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent (Accessed 17th January 2023).

EWR-MWJV Technical Partner

Routewide – Environmental – EIA Scoping Method Statement – Approach to Code of Construction Practice

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East West Rail

1.1. Introduction

1.1.1. This document sets out East West Rail (EWR) Company's proposed approach to the development of the Code of Construction Practice (CoCP) during the design and environmental assessment of the Project. This document includes examples measures which would be expected to be contained within the final CoCP. The CoCP will provide a consistent approach to the management of construction activities across local authority boundaries, and with a wide range of key stakeholders.

1.1.2. The Project has been designed to reduce impacts as much as possible and avoid significant environmental effects. Construction work can be one of the chief causes of environmental impact. The code of construction practice (CoCP) will be developed for the Project setting out a range of control measures, standards and principles which any future contractor would be required to comply with when constructing the Project.

1.1.3. The CoCP will be a fundamental part of the Project and will outline the measures which will be applied during the construction phase to avoid or reduce likely significant impacts on people and on natural and historic assets. The environmental assessment will assume that these measures will, as a minimum, be implemented. The measures will represent a best practice approach and are typical of most construction activity for a Project of this nature. The implementation of the measures set out in the CoCP will be secured through suitable provisions in the DCO.

1.1.4. A CoCP is sometimes considered as an outline environmental management plan (EMP) on other projects and may be supported by or interact with other specific management plans. The approach to the CoCP and other management plans will develop as the Project progresses towards application.

1.1.5. The CoCP and supporting documentation will be produced in conjunction with the environmental statement (ES) with the aim of ensuring that potential likely significant construction effects will be mitigated (such that they become not significant). It will be published as an integral part of the ES documentation. The final CoCP will reflect any amendments made during the Examination and refinements resulting from the detailed design stage. All such commitments will be recorded in the register of environmental actions and commitments.

Abbreviations & definitions

Table 1 - Abbreviations and definitions.

Abbreviation	Definition
BPM	Best practicable means
CoCP	Code of Construction Practice
DCO	Development Consent Order
ES	Environmental Statement
EWR	East West Rail
EMP	Environmental Management Plan
PRoW	Public Right of Way
REAC	Register of Environmental Actions and Commitments

Code of construction practice principles

1.1.6. The Project has been designed to reduce and avoid environmental impacts on people, the environment and the historic environment during construction and operation, but where effects cannot be fully designed out the CoCP identifies mitigation measures that may be applied. Best practicable means (BPM) will be employed throughout construction, considering the risks, costs and best practice.

1.1.7. The CoCP will include relevant standards and guidance, including best practice identified by aspect specialists, in relation to the environmental impacts of construction. It will set out the approaches and measures to be used to mitigate and manage construction activities to reduce likely significant effects as far as reasonably practicable during the construction phase.

1.1.8. The CoCP will be developed in consultation with stakeholders.

1.1.9. The design of the Project will, where possible, limit and reduce permanent and temporary significant environmental effects during construction. Construction works will be designed to reduce environmental impacts, with mitigation employed to address impacts that cannot be designed out.

1.1.10. The CoCP will include measures to prevent, limit and mitigate significant construction effects relevant to the following general matters (although this list is not exhaustive):

- Climate resilience and extreme weather events. With the relatively short to near term planned construction programme, construction management needs to take account of current climate and variability, rather than climate change specifically;
- Community relations and stakeholder engagement including complaints procedures;
- Timing of construction works and working hours;
- Environmental management systems;
- Site security, including hoarding, fencing, screening and lighting;
- On-site working practice and amelioration including staff competency and training;
- Selection and operation of construction plant;

- Site access including construction traffic routes and diversions of roads, public rights of way (PRoW), footways, cycleways;
- Fire prevention;
- Site safety including health and safety;
- Pollution prevention measures and pollution incident control;
- Investigation and reporting including compliance audits;
- Emergency preparedness and access;
- Unexpected discoveries including unexploded ordnance;
- Watercourse and groundwater protection;
- Pre-emptive environmental surveys to guide on-site activities;
- Demolition;
- Carbon management;
- Selection and management of materials;
- Minerals and contamination;
- Management of hazardous waste;
- Duty of care;
- Protection of land and soils;
- Ground investigation; and
- Monitoring requirements.

1.1.11. The specific environmental matters to be considered include the following (although this list is not exhaustive). For more detail refer to Section 0 of this document:

- Agriculture and soils;
- Air quality;
- Carbon;
- Historic environment;
- Ecology and biodiversity;
- Ground settlement;

- Land quality;
- Landscape and visual;
- Odour;
- Resources and waste;
- Sound, noise and vibration;
- Traffic and transport; and
- Water resources and flood risk.

Environmental matters

1.2. Introduction

1.2.1. This section outlines examples of the environmental matters and measures that may be included in the CoCP. A register of environmental actions and commitments will also be developed alongside the ES and the CoCP. The following measures are examples of the types of measures that may be included. This will be subject to review and will be updated as the Project design is refined.

1.3. Agriculture and soils

1.3.1. Controls will be implemented to mitigate avoidable potential impacts on soils and agricultural land holdings as they affect land use and accessibility.

1.3.2. The CoCP will set out the arrangements for the protection of agricultural land adjacent to construction sites; reinstatement of agricultural land after construction where possession has been required temporarily; maintenance of access to agricultural land, property and infrastructure which may be affected by construction; and construction traffic routes.

1.3.3. The CoCP will set out the soil handling procedures to be followed and the records to be kept prior to and during construction.

1.4. Air quality

1.4.1. Controls will be implemented to limit dust and air pollution during the construction works as far as reasonably practicable and in accordance with BPM.

1.4.2. The CoCP will set out site management and other measures to limit emissions from construction plant and vehicles, and to control and suppress dust and emissions during construction, transport and storage of materials, demolition, earthworks, materials handling (including crushing, grinding, and processing) and use of haul routes.

1.4.3. The CoCP will include consideration of areas with higher sensitivity to dust or air pollutant emissions/or areas of higher risk (e.g. Air Quality Management Areas or areas where there will be residential properties close to construction sites).

1.4.4. The CoCP will set out the proactive approach to managing air quality including the monitoring requirements and records to be kept prior to and during construction.

1.5. Carbon

1.5.1. The CoCP will set out the strategies, procedures and steps to be taken to mitigate and reduce the impact of construction on the Project's total carbon emissions.

1.5.2. The CoCP will set out the plans, monitoring requirements and records to be kept prior to and during construction.

1.6. Historic environment

1.6.1. Controls will be implemented to manage impacts on designated and non-designated historic environment assets. The CoCP will set out the following:

- General provisions;
- A written scheme of investigation, setting out objectives, technical standards and procedures to be followed during construction of the Project;
- Procedures for human remains;
- Compliance with the Treasure Act 1996; and
- Measures in relation to unexpected discoveries of heritage assets including those of national importance.

1.6.2. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

1.7. Ecology and biodiversity

1.7.1. Controls will be implemented to manage impacts and protect the ecology of the area of the Project with particular attention to specific ecological resources including:

- Statutory and non-statutory designated habitats and sites;
- Protected and notable species; and
- Other habitats and features of ecological importance.

1.7.2. The CoCP will set out the measures for controlling potential ecological impacts including protection of retained habitat, control of dust, noise and vibration, pollution control, water quality controls, water flow controls, and lighting.

1.7.3. The CoCP will set out the measures to be implemented for the treatment and control of invasive non-native species and injurious weeds as well as the measures to promote bio-security.

1.7.4. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

1.8. Ground settlement and land stability

1.8.1. The CoCP will set out measures to control and limit the effects of settlement and instability, for example during excavation for any below ground structures and tunnels.

1.9. Land quality

1.9.1. Land quality encompasses the issues of land contamination and designated geological resources. The CoCP will set out the procedures and statutory guidance to be followed to undertake ground investigation and risk assessment work where necessary and to identify and implement remediation measures where required. Consideration will also be given to the presence of ground gases and vapours. The CoCP will also outline procedures taken during construction to minimise the spread of contamination, protocols for dealing with unexpected contamination, as well as measures for the management of excavated materials in accordance with industry guidance and best practice. Procedures will also be set out for works that may impact designated geological resources.

1.9.2. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

1.10. Landscape and visual

1.10.1. Controls will be put in place to protect the landscape features and the visual amenity of people overlooking construction works.

1.10.2. The CoCP will set out details of the temporary measures needed during construction to protect notable landscape elements and aim to control adverse visual impacts from views of construction activity. This includes control of light spillage and any tree removal requirements.

1.10.3. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

1.11. Odour

1.11.1. During construction, potential odour sources could arise, such as from the disturbance of potentially contaminated ground or from spillages of odorous liquids such as fuels.

1.11.2. The CoCP will set out measures to limit odour during the construction works as far as reasonably practicable and in accordance with BPM.

1.11.3. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

1.12. Resources and waste

1.12.1. The CoCP will set out the measures to be implemented to use material resources efficiently, reduce waste at source, re-use resources, recycle and reduce the quantity of waste that requires disposal to landfill, in accordance with the waste hierarchy.

1.12.2. The CoCP will outline the requirements for site waste management plans including segregation and storage of waste.

1.12.3. The CoCP will outline the requirements for the excavation works to consider the potential use of site won materials including minerals extracted (if any).

1.12.4. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction including a register of all waste loads leaving site.

1.13. Sound, noise and vibration

1.13.1. The CoCP will set out the BPM measures to be followed to reduce noise and vibration at neighbouring residential properties and other sensitive receptors arising from construction activities, including a policy for noise insulation and temporary re-housing where these are required.

1.13.2. The CoCP will set out the measures for noise and vibration management including the procedures for applying for prior consent under s61 of the Control of Pollution Act 1974. It will also detail the measures to be implemented in accordance with the duty of care requirements of legislation.

1.13.3. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction including noise and vibration monitoring.

1.14. Traffic and transport

1.14.1. Controls will be implemented to reduce impacts on the ability of the local community (including local residents, businesses and their customers, visitors to the area and users of the transport network) to make journeys and gain access, as well as to limit impacts affecting road safety and potentially resulting in fear and intimidation due to construction traffic.

1.14.2. The CoCP will set out project wide, local area and site-specific measures for construction traffic and other transport related issues developed in consultation with relevant stakeholders. These will include measures for road safety, vehicle safety, traffic management and road closures, routes and timings of site operations, traffic movements and road cleanliness.

1.14.3. The CoCP will also address workplace travel plans.

1.14.4. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction.

1.15. Water resources and flood risk

1.15.1. The CoCP will set out the controls to be implemented during construction to protect the quality of surface water and ground water resources including significant changes to the hydrological regime through controls to manage the rate and volume of run-off.

1.15.2. Monitoring systems will be employed during the construction works and there will be emergency procedures in place in the event of any pollution incidents.

1.15.3. The CoCP will include measures to reduce potential impacts to water resources including ground water and surface water bodies. This will include controls for foul drainage, pollution, excavations and dewatering, and private water supplies.

1.15.4. The CoCP will set out the controls to meet requirements to avoid any significant increase of flood risk.

1.15.5. The CoCP will set out the monitoring requirements and records to be kept prior to and during construction including consents required from the relevant regulatory authority.

EWR-MWJV Technical Partner

Routewide – Environmental – EIA Scoping - Approach to Equality Impact Assessment

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1. East West Rail

1.1. Introduction

1.1.1. East West Rail Company (EWR Co) is proposing to apply to the Secretary of State for a development consent order (DCO) to authorise the construction, operation, and maintenance of a new railway between Bedford and Cambridge and associated works including works to the existing railway between Oxford and Bedford (the Project). To deliver the Project, EWR Co will apply for an order granting development consent under the Planning Act 2008[1] (as amended). The Project forms part of East West Rail which will introduce a new railway connection between Oxford and Cambridge. The Project is considered to be a project requiring environmental impact assessment (EIA).

1.1.2. EIA is a process that is required as part of the consenting of certain projects depending on their size, activities, location and potential to give rise to significant effects on the environment. Information about an EIA and its findings is presented within an environmental statement (ES). The ES is fundamental to the decision-making process, allowing decision makers (for the Project this is the Secretary of State for Transport) to exercise their responsibilities by weighing up environmental issues and ensuring that the necessary measures to prevent or lessen potential negative effects form part of any consent and the powers inherent in it.

1.1.3. In order to plan how the EIA for the Project should be undertaken a scoping exercise has been carried out. An overarching EIA Scoping Report has been prepared that sets out the EIA scope as a whole, addressing all assessment aspects. The EIA Scoping Report includes wider context for this Method Statement including more detailed descriptions of the proposals that make up the Project.

1.1.4. More detailed descriptions of the proposals that make up the Project are contained in the EIA Scoping Report. This approach to equality impact assessment (EqIA) should be read in conjunction with the Method Statements prepared for other aspects.

1.1.5. This document sets out the approach to the EqIA of the Project. An EqIA is a predictive assessment tool which supports compliance by public bodies with the public sector equality duty (PSED) which is set out in section 149 of the Equality Act 2010[2] (hereafter referred to as 'the Equality Act'). An integrated 'Preliminary EqIA findings report' will be developed alongside the PEIR. A final

[1] Uk Government (2008) *Planning Act 2008.* Accessed at https://www.legislation.gov.uk/ukpga/2008/29/contents (Last Accessed November 2024)
[2] *Equality Act 2010* (2010). *GOV.UK*. Available at: https://www.legislation.gov.uk/ukpga/2010/15/contents (Accessed: 15 April 2024).

route wide EqIA will be completed and submitted alongside the DCO application, which will build on the findings of the Preliminary EqIA findings report.

1.1.6. The Equality Act requires that disadvantages experienced by people due to their protected characteristics are considered, reduced as much as possible, and that steps are taken to meet the different needs of sensitive social groups which share protected characteristics (referred to hereafter as 'equality groups'). It also requires that participation from these groups is actively encouraged, especially when their involvement is disproportionately low.

1.1.7. EqIA is a common means of understanding the potential effects of a proposed development or project on equality groups through:

- Providing a written record of the equality considerations which have been taken into account;
- Ensuring that decision-making includes a consideration of the actions that would help to avoid or mitigate any negative effects on particular equality groups; and
- Supporting evidence-based and transparent decision-making.

1.1.8. The purpose of the EqIA is to build a proportionate understanding of the potential equality effects of the Project and, as set out within the PSED, how EWR Co has had due regard to the need to:

- Eliminate discrimination, harassment, victimisation, and any other conduct that is prohibited by or under the Equality Act.
- Advance equality of opportunity between people who share a protected characteristic and those who do not. This includes:
    - Removing or reducing as much as possible disadvantages suffered by people due to protected characteristics;
    - Taking steps to meet the needs of people with protected characteristics where these are different from the needs of other people; and
    - Encouraging people with protected characteristics to participate in public life or in other activities where their participation is disproportionately low.
- Foster good relations between people who share a protected characteristic and those who do not.

1.1.9. It is important for those involved in making decisions that they understand the full range of potential impacts that any changes could have on the local population. It is particularly important to understand that impacts are not experienced uniformly across populations, and therefore to identify where potential impacts fall on groups and communities who would be the most sensitive to change. As such, the EqIA process helps to support design development, good decision making, planning for different people's needs, and delivering services that are appropriate and inclusive for all.

1.1.10. The National Networks National Policy Statement[3] (NNNPS) sets out the need for, and government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national rail networks in England and outlines the policies against which decisions on major rail projects will be made. The NNNPS states that applicants must comply with any obligations under the Equality Act and recognises that the Secretary of State must have regard to the Public Sector Equality Duty when exercising their functions.

1.1.11. The Project is likely to result in both positive and negative effects on the people living in the communities around the railway, as well as on its passengers, and on its staff. Due to the diversity of local communities, some of those people may experience those effects in a way that is different to those experienced by the population at large. It is therefore important for the success of the Project to understand what those effects may be, who may experience them, and the measures that can be put in place to maximise positive outcomes and minimise negative outcomes.

1.1.12. For the Project, considerations relating to equality groups will inform the development of the Project design through stakeholder engagement and public consultation and help shape the Project consultation and engagement activities.

1.1.13. This document describes the methodologies that will be used to identify the potential for impacts and effects on equality groups as defined under the Equality Act. It also outlines the issues that will be addressed by the EqIA and the types of equality effects that may arise. It sets out:

- The criteria used in assessing them (the technical scope of the assessment);
- The geographical coverage of these effects and the assessment (the spatial scope); and
- The periods of time in which the effects are likely to arise during construction and operation (the temporal scope).

[3]National Networks National Policy Statement (NNNPS), Department for Transport. Available at: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf (Accessed: 01 November 2024).

2. Abbreviations & definitions

Table 1 – Abbreviations and definitions.

Abbreviation	Definition
CoCP	Code of construction practice
DCO	Development consent order
EIA	Environmental impact assessment
EqIA	Equality impact assessment
ES	Environmental statement
EWR Co	East West Rail Company
LGBTQ+	Lesbian, gay, bisexual, transgender, queer (or questioning) +
NNNPS	National networks national policy statement
NSIP	Nationally significant infrastructure project
PSED	Public sector equality duty
PRoW	Public right of way
TMP	Traffic management plan

3. Relevant standards and guidance

3.1. Guidance

3.1.1. Guidance on undertaking an EqIA is limited and there is no statutory guidance for the process. Available national guidance includes:

- *Equality Act 2010 – Public Sector Equality Duty What Do I Need to Know? A Quick Start Guide for Public Sector Organisations* - which identifies a range of requirements around EqIA[4];
- *Meeting the Equality Duty in Policy and Decision-Making* - which covers areas of EqIA good practice[5];
- *Engagement and the Equality Duty: A Guide for Public Authorities* - which provides suggestions for effective engagement with equality groups[6];
- *Equality Act 2010 – Handbook for Advisors* - which covers the general requirements of the Equality Act[7]; and
- *Technical Guidance on the Public Sector Equality Duty: England* - which provides an authoritative, comprehensive, and technical guide to the detail of the law[8].

3.1.2. Available national guidance will be used alongside professional judgement to inform the EqIA process.

[4] Government Equalities Office (2011). *Equality Act 2010 – Public Sector Equality Duty What Do I Need to Know? A Quick Start Guide for Public Sector Organisations*. [online] Available at: https://assets.publishing.service.gov.uk/media/5a78b9ae40f0b62b22cbc4b4/vcs-association-perception.pdf (Accessed: 15 April 2024).
[5] Equality and Human Rights Commission (2014). *Meeting the Equality Duty in Policy and Decision-Making*.
[6] Equality and Human Rights Commission (2014). *Engagement and the Equality Duty: A Guide for Public Authorities*. [online] Available at: https://www.equalityhumanrights.com/sites/default/files/engagement_and_the_equality_duty.pdf (Accessed: 15 April 2024).
[7] Equality and Human Rights Commission (2018). *Equality Act 2010 – Handbook for Advisors*. [online] Available at: https://www.equalityhumanrights.com/sites/default/files/equality-act-2010-handbook-for-advisers.pdf (Accessed: 15 April 2024).
[8] Equality and Human Rights Commission (2023). *Technical Guidance on the Public Sector Equality Duty: England*. England: Equality and Human Rights Commission

4. Scope of assessment

4.1. Technical scope: equality groups

4.1.1. The Equality Act provides a single legislative framework to effectively tackle disadvantage and discrimination toward people with protected characteristics. The protected characteristics are set out in Table 2.

Table 2 – Protected characteristics under the Equality Act 2010.

Protected characteristic	Equality and human rights commission (EHRC) definitions[9]
Age	A person belonging to a particular age (for example 32 year olds) or range of ages (for example 18 to 30 year olds).
Disability	A person has a disability if she or he has a physical or mental impairment which has a substantial and long-term adverse effect on that person's ability to carry out normal day-to-day activities.
Gender reassignment	Where a person undergoes, or proposes to undergo, a process for the purpose of reassigning their sex.
Marriage and civil partnership	Marriage is a union between a man and a woman or between a same-sex couple. Same-sex couples can also have their relationships legally recognised as 'civil partnerships'. Civil partners must not be treated less favourably than married couples (except where permitted by the Equality Act).
Pregnancy and maternity	Pregnancy is the condition of being pregnant or expecting a baby. Maternity refers to the period after the birth and is linked to maternity leave in the employment context. In the non-work context, protection against maternity discrimination is for 26 weeks after giving birth, and this includes treating a woman unfavourably because she is breastfeeding.
Race	A race is a group of people defined by their colour, nationality (including citizenship) ethnicity or national origins. A racial group can be made up of more than one distinct racial group, such as Black British.
Religion and belief	Religion refers to any religion, including a lack of religion. Belief refers to any religious or philosophical belief and includes a lack of belief. Generally, a belief should affect your life choices or the way you live for it to be included in the definition.
Sex	A man or a woman, a group of people of the same sex.
Sexual orientation	Whether a person's sexual attraction is towards their own sex, the opposite sex or to both sexes.

[9] Equality and Human Rights Commission (2021). *Protected characteristics*. [online] Available at: https://www.equalityhumanrights.com/equality/equality-act-2010/protected-characteristics (Accessed: 15 April 2024).

4.1.2. Equality groups have been identified within certain protected characteristics, based on the desk-based evidence review to improve the assessment:

- Within 'age', all ages and age ranges are considered, but specific equality groups include children (aged under 16 years), younger people (aged 16 to 24 years), and older people (aged 65 and over);
- Within 'pregnancy and maternity', pregnant women are reported as an equality group where an effect only relates to pregnancy;
- Within 'race', all races and ethnicities are considered, but people from ethnic minority groups or backgrounds are identified as referring to people from all ethnic groups excluding White British;
- Within 'religion and belief', all religious, faith and belief groups are considered, but the term 'minority faith groups' is used to refer to religious groups who are not Christian (including Buddhist, Hindu, Jewish, Muslim, Sikh, and 'other'). People who profess no religion or belief are considered, but are not included within 'minority faith groups';
- Within 'sexual orientation' and 'gender reassignment', all sexual orientations and gender statuses are considered, but the 'lesbian, gay, bisexual, transgender, queer (or questioning) +' (LGBTQ+) community is considered as an equality group; and
- Within 'sex', the equality groups of men and women are used.

4.1.3. In line with best practice, additional equality groups have been identified for inclusion in the EqIA, which are not covered by the protected characteristics set out in the Equality Act. Understanding the unique perspectives of these groups can lead to more targeted interventions and promote equity and inclusivity. They include:

- People living in deprived neighbourhoods – defined as people living within the most deprived Local Planning Authorities, using national Indices of Deprivation;
- People living in low-income households – defined as people who live on less than 60% of the average (median) net disposable equivalised UK household income;
- Carers – defined as anyone, including children and adults, who looks after a family member, partner or friend who needs help because of their illness, frailty, disability, a mental health problem or an addiction and cannot cope without their support. The care they give is unpaid[10];
- People living in households without access to a car;
- Ex-offenders – defined as persons who have criminal convictions;
- Homeless people – defined as people living on the street or staying temporarily with friends/family, in hostels or bed and breakfasts;
- Veterans – defined as former armed forces personnel;
- Intersex people – defined as individuals born with any of several sex characteristics including chromosome patterns, gonads or genitals that do not

[10] NHS England (2023). *Who is considered a carer?* [online] Available at: https://www.england.nhs.uk/commissioning/comm-carers/carers/#:~:text=A%20carer%20is%20anyone%2C%20including,care%20they%20give%20is%20unpaid. (Accessed: 01 November 23).

fit typical binary notions of male or female bodies. This equality group is not protected under equality legislation, but is considered within the EqIA where relevant; and

- Non-binary people – people who feel their gender identity cannot be defined within the margins of gender binary – identifying as either a man or woman. This equality group falls outside of the definitions applied to 'gender reassignment' and 'sex' but is considered within the EqIA where relevant.

4.1.4. Intersectionality recognises the interconnected nature of social characteristics, such as race, gender and other identity markers and acknowledges that individuals may experience overlapping forms of discrimination or privilege based on the intersections of these characteristics. The EqIA will consider the intersectionality to identify and address the challenges faced by individuals with multiple protected characteristics identities.

4.2. Geographic scope: study area

4.2.1. Based on good practice and experience undertaking EqIAs, and based on the likely effects from other aspects, a study area of 500m from the draft Order Limits of proposed works will be used to consider equality impacts. The study area will focus on those locations where the land use of receptors[11] is likely to change temporarily or permanently, and areas affected by disturbance because of construction activities or the operation of the Project. In addition, some temporary and permanent components of the Project may result in changes in accessibility between community receptors. This may result in impacts that occur beyond 500m from the proposed route/area of intervention. These instances will be considered separately (informed by baseline analysis, stakeholder engagement and professional judgement).

4.2.2. A social baseline has been developed based on the location of nearby sensitive receptors. The Social Baseline, alongside Project activities, duration, and potential effects identified in the ES will inform the EqIA study area. Aspects within the ES that will influence the study area for the EqIA include communities; health; socio-economics; sound, noise and vibration; air quality; landscape and visual; and traffic and transport.

4.3. Temporal scope: construction and operational timescales

4.3.1. The construction and operational phases for the Project guide the timing and therefore temporal scope of the assessment. The Project would be constructed

[11] In the context of IEMA (Institute of Environmental Management & Assessment) guidance, receptors are points of interest within a study area that experience land use modifications, disturbances, and potential changes in accessibility due to the activities associated with a project or scheme.

and implemented over a number of years, with a series of construction phases, meaning the effects of the Project at several different time periods will need to be considered.

4.3.2. The Project would be constructed following the grant of the DCO[12].

4.3.3. The construction phase would include activities relating to the preparation for construction works such as land clearance and relocations. Effects associated with use of construction plant and construction traffic will be assessed at the point where the intensity of activity (and consequent effects) is likely to be greatest – this will be determined through the impact assessments for sound, noise and vibration, emissions to air (including odour) and changes to visual amenity. The assessment will consider the duration of these effects in addition to the effects associated with potential disturbance over the entire duration of construction activity.

4.3.4. There are likely to be different effects at different operational stages of the Project. Key points for consideration in the assessment include year of opening (where communities are likely to be newly exposed to rail noise), years of maximum environmental effects (where noise and emissions are likely to be at their peak) and year of maximum rail transport movement capacity (which gives an indication of the longer-term effects such as realisation of job opportunities).

[12] A Development Consent Order is granted by the Secretary of State and gives consent to construct, maintain and operate projects of national significance.

5. Establishing the baseline

5.1. Preliminary baseline description

5.1.1. The Social Baseline for the community, health, socio-economic and equalities aspects will enable a holistic and integrated approach to assessing and managing the social impacts of the Project. Social aspects will be coordinated by a multidisciplinary team of experts who will collect and analyse relevant data and evidence from various sources, such as census, surveys, interviews, focus groups and stakeholder consultations.

5.1.2. A review of the Social Baseline will be undertaken as part of the EqIA to identify relevant equality receptors and resources, and to understand the composition and characteristics of communities within the study area.

5.1.3. For each defined equality group, publicly available demographic data (and information on low-income groups/areas of deprivation) will be analysed and mapped. In cases where data sources present limitations the assessment may utilise proxy data. For instance, when assessing pregnancy, indicators such as the number of women aged 16 to 45 (the typical childbearing age range) and fertility rates. Similarly, for marginalised groups, the assessment may consider deprivation and employment data as proxies. The populations of equality groups for the south-east region and for England as a whole will be used as comparators. The output of this work will help to understand the diversity and needs of the affected communities and measure the potential impacts of the Project on different equality groups.

5.2. Future baseline

5.2.1. Future demographic baseline will be set out in the Social Baseline.

5.2.2. Some new developments may be built before or during the Project, therefore people working, living or visiting these new developments, with different protected characteristics, may be affected positively or negatively.

5.2.3. The physical impacts of climate change may impact the project assets and operations, and the setting of environmental and social receptors affected by the project. Climate change is manifesting as a variety of climate hazards which may change weather related risks to the project and associated environmental and social receptors. In general, climate change in the UK is leading to:

- Hotter, drier summers with increased frequency and duration of heatwaves and droughts;
- Warmer, wetter winters with reduced frequency of snow and ice. However, snow and ice events, and extreme cold snaps, remain a risk; and

- Increased frequency of extreme events such as heavy rainfall (and resultant flooding), high winds, and storms, both in summer and winter.

5.2.4. By integrating climate change impacts into the EqIA, planning and decision making can ensure equitable outcomes and responsiveness to the diverse needs and experiences of all individuals and communities, particularly those who are most vulnerable. Refer to section 9.2 for further discussion on climate change and equalities.

5.2.5. Refer to section 5 of the Climate Resilience Method Statement for further details on the current and projected future climate.

5.3. Consultation

5.3.1. Consultation will be ongoing to inform the assessment of Equalities as the DCO application progresses. A non-statutory consultation has commenced in November 2024.

6. Identifying and assessing equality effects

6.1. Types of equality effects

Differential effects

6.1.1. Differential effects arise where protected characteristic groups and/or equality groups are likely to be affected in a different way when compared to the general population. This may be because groups have specific needs or are more susceptible to the effects due to their protected characteristic. These effects are not dependent on the number of people affected. For example, removal of a level crossing may require a temporary diversion that increases walking distances that are challenging for some people with mobility impairments.

6.1.2. Differential effects will be identified by exploring Project activities, potential impacts and their locations, reviewing relevant national and local policy documents, as well as published secondary and academic literature. Stakeholder engagement will also be reviewed to identify the views of community groups, national and local charities and relevant organisations that represent or serve people with protected characteristics and other equality groups.

Disproportionate effects

6.1.3. Disproportionate effects occur where there is likely to be a comparatively greater effect on protected characteristic groups and/or equality groups than on other members of the general population. Disproportionate effects may occur if the affected community comprises a higher than average proportion of people with a particular protected characteristic, or because people from a particular equality group are the primary users of an affected resource. For example, where the makeup of an area or the users of a resource, such as a school or church, include greater numbers of a particular group.

6.1.4. The demographic data for the study area will be compared with the regional and national demographic profile, to build a comparative picture of its demographic composition. When comparing these areas, a difference exceeding 3% is explicitly identified as higher or lower.

6.1.5. Disproportionate effects will be identified by exploring Project activities, potential impacts and their locations and reviewing the baseline to identify areas where representation of an equality group is high.

Combined effects

6.1.6. Combined effects arise where a specific area is expected to experience effects on numerous equality groups or where an equality group would experience multiple effects irrespective of geography.

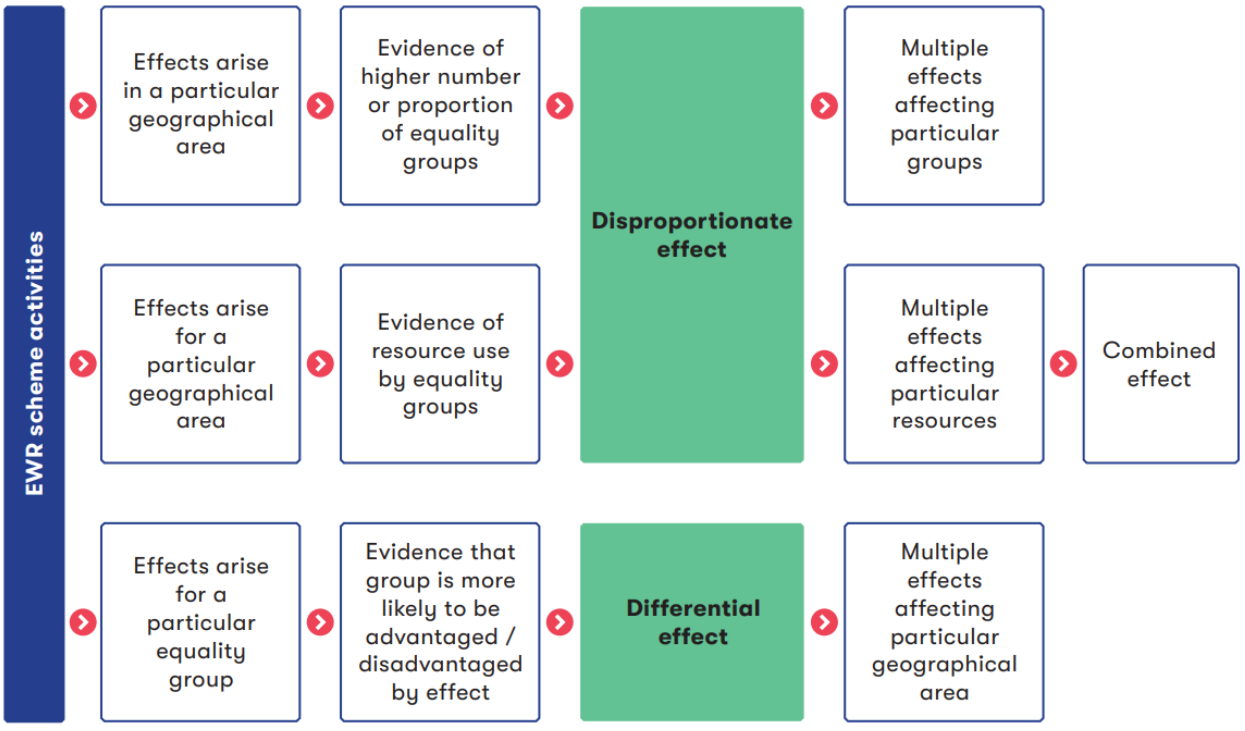
6.1.7. Combined effects will be identified by exploring Project activities, potential impacts and their locations and reviewing the baseline to identify areas where representation of an equality group is high and is likely to experience multiple effects.

6.2. Identifying equality effects

6.2.1. Where the Project's activities are identified as likely to result in impacts on sensitive receptors or resources, specific geographic areas, or sections of the population, equality effects may be identified. Equality effects arise where these impacts are likely to have disproportionate, differential, or in-combination effects on individuals or groups of people on the grounds of their protected characteristics.

6.2.2. Figure 1 shows the steps to identify each type of effect, which are described in the sections that follow.

Figure 1 – Identifying equality effects.



6.2.3. The assessment of equality effects will be predominantly qualitative, drawing on quantitative outputs from other studies being completed for the Project, including parts of the EIA, where relevant and applicable. It will consider the residual effects after mitigation, such as measures that are embedded in design and implementation strategies that aim to reduce effects.

6.3. Assessing effects

6.3.1. Once potential effects have been identified, they will be characterised and assessed. The following information for each effect will be gathered:

- Whether the effect is positive, negative, or neutral;
- Whether the effect is a direct relationship (for example, land requirement) or an indirect relationship (for example, access to services) affecting lives of equality groups;
- The duration, frequency and permanence of the effect;
- The severity of the effect and the amount of change relative to the baseline;
- Any existing regulatory standards already in place to manage the effect;
- The size of the population experiencing the effect or the extent of usage of a particular facility or service;
- Local equality priorities, supported by evidence and the views of professional stakeholders;
- The capacity of the affected population to absorb the effects (their resilience), including access to alternatives; and
- Views of local people, captured through consultation and engagement with community stakeholders.

6.3.2. The assessment will be reported for each equality group within the scope of the EqIA to identify potential positive and negative effects, reaching a conclusion on whether any disadvantage is expected and whether any disadvantage is 'because of' a protected characteristic. Where equality effects are identified within the study area, these will be reported, and each equality group effected identified.

6.3.3. Measures will be applied to minimise any negative effects, maximise any positive effects and identify the need for monitoring.

7. Stages of assessment

7.1. Preliminary EqIA findings

7.1.1. Alongside the preliminary environmental information report, an integrated 'Preliminary EqIA findings report' will be developed. The Preliminary EqIA findings report will provide an overview of the existing data and evidence from published literature on the protected characteristics of people who may be affected by the Project. This report will support the identification of potential equality impacts that will require assessment at the next stage of the EqIA process (full assessment). The preparation of the Preliminary EqIA findings report will enable EWR Co to engage with relevant equality groups and organisations and seek their views and feedback on the Project and its potential equality effects.

7.2. Full assessment

7.2.1. Following the EqIA findings report, a full EqIA is proposed, which will build on findings of the Preliminary EqIA findings report. This phase will examine the potential impacts of the Project on different equality groups, assessing whether it promotes equality or may unintentionally lead to discrimination. After the assessment, findings will be analysed, and recommendations will be formulated to mitigate any negative impacts and enhance positive outcomes.

8. Relationship to other deliverables

8.1. Relationship to the EIA/ES

8.1.1. The EqIA will sit alongside the ES as part of the DCO application and will draw on relevant chapters of the ES to identify impacts and equality effects. The EqIA will seek to assess whether significant effects identified in the relevant ES assessments including but not limited to - communities; human health; socio-economics; sound, noise and vibration; air quality; landscape and visual; and traffic and transport – would have disproportionate or differential impacts on equality groups.

8.1.2. The EqIA will draw on the common 'Social Baseline' which will be developed between the socio-economic, health, community, and equality aspects. This will provide a comprehensive and consistent picture of the current social conditions and trends in the Project area. The Social Baseline will help to identify the main social issues and opportunities that the Project may affect, as well as the potential impacts on different groups of people, especially those with protected characteristics. The Social Baseline will also inform the development of mitigation measures and enhancement strategies to address the social impacts and promote positive outcomes for the affected communities.

8.1.3. The assessment will draw from:

- **The Project description** and associated mitigation strategies that are likely to reduce effects on equality groups. This will include the physical route, facilities, future design considerations as well as operational practices and strategies such as the approach to property purchase and relocation that could have equalities effects;
- **The EIA communities assessment** which provides the number and location of residential properties required by the Project and the community facilities (including public open and green space and recreational walking and cycling routes) that would be affected by land requirements and by changes in local transport. In addition, information on the anticipated effect on communities following the loss of some facilities and/or residential properties;
- **The EIA human health assessment** which provides information on a wide range of determinants of health (including noise, air quality, employment, access to services, active lifestyles and social cohesion). The EqIA will be undertaken in parallel to analyse health effects on protected characteristic groups and/or equality groups and identify health inequalities affecting them;
- **The EIA socio-economics assessment** which outlines the number of jobs that are likely to be generated, as well as apprenticeship opportunities, during construction and operation, including where these would be based and the existing employment conditions in those areas;

- **The EIA sound, noise and vibration assessment** which sets out the populations that are predicted to experience significant noise effects and the measures that are in place to manage noise effects;
- **The EIA air quality assessment** which identifies the locations that are likely to experience air quality effects during construction and operation, as well as the mitigations put in place to manage these effects;
- **The EIA landscape and visual assessment**, which assesses the likely landscape, townscape and visual impacts and evaluates the resulting effects of the Project, as well as the measures that are in place to manage these effects;
- **The EIA traffic and transport assessment** which sets out the proposed changes to local road traffic routes, local public transport, walking and cycling routes (including public rights of way (PRoW)), and any diversions, as well as the measures that are in place to manage these effects; and
- **Accessibility and inclusive design reviews** which will set out the compliance of Project assets (including stations, level crossings, footbridges) with relevant accessible and inclusive design standards.

8.2. Relationship to design

8.2.1. The EqIA team will continue to work iteratively with the design team throughout the EqIA process, informing them of measures required to avoid, manage, mitigate or appropriately compensate for any potential adverse equality effects and measures to enhance potential beneficial equality effects. Throughout the EqIA process, EWR Co will identify and assess any potential accessibility effects on equality groups, and work with the design team to incorporate accessible and inclusive design principles into the Project to help East West Rail be accessible and inclusive for all. This iterative process will enable the design team to incorporate and embed recommendations into the design.

8.3. Relationship to stakeholder engagement and public consultation

8.3.1. Engagement will take place with community groups, national and local charities and relevant organisations that represent or serve people with protected characteristics and equality groups, and it will incorporate and capture views on equality aspects. This will provide opportunities for stakeholders, including equality groups, seldom heard groups, and the wider community, to inform and influence the design and development of both the EqIA and the Project.

8.3.2. Stakeholder engagement to inform the EqIA will be used to:

- Identify the equality groups and the local organisations that represent protected characteristics groups;
- Record the views of how the Project would potentially lead to positive or negative effects on equality groups and help form part of the evidence base for the assessment;

- Inform the type, location, nature of potential effects on equality groups; and
- Capture suggestions to inform measures to minimise negative effects and maximise positive effects.

8.3.3. The East West Rail Accessibility Advisory Panel, whose purpose is to understand the potential impacts of the Project on disabled people, contributes to better understanding of barriers to travel and identifying opportunities for more inclusive access, and assists with understanding the impacts to communities from the work on the Project. Their insights are essential to ensuring a comprehensive EqIA.

8.3.4. Recognising the importance of diverse perspectives, the EqIA team will collaborate closely with inclusion specialists throughout the assessment process.

9. Potential impacts and equality effects

9.1. Sources of impact

9.1.1. The Project includes works to existing stations (including closures), new stations, new railway, works to existing railway, works to level crossings and works to local highways.

9.1.2. Based on the description of the Project set out in the EIA Scoping Report, different equality groups could be affected by various activities related to its construction and operation. This includes people that could be living near to or on the Project, working on the construction project or operational railway, using the railway, or passing through the area around the Project.

9.1.3. These activities may give rise to a number of impacts during construction and operation, and subsequently result in potential effects on equality groups. A high-level overview of potential impacts, their potential equality effect and a preliminary view on which equality groups may be affected are set out in Table 3 and the narrative that follows.

Table 3 – Sources of impact and potential equality effects.

Source of equality impact	Potential equality effects
Land and property required temporarily or permanently for construction and operation of the new railway (including a potential central construction site and logistics hub).	• Relocation of residents resulting in dislocation from social networks, services, and resources; • Impact on housing provision and change in access to housing in community around the railway; • Permanent relocation, loss or partial loss of community resources used by equality groups; • Changes in access to services and facilities used by equality groups; and • Changes in community composition.
Changes in access to residential areas, community infrastructure, and businesses.	• Changes in access to residential properties; • Changes in access arrangements, including potential severance of residents and users from community facilities and resources used by equality groups; • Changes in the navigability of pedestrian spaces for some users; and • Changes in people's perception of safety and personal security around construction sites, and railway infrastructure.
Changes to the scale and distribution of traffic movements including construction vehicles, traffic diversion routes, use of roads, and parking.	
Changes to the built and pedestrian environment, for example from modification or closures of level crossings, overbridges, and	

Source of equality impact	Potential equality effects
underpasses or from diversions or closures of PRoW.	
Changes in environmental conditions, including exposure to sound, noise and vibration, changes in air quality, and changes in the visual landscape arising from construction activities and operation of the Project.	• Changes in air quality including changes in exposure to pollutants (including oxides of nitrogen, and particulate matter), potentially affecting the health and wellbeing of equality groups; • Changes in noise exposure affecting residential areas and users of sensitive community resources; and • Changes in the visual environment potentially affecting some equality groups sensitive to these changes.
Generation of employment opportunities as part of the construction workforce or on the operational railway.	• New employment and training opportunities for some protected characteristics groups arising from construction activities required to deliver the Project and from the new railway.
Provision of new railway infrastructure to meet the connectivity and accessibility needs of all users including new stations and improvements to existing stations.	• Provision of a modern railway including upgraded infrastructure to meet the accessibility and inclusion needs of all users.

9.2. Potential construction and operation effects

9.2.1. The sources of impact and the potential equality effects they give rise to, may be temporary construction effects or permanent and operational effects. Potential equality effects that may arise due to the Project are outlined below. It is proposed that the potential equality effects identified in this section are assessed as part of the EqIA. However, other potential equality effects may be identified at a later stage and included in the assessment.

Housing loss and relocation of residents

9.2.2. Land and property required to deliver the Project may result in the loss of residential properties, resulting in the need for residents to relocate.

9.2.3. There may be some unavoidable loss of housing and private property in various locations along the Project. This is likely to have effects on community composition, community networks, and severance, particularly where residents need to relocate. Groups particularly sensitive to impacts on housing and the effects of relocation include children, younger people, older people, ethnic minority and minority faith communities, people who are pregnant, and people residing in deprived areas.

Loss or partial loss of resources or businesses used by the community

9.2.4. The Project may require acquisition of land used for community facilities. This could give rise to temporary or permanent effects during construction for groups using those facilities including children, younger people, older people, disabled people, people who are pregnant, and ethnic minority and minority faith communities.

9.2.5. The Project may also require acquisition of land used by businesses. This could affect business viability, staff, and customer bases, particularly for small independent businesses. Some businesses, such as ethnic minority-run businesses may serve customers specific to their communities, while older people may be particularly affected by the loss of their business or employment.

Changes in access to services and facilities

9.2.6. During construction, communities close to the Project are likely to be directly affected by changes in access arrangements to private property, community resources and businesses, arising from temporary construction works, including road closures and diversions. There may be impacts on the catchment areas of local community resources, such as schools and healthcare facilities, and businesses, resulting in community severance. Many of these facilities and businesses are likely to have relatively localised catchments.

9.2.7. Temporary or permanent alterations to access routes, desire lines or the imposition of barriers to movement could result in adverse effects on people living the affected areas, especially those with protected characteristics such as older people, disabled people, people from ethnic minority groups or minority religions.

9.2.8. Construction would also require a large number of construction vehicle movements. This has the potential to temporarily increase levels of traffic congestion during the construction phase and any potential change in traffic flow can result in impacts on access, severance, journey time and length effects for pedestrians, cyclists, and other road users. This can affect users of community facilities, but can particularly affect children, older people and disabled people accessing community resources as pedestrians.

9.2.9. During operation, the Project would expand and create new opportunities for education, leisure, and access to local amenities and services that may otherwise be limited or inaccessible, by providing a fast, reliable, and sustainable rail service. This could benefit children, young people, older people and disabled people.

Changes in accessibility of the built environment

9.2.10. The Project has the potential to affect the accessibility of the built environment, including provision for pedestrians and cyclists, during the construction and operation phases of the Project. There will be both temporary and permanent changes to the public realm and built environment, changes to PRoW or cycle route diversions, new underpasses, as well as changes to crossing infrastructure (including footbridges and level crossings). The quality of pedestrian journeys may be affected as a result, potentially affecting user propensity to walk or cycle. Changes to the pedestrian environment may impact several equality groups including children, older people, disabled people, ethnic minority groups, women, and people living in deprived areas.

Changes in air quality

9.2.11. During construction, the Project has the potential to result in temporary changes to local air quality around construction sites, due to activities including movements of construction vehicles. During operation, the Project may result in permanent change to air quality along the route, due to new rail movements. However, the intentional choice of discontinuous electrification for traction power has a lower environmental impact than diesel trains. Also, the increased use of train travel over private vehicles is likely to decrease the overall emissions from individual cars and lead to cleaner air in the East West Rail vicinity. Changes to air quality can affect children, older people, disabled people, those who are pregnant and those who live in deprived areas, due to particular sensitivity for these groups to air pollution and particulate matter concentrations.

Changes in noise exposure

9.2.12. The Project has the potential to temporarily change noise exposure during construction, arising from construction traffic movements, and associated construction activities. During operation the new railway and associated rail movements would result in permanent changes to the noise profile of areas along the Project.

9.2.13. Increases in noise levels can cause disturbance and disruption to users of community resources requiring quieter environments, such as schools and churches. Changes in exposure to noise have been linked to health outcomes for children, older people and disabled people as these groups are vulnerable to such changes.

Changes in the visual environment

9.2.14. The Project would result in changes to the landscape and visual environment for people who live, work, or visit the areas along the route, as a result of construction activities and permanent new infrastructure being provided,

including viaducts and new stations. Such changes may impact groups particularly sensitive to the changes in visual stimuli, including older people with conditions such as dementia, and disabled people including those who are neurodivergent.

9.2.15. The reduction of visual amenity can affect people's sense of identity, belonging and well-being, while for people who rely on visual cues or landmarks to navigate or orient themselves, such as people with visual impairments or cognitive disabilities, this can affect their independence and safety.

Impacts on safety, security and the perception of safety and security

9.2.16. During construction, the Project may temporarily alter feelings of safety and security. The fear of crime is the anxiety people feel about potentially being a victim of crime. It does not necessarily relate to the probability of being a victim of crime, but instead can be influenced by external factors such as the presence of construction sites and lack of lighting. This can affect children, working aged people, older people, disabled people, ethnic minority groups, women, young men and LGBT+ groups, as it can affect their access and participation to social life, due to potential risk to discrimination, harassment or hate crime.

9.2.17. In particular, many equality groups, including children, young people, older people, people from LGBTQ+, people from ethnic minority and minority faith communities, disabled people and women all identify personal safety and security concerns to be a factor in their decision to use transport infrastructure, particularly at night. The design of the new railway will need to account for these concerns and, even more, to contribute positively to safety of the passengers, workers, and surrounding communities.

Opportunities for employment

9.2.18. The Project has the potential to bring temporary new employment, skills development and training opportunities during the construction phase, as a construction workforce will be required to deliver the infrastructure necessary for the Project. This may benefit those more likely to face barriers to employment, including young people, people from some ethnic minority groups, and disabled people, as well as men who are more likely to work in the construction sector.

9.2.19. The construction of the Project may also result in an adverse impact on employment due to loss of business premises required to construct the railway.

9.2.20. During operation, the Project may create a small number of additional operational jobs.

9.2.21. The Project also has the potential to permanently improve access to employment opportunities via the new railway, which may again affect people more likely to experience transport- or connectivity-related barriers to employment.

Accessibility and inclusion

9.2.22. During operation, the Project would provide new railway infrastructure that will be designed to be accessible and inclusive for all where possible, through the provision of new and improved stations and platforms, crossing infrastructure, and the associated pedestrian environment and public realm. This is likely to benefit those people most likely to experience challenges in using the transport network due to mobility or sensory impairments, such as older people and disabled people. It is also likely to benefit people who experience other difficulties using the built environment including people who are pregnant, people travelling with small children, or children in pushchairs.

Climate change

9.2.23. Changing climate conditions into the future, together with the impacts of the project on equality groups may exacerbate (or occasionally ameliorate) the Project effects. For example: equality groups often reside in areas susceptible to climate-related risks (e.g., flooding, heatwaves, or storms). The project's effects may intersect with existing vulnerabilities, exacerbating inequalities.

9.2.24. The influence of climate change in exacerbating or ameliorating the significance of project effects will be incorporated within the assessment stage.

10. Assumed mitigation

10.1. Mitigation principles

10.1.1. As the EqIA progresses and potential equality effects are identified, measures to mitigate adverse effects and opportunities to enhance benefits will be identified. These mitigation measures will be identified in discussion with relevant EIA aspects from which evidence of impact has been drawn. These effects include those identified in section 6.1.

10.1.2. The EqIA will provide inputs into the development of the Project design and into the evaluation process by which design options will be selected. This will help to ensure that equality issues have been appropriately considered. The EqIA will also be used to inform the detailed design as it progresses through the planning process.

10.1.3. Engagement with local communities will contribute to a better understanding of people's concerns and expectations. Through stakeholder engagement we will gather and monitor feedback from communities and representatives of protected characteristic groups and will aim to address community needs. Ongoing communication with stakeholders needs to be maintained, including regular updates on construction progress and potential impacts.

10.1.4. A traffic management plan (TMP) will include traffic diversion plans to minimise disruption to local traffic and coordinate with local authorities to minimise the need of road closures and diversions.

10.1.5. Throughout the Project's phases, the progress and effectiveness of the measures will be monitored and new measures will be implemented, as required.

10.2. Assumed mitigation measures

10.2.1. Table 4 sets out potential mitigations and how these might be implemented to address the equality impacts and effects set out in section 9.

Table 4 – Assumed mitigations

Potential impact	Potential effects	Potential mitigation/ enhancement	Implementing/Monitoring mechanism	Phase
Housing loss and relocation of residents	Community composition Networks Severance	Design to minimise loss Compensation Relocation Engagement	Stakeholder Engagement Strategy Construction Communication Strategy	Construction and Operation

Potential impact	Potential effects	Potential mitigation/ enhancement	Implementing/Monitoring mechanism	Phase
		Community support services	Policies for compensation and relocation Public reporting	
Loss or partial loss of resources or businesses used by the community	Physical activity and well-being Social interaction Opportunities and participation Business viability and customer base Employment and income	Design to minimise loss Temporary or permanent relocation Compensation Community support services Offer relocation or alternative employment opportunities to displaced workers	Stakeholder Engagement Strategy Construction Communication Strategy Code of construction practice (CoCP) Surveys Skills, Education and Employment Plan	Construction and Operation
Change in access to services and facilities	Severance Social Inclusion Accessibility Inclusion Connectivity Journey time and length	Design Project to minimise disruption Designed to inclusive design standards and guidance Alternative or temporary services Coordinate and schedule construction activities to minimise traffic disruption and avoid peak hours Provide clear and timely information Provide clear signage Diversions and wayfinding	Surveys Stakeholder Engagement Strategy TMP Construction Communication Strategy CoCP	Pre-construction, Construction and Operation
Changes in accessibility of the built environment	Access - PRoW or cycle route diversions, new underpasses, changes to level crossings and journey experience	Provide clear and timely information Provide clear signage Provide safe, convenient, accessible, and well-maintained diversions	Surveys CoCP TMP Stakeholder Engagement Strategy	Design, Construction and Operation

Potential impact	Potential effects	Potential mitigation/ enhancement	Implementing/Monitoring mechanism	Phase
	Accessibility and inclusion	Minimise the duration and extent of closures and diversions Design new underpasses and level crossings to meet the needs and preferences of pedestrians and cyclists Provide safe and convenient access for pedestrians, cyclists, and public transport users Enhance the journey experience of pedestrians and cyclists	Construction Communication Strategy	
Changes in air quality	Health and quality of life	Select appropriate equipment, methods, and locations that generate fewer emissions Minimise the duration and frequency of emission-generating activities Limit vehicle movement	Surveys Air quality monitoring CoCP Stakeholder Engagement Strategy Construction Communication	Construction and Operation
Changes in noise and vibration exposure	Health and quality of life Disruption to resources (such as schools, churches, hospitals) near noise sources	Select appropriate equipment, methods, and locations that minimise noise and vibration Minimise the duration and frequency of noisy or vibratory activities Provide acoustic barriers, enclosures, or damping devices to reduce noise and vibration transmission Implement noise and vibration management plans that include measures such as working hours, notification, complaints handling Implement noise proofing and insulation schemes	Surveys Noise monitoring at key locations CoCP Stakeholder Engagement Strategy Construction Communication Strategy	Construction and Operation

Potential impact	Potential effects	Potential mitigation/ enhancement	Implementing/Monitoring mechanism	Phase
Changes to visual environment	Landscape character Viewer sensitivity	Minimise visual impacts Minimise the footprint of the Project Screen or camouflage the Project from sensitive receptors Early planting of trees and other barriers	Surveys CoCP Stakeholder Engagement Strategy Construction Communication Strategy	Design, Construction and Operation
Impacts on safety, security and the perception of safety and security	Discrimination Harassment Hate crime	Design with safety and security in mind Secure design for stations and platforms, with clear sightlines and open space Integrate technology systems for a comprehensive approach to security Use landscaping to enhance natural surveillance Provide training and guidance to staff in both construction and operation Provide support and assistance to individuals who are affected by safety issues Establish and communicate procedures for reporting, investigating and resolving safety concerns or incidents	Surveys CoCP Stakeholder Engagement Strategy Construction Communication Strategy	Construction and Operation
Opportunities for employment	Economic activity and income Skills development and training	Job opportunities during construction and operation for local workforce Maximise economic benefits Support local businesses and suppliers to participate and benefit from the Project's opportunities	Surveys CoCP Skills Education and Employment Plan Equality, Diversity and Inclusion Strategy Stakeholder Engagement Strategy	Construction and Operation

Potential impact	Potential effects	Potential mitigation/ enhancement	Implementing/Monitoring mechanism	Phase
		Provide training and education programmes to enhance skills and qualifications of workers	Construction Communication Strategy	
Accessibility and inclusion	Travel experience Connectivity Access to opportunities Improved awareness, confidence, and satisfaction of passengers	Comply with the relevant design standards and regulations Design and construct stations, platforms and vehicles with accessibility features such as ramps, elevators and tactile paving Connect with other modes of transport and services Provide clear and timely information and communication about train schedules, delays and platform changes through accessible digital displays or announcements Train staff on disability awareness and etiquette, ensuring they are able to provide assistance to passengers with disabilities	Surveys Conduct regular assessments to identify and address any barriers to accessibility	Construction and Operation

10.2.3. The influence of climate change is not expected to impede the effectiveness of mitigations. While climate change introduces complexities, it does not inherently hinder the effectiveness of the mitigations listed in Table 4.

10.3. Design principles

10.3.1. The approach to the design of the Project will include the application of best practice to help inclusivity and fairness. The design will consider how people's physical and mental abilities may limit their ability to cope with the impacts caused by the Project.

10.4. Code of construction practice

10.4.1. Construction work can be one of the main causes of impacts on equality groups. A draft CoCP will be developed for the Project that sets out a range of measures and principles which future contractors will be required to comply with in undertaking their work.

10.4.2. The draft CoCP will be a fundamental part of the Project proposals and assumptions that will outline the measures needed during construction to avoid or reduce likely adverse effects on people and community assets. The measures will represent a best practice approach and are generic to most construction activity for a project of this nature.

10.4.3. The measures to be addressed within the CoCP that pertain to mitigation of construction impacts on equality groups may include the following generic categories:

- Community relations;
- Timing of construction works and working hours;
- Construction traffic routes;
- On-site working practice and amelioration;
- Hoarding, fencing, screening and lighting;
- Pollution prevention measures;
- Demolition;
- Workplace travel plans;
- Sie specific measures; and
- Monitoring requirements.

10.4.4. Best practicable means will be employed throughout construction, taking into account the risks, costs and best practice.

10.4.5. A register of environmental actions and commitments will also be developed alongside the ES and CoCP.

11. Assumptions and risks

11.1. Assumptions

11.1.1. The assessment will be based on a desk-based study, using publicly available information and stakeholder engagement where relevant.

11.1.2. The assessment of equality effects relies on the use of reasonable assumptions, professional judgement, and guidance to determine the nature of effects.

11.1.3. A list of key assumptions and source of information for the assessment will be outlined in further detail within the EqIA.

11.2. Risks

11.2.1. The assessment will rely, in part, on data provided by third parties (e.g., local authorities and the Office for National Statistics) which are the most up-to-date data available at the time of writing. These may be subject to change over time, which may influence the findings of the assessment.

11.3. Opportunities

11.3.1. The EqIA serves as a tool to influence the design by identifying opportunities to promote inclusivity and accessibility. Designers and decision-makers can pinpoint areas where adjustments and enhancements can be made to ensure that the Project meets the diverse needs of all users.

11.3.2. Additionally, the EqIA can influence decision-making by emphasising the importance of community engagement. Through community engagement, public consultations, and feedback mechanisms, the EqIA encourages designers to go beyond compliance standards and becomes a catalyst for inclusive design decisions.

EWR-MWJV Technical Partner

Routewide – Environmental – Social Baseline

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1. Introduction

1.1.1. The single Social Baseline includes baseline information relevant to communities, socio-economics and human health. While some of the information here is also relevant to the Equality Impact Assessment (EqIA), the EqIA will identify relevant demographic data. The Scheme passes through nine local authority boundaries. The Social Baseline will be further developed at the Preliminary Environment Information Report and Environmental Statement stage of the project.

2. Abbreviations & Descriptions

Table 1: Abbreviations and Descriptions

Abbreviation	Definition
EqIA	Equalities Impact Assessment
EWR	East West Rail
IMD	Indices of Multiple Deprivation
ONS	Office of National Statistics

3. Study Area

3.1.1. Individual assessments will identify specific study areas.

3.1.2. The EWR scheme will run through the following local authorities:

- Oxford City Council;
- Oxfordshire County Council;
- Cherwell District Council;
- Buckinghamshire Council;
- Milton Keynes City Council;
- Central Bedfordshire Council;
- Bedford Borough Council;
- Huntingdonshire District Council;
- South Cambridgeshire District Council;
- Cambridge City Council; and
- Cambridgeshire County Council.

3.1.3. Settlements along the route include:

- Oxford
- Cherwell: Water Eaton; Islip Bicester;
- Buckinghamshire; Verney Junction; Addington Winslow;
- Milton Keynes: Bletchley; Fenny Stratford; Caldecott; Woburn Sands
- Central Bedfordshire: Aspley Guise, Ridgmont, Brogborough; Lidlington; Marston Morteyne
- Bedford; Stewartby; Kempston; Clapham; Tempsford; Little Barford
- Huntingdonshire: St. Neots
- South Cambridgeshire: Cambourne; Highfields Caldecote; Toft, Comberton, Haslingfield, Harston, Hauxton
- Cambridge

4. Data Sources

4.1.1. The data sources used are the following:

- Office for National Statistics (ONS)
- NOMIS Labour Market Profiles
- Indices of Multiple Deprivation (IMD)
- Office for Health Improvement and Disparities

5. Baseline Information

5.1. Population

5.1.1. The total population for each local authority within the Study Area can be seen in **Table 1 of Appendix 1**[1]. The most populated area is Buckinghamshire with 555,200 people in 2021, followed by Central Bedfordshire and Milton Keynes with 295,700 and 288,300 people respectively.

5.1.2. The breakdown of population by age group and sex for each area is detailed in **Table 2 of Appendix 1**[2]. Milton Keynes and Bedford Borough have the highest percentage of children aged 0-15 years at 21.6%, and 20.1% of the total population respectively. The City of Cambridge and Oxford have the lowest percentage of children at 15.6% and 14.4% of the total population respectively. This is lower than the national average of 18.6%.

5.1.3. Conversely, both the City of Cambridge and Oxford have the highest percentage of working age population (aged from 16-64 years old) at 74.8% and 72.5% respectively. This is significantly higher than the national average of 63.1%. The area with the lowest working age population is South Cambridgeshire at 60.7%.

5.1.4. South Cambridgeshire also has the largest percentage of older people (ages 65+ years) at 19.6% of the total population. This is higher than the national average of 18.4%. the City of Cambridge, Oxford, and Bedford Borough have significantly lower percentage of older people at 10.6%, 11.7%, and 15.8%, respectively.

5.1.5. All local authorities within the study area have experienced a population increase since 2011 (**Table 3 of Appendix 1**[2]). Milton Keynes experienced the highest population increase in the South East of England since 2011 with an increase of 15.3%, which is also significantly higher than the national average change of 6.6%. However, in comparison to all the local authorities within the Study Area, Bedford had the highest population increase of 17.7%. This was also the largest population increase in the East of England.

5.1.6. It is expected that the proportion of the population aged 65 and over for all the local authorities within the Study Area will overtake that of children (aged 15 and under) by 2031[3].

5.2. Deprivation

5.2.1. The Indices of Multiple Deprivation[4] uses a combination of information relating to seven 'domains': income; employment; health deprivation and disability; education, skills and training; barriers to housing and services; crime; and living environment to create an overall score of deprivation. Deprivation is scored between 1 and 317 (representing the 317 local authority districts within England), with a score of 1 being most deprived and 317 being least deprived.

[1] Office for National Statistics (2022) How the population changed: Census 2021 [online] Available at: https://www.ons.gov.uk/visualisations/censuspopulationchange/E07000178/
[2] Nomis (2022) Age by Sex [online] Available at: https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=2221
[3] Office for National Statistics (2020) Population projections for local authorities: Table 2 [online] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/localauthoritiesinenglandtable2
[4] Ministry of Housing, Communities and Local Government (2019) English indices of deprivation 2019 [online] Available at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019 (Accessed 29th November 2023)

5.2.2. The Indices of Multiple Deprivation 2019 ranking for each local authority can be seen in **Table 4 of Appendix 1**. Bedford is the most deprived local authority within the study area with mid-range deprivation ranking of 156. This is followed by Milton Keynes at 172nd and Oxford at 189th. Within these local authorities, there are higher levels of deprivation with city of Bedford, Kempston Towns, and Bletchley East and Woughton and Fishermead wards.

5.2.3. In comparison, Chiltern (within Buckinghamshire) and South Cambridgeshire had the lowest levels of deprivation ranking 312th and 301st respectively. However, within these areas there is also pockets of higher deprivation in Aylesbury, High Wycombe, Chesham, Denham, Burnham, Westcott and Buckingham, Melbourn and Milton, and Waterbeach.

5.3. Employment and Economic Activity

5.3.1. The NOMIS Job Densities Report (see Table 5, Appendix 1) is available on a local authority-wide and sub-regional level and indicates the availability of employment and labour demand. **Table 5 of Appendix 1** details the job density levels for each local authority, East of England and South East regions and the national level in England. As of 2021, the job density levels (i.e. the ratio of total jobs to the population aged 16-64) in the East of England and South East were in line with the England level (0.84, 0.85 and 0.85 respectively). Oxford (1.10) and Cambridge (1.10) have the highest job density levels when compared with the other local authorities and the regional and national levels, indicating more employment opportunities within these areas. Central Bedfordshire has the lowest job density level out of all the areas at 0.65, which is significantly lower than the regional and national averages, indicating fewer employment opportunities.

5.3.2. The number of estimated jobs in 2022 varies in each local authority, from 78,000 in Huntingdonshire and 247,000 in Buckinghamshire, as detailed in **Table 6 of Appendix 1**. South Cambridgeshire had the highest percentage of full-time jobs at 75.0% and Oxford had the lowest at 67.2%.

5.3.3. **Table 7 of Appendix 1** details the employee jobs per industry sector in 2022 for each local authority as well as East of England, South East and England averages. In the South East, the industry sector with the highest proportion of employees was Wholesale and retail trade; repair of motor vehicles and motorcycles (Sector G), with 15.0% across the region. This is reflective of Sector G having the highest proportion of employee jobs in Cherwell, Buckinghamshire, and Milton Keynes at 20.5%, 17.8% and 16.7% respectively. However, in Oxford, the highest proportion of employee jobs were in Education (Sector P) at 31.1% which is considerably higher than the regional and national averages. This is representative of employment opportunities at major universities located within Oxford. The proportion of employee jobs in Cherwell and Buckinghamshire in the Construction sector (Sector F) were in line (4.2%, 5.7% respectively) with the South East (5.0%) and national averages (4.8%). However, Oxford and Milton Keynes had a much lower rate of employee jobs in the Construction sector (1.4% and 2.8% respectively).

5.3.4. In the East of England, the industry sector with the highest proportion of employees was also Wholesale and retail trade; repair of motor vehicles and motorcycles (Sector G), with 15.5% across the region. This is reflective of Sector G having the highest proportion of employee jobs in Central Bedfordshire, Bedford and Huntingdonshire at 18.1%, 17.5% and 15.4% respectively. The highest proportion of employee jobs in South Cambridgeshire was in Professional, scientific and technical activities (Sector M) at 25.0%, and in Cambridge it was Education (Sector P) at 21.8%, which are both significantly higher than regional and national averages. This is representative of employment opportunities at research facilities and major universities in

Cambridge and South Cambridgeshire. The proportion of employee jobs in the Construction sector (Sector F) in the East of England (6.7%) was higher than national average (4.8%). Central Bedfordshire, Bedford, South Cambridgeshire and Huntingdonshire were in line (7.6%, 6.2%, 6.0%, 5.8% respectively) with the South East average and higher than the national average. However, Cambridge had a much lower rate of employee jobs in the Construction sector at 1.4%.

5.4. Qualifications

5.4.1. The educational attainment of the economically active population varies across the local authorities in the Study Area as well as between the East of England and South East regions, as shown in **Table 8 of Appendix 1**. Rates of attainment show a higher level of qualifications for residents within Oxford, Cambridge and South Cambridgeshire when compared to the South East and East of England. This aligns with the breakdown of employees by industry sector in these local authorities, with those residents achieving higher qualifications likely to be employed in professional occupations, such as in education. Rates of attainment for all qualifications are similar across Cherwell, Buckinghamshire and Bedford, while Milton Keynes and Central Bedfordshire have similar rates of attainment. Huntingdonshire has the lowest rate of attainment for NVQ4 and above qualifications compared with other local authorities in the Study Area at 37.8%, however it is in line with the East of England (39.6%). Huntingdonshire also has the highest proportion of economically active people with no qualifications compared with the other local authorities and regions.

5.5. Business Health

5.5.1. Information on business health was obtained using data from the ONS 2023 business demography births and deaths dataset[5]. **Table 9 of Appendix 1** shows data for each local authority in the Study Area over a five-year period from 2018-2022. In 2018 there were more business openings than closures for every local authority, demonstrating a growth in business health. 2019 and 2021 saw more business openings than closures in most local authorities except for Milton Keynes and Central Bedfordshire in 2019 and Milton Keynes and Huntingdonshire in 2021. In 2020 there were more business closures than openings in four local authorities and 2022 only two local authorities (Oxford and Cambridge) had more business openings than closures, demonstrating a significant decline in business health.

5.6. Businesses

5.6.1. Where relevant, businesses within the study area will be identified and presented within the relevant assessments. Businesses include commercial premises and assets as well as land used for or associated with business operations. Businesses within the study area will be varied and are anticipated to include a wide breath of sectors, including, for example:

- Sector C: Manufacturing;
- Sector G: Wholesale and retail trade;
- Sector H: Transportation and storage;
- Sector I: Accommodation and food service activities;
- Sector J: Information and communication;
- Sector K: Financial and insurance activities;
- Sector M: Professional, scientific and technical activities;
- Sector N: Administrative and support service activities; and

[5] Office for National Statistics (2023) *Business demography UK* [online] Available at: https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/businessdemographyreferencetable (Accessed 29th November 2023)

- Sector R: Arts, entertainment and recreation.

5.7. Health and Wellbeing Profile

5.7.1. Average life expectancy for each local authority within the Study Area can be seen in **Table 10 of Appendix 1**[6]. Life expectancy is highest for both males and females within South Cambridgeshire (male: 82.8 years and female: 85.7 years) and City of Cambridge(male: 82.8 years and female: 85.8 years), which are also higher than the national averages of 78.8 years for males and 82.8 years for females. In comparison the lowest life expectancy is within Bedford, where the life expectancy for males is 77.5 years and 82.1 years for females which is slightly lower than the national average.

5.7.2. Inequalities in life expectancy at birth for males and females from the most to the least deprived areas are estimated to be highest in Oxford where there is 13-year difference for males and a 9-year difference for females[7]. Bedford also has high inequalities for male life expectancy, with a difference of 11.6 years[8]. South Cambridgeshire have the lowest inequalities in life expectancy compared to the other local authorities in the Study Area with a difference of 4.5 years for males and 1.8 years for females8.

5.7.3. **Table 11 of Appendix 1** details the general health and wellbeing profiles for the local authorities that fall within the Study Area[9]. Oxford has the largest proportion of those that were recorded as having day-to-day activities limited a lot at 7.5% , which is in line with the national average of 7.5%. In comparison, Buckinghamshire has the lowest proportion at 5.0%.

5.7.4. Cancer rates are generally inline or lower than the national average within the Study Area. However, Milton Keynes does have slightly higher rates at 104.6 (standardised incident ratio per 100, where England is 100). Buckinghamshire has the lowest at 93.6.

5.7.5. Rates of low birth weight in babies is also generally in line or lower than the national average of 6.8%. However, Milton Keynes has a significantly higher low birth rate of 7.4%. Conversely, Milton Keynes also has one of the highest prevalence of Year 6 children being overweight at 35.9%. Bedford has a slightly higher prevalence at 36.6%, however these are still not considered to be significantly different to the national average of 35.8%.

5.7.6. Milton Keynes has the highest emergency hospital admission rates for coronary heart disease and chronic obstructive pulmonary disease (COPD) within the Study Area at 119.3 and 112.6 (standardised admission ratio, where England is 100), respectively. Whereas, Huntingdonshire has the highest emergency hospital admission rates for strokes (93.0 standardised admission ratio) and for injuries in children under 15 years old (93.9 per 10,000 people).

5.7.7. The city of Cambridge has the highest emergency hospital admission rates for intentional self-harm within the Study Area, at 143.6 (standardised admission ratio, where England is 100).

[6] Office for Health Improvements and Disparities (2021) Indicators: maps, data and charts [online] Available at: https://www.localhealth.org.uk/#c=indicator&selcodgeo=E07000178&view=map10 (Accessed 8th December 2023)
[7] Oxford City Council (2023) Oxford's Health [online] Available at: https://www.oxford.gov.uk/info/20127/health/457/oxfords_health (Accessed Oxford City Council (2023) Oxford's Health [online] Available at: https://www.oxford.gov.uk/info/20127/health/457/oxfords_health
[8] Office for Health Improvements and Disparities (2022) Local Authority Health Profiles 2019. Available at: https://fingertips.phe.org.uk/profile/health-profiles
[9] Office for Health Improvements and Disparities (2022) Indicators: maps, data and charts [online] Available at: https://www.localhealth.org.uk/#bbox=397793,283378,222561,131105&c=indicator&selcodgeo=E06000042&view=map10

APPENDIX A – Social Baseline

Table 2: Total Population (2021)[10]

Area	Total Population
Oxford	160,400
Cherwell	161,800
Buckinghamshire	555,200
Milton Keynes	288,300
Central Bedfordshire	295,700
Bedford Borough	185,800
Huntingdonshire	181,800
South Cambridgeshire	163,000
City of Cambridge	145,000

Table 3: Age breakdown by age and sex for the population (2021)[11]

	Oxford (%)			Cherwell (%)			Buckinghamshire (%)			Milton Keynes (%)			Central Bedfordshire (%)			Bedford Borough (%)			Huntingdonshire (%)			South Cambridgeshire (%)			City of Cambridge (%)			England (%)		
Age Group	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
0 - 15	8.1	7.5	15.6	9.8	9.1	18.9	10.1	9.7	19.8	11.1	10.5	21.6	10.0	9.5	19.5	10.3	9.75	20.05	9.3	8.7	18	10.0	9.6	19.6	7.4	7.0	14.4	9.5	9.1	18.6
16-24	10.9	11.3	22.2	4.6	4.3	8.9	4.6	4.4	9.0	5.0	4.6	9.6	4.5	4.1	8.6	5.0	4.7	9.7	4.5	4.1	8.6	4.1	3.8	7.9	10.6	10.4	21	5.4	5.2	10.6
25-64	24.8	25.5	50.3	27.8	28	55.8	26.0	27.4	53.4	27.3	28.4	55.7	26.9	27.9	54.8	26.7	27.7	54.4	27.0	27.4	54.4	25.8	27.0	52.8	27.2	26.6	53.8	25.7	26.8	52.5
65-84	5.4	4.6	10.0	6.6	7.5	14.1	7.0	8.0	15.0	5.3	8.0	13.3	7.0	7.8	14.8	7.2	6.3	13.5	7.9	8.8	16.7	8.0	8.9	16.9	4.2	4.8	9	7.5	8.5	16.0
85+	0.7	1.0	1.7	0.9	1.4	2.3	1.7	1.0	2.7	0.5	1.0	1.5	0.8	1.3	2.1	0.9	1.4	2.3	0.9	1.4	2.3	1.1	1.6	2.7	0.62	1.0	1.62	0.9	1.5	2.4

[10] Census (2022) How the population changed: Census 2021 [online] Available at: https://www.ons.gov.uk/visualisations/censuspopulationchange/E07000178/
[11] Nomis (2022) Age by Sex [online] Available at: https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=2221

Table 4: Total population change from 2011 to 2021[12]

Local Authority	Total population change since 2011 to 2021 (%)
Oxford	6.7
Cherwell	13.5
Buckinghamshire	9.5
Milton Keynes	15.3
Central Bedfordshire	15.7
Bedford Borough	17.7
Huntingdonshire	6.7
South Cambridgeshire	8.9
City of Cambridge	17.6
South East	7.5
East of England	7.5
England	6.6

Table 5: Overall Deprivation Rank[13]

Local Authority	Overall Deprivation Ranking (out of 317 local authorities)
Oxford	189
Cherwell	220
Alsbury*	272
Chiltern*	312
South Bucks*	299
Wycombe *	250
Milton Keynes	172
Central Bedfordshire	245
Bedford Borough	156
Huntingdonshire	248
South Cambridgeshire	301
City of Cambridge	210

*****These four local authorities make up Buckinghamshire

[12] Census (2023) How your area has changed in 10 years: Census 2021 [online] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/howyourareahaschangedin10yearscensus2021/2022-11-08/
[13] GOV.UK (2019) English indices of deprivation [online] Available at: https://www.gov.uk/government/collections/english-indices-of-deprivation

Table 6: NOMIS Job density report, 2021[14]

Local Authority / Region	Job density
Oxford	1.10
Cherwell	0.90
Buckinghamshire	0.84
Milton Keynes	1.06
Central Bedfordshire	0.65
Bedford	0.78
Huntingdonshire	0.79
South Cambridgeshire	0.99
City of Cambridge	1.10
East of England	0.84
South East England	0.85
England	0.85

Table 7: Number of Jobs, 2022 (NOMIS Labour Market)[15]

Local Authority	Total employee jobs	Full time (%)	Part time (%)
Oxford	122,000	67.2	32.0
Cherwell	83,000	69.9	30.1
Buckinghamshire	247,000	70.0	30.0
Milton Keynes	180,000	71.7	28.3
Central Bedfordshire	105,000	68.6	31.4
Bedford	80,000	70.0	30.0
Huntingdonshire	78,000	69.2	30.8
South Cambridgeshire	84,000	75.0	25.0
City of Cambridge	110,000	70.9	29.1

Table 8: Proportion of employees per industry sector, 2022 (%)[15]

Industry Sector	Oxford	Cherwell	Buckinghamshire	Milton Keynes	Central Bedfordshire	Bedford	Huntingdonshire	South Cambridgeshire	Cambridge	East of England	South East England	England
B: Mining and quarrying	0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1
C: Manufacturing	3.3	10.8	6.9	5.6	10.5	6.2	14.1	13.1	1.4	7.4	5.9	7.5
D: Electricity, gas, steam and air conditioning supply	0.0	0.4	0.1	0.3	0.0	0.4	0.1	0.1	0.0	0.2	0.3	0.3
E: Water supply; sewerage, waste management and remediation activities	0.3	0.6	1.0	0.6	0.2	0.9	2.6	0.6	0.3	0.8	1.0	0.7
F: Construction	1.4	4.2	5.7	2.8	7.6	6.2	5.8	6.0	1.4	6.7	5.0	4.8
G: Wholesale and retail trade; repair of	8.2	20.5	17.8	16.7	18.1	17.5	15.4	10.7	8.2	15.5	15.0	14.1

[14] NOMIS (2021) Job Density Profile [online] Available at: https://www.nomisweb.co.uk/datasets/jd
[15] NOMIS (2021) Labour Market Profile [online] Available at: https://www.nomisweb.co.uk/reports/lmp/la/contents.aspx

motor vehicles and motorcycles												
H: Transportation and storage	2.0	4.8	3.2	9.4	7.6	7.5	4.5	2.1	1.6	5.6	4.8	5.1
I: Accommodation and food service activities	6.6	6.0	6.5	5.6	9.5	7.5	7.7	4.8	7.3	7.9	7.5	7.9
J: Information and communication	5.7	3.6	6.1	6.7	2.4	2.8	3.2	8.3	9.1	3.6	6.1	4.8
K: Financial and insurance activities	0.6	1.1	1.4	5.0	0.7	1.9	1.6	1.1	0.9	2.4	2.5	3.4
L: Real estate activities	1.0	1.8	1.8	2.2	3.3	3.1	1.6	1.2	1.8	1.9	1.7	1.9
M: Professional, scientific and technical activities	9.8	9.6	9.3	7.8	6.7	6.2	6.4	25.0	18.2	8.0	9.6	9.4
N: Administrative and support service activities	4.9	10.8	11.3	8.3	8.6	7.5	7.7	4.8	3.6	11.0	9.2	9.2
O: Public administration and defence; compulsory social security	2.9	4.8	2.8	2.8	3.3	5.6	6.4	1.8	2.3	3.5	3.6	4.3
P: Education	31.1	7.2	9.3	10.0	10.5	8.8	6.4	7.1	21.8	8.7	9.9	8.6
Q: Human health and social work activities	18.9	9.6	11.3	9.4	5.7	15.0	11.5	9.5	17.3	12.4	12.7	13.2
R: Arts, Entertainment and Recreation	1.4	2.4	2.8	2.8	3.3	1.2	1.9	1.5	2.3	2.2	3.0	2.4
S: Other service activities	1.4	1.8	1.8	2.2	2.9	1.6	1.6	2.1	2.0	1.7	2.0	2.0

Table 9: Qualifications Jan 2021 – Dec 2021 of the population aged 16-64 (%)[15]

Qualification	Oxford	Cherwell	Buckinghamshire	Milton Keynes	Central Bedfordshire	Bedford	Huntingdonshire	South Cambridgeshire	Cambridge	East of England	South East	Great Britain
NVQ4 and Above	66.1	49.7	47.8	43.8	41.7	49.5	37.8	63.0	63.5	39.6	45.2	43.6
NVQ3 and Above	80.1	66.9	68.0	61.5	62.6	64.6	60.7	77.6	77.8	58.2	63.8	61.5
NVQ2 and Above	90.8	81.0	83.3	79.1	78.3	82.4	78.2	87.3	91.1	76.7	80.7	78.1
NVQ1 and Above	95.0	89.4	90.6	89.3	90.8	88.3	91.1	93.9	94.1	88.5	90.4	87.5
Other Qualifications	2.6	6.0	4.6	6.3	3.7	6.4	2.4	3.0	2.5	5.8	4.6	5.9
No Qualifications	2.3	4.6	4.8	4.4	5.5	5.3	6.5	3.2	3.5	5.8	5.0	6.6

Table 10: ONS business demography births and deaths, 2018-2022 (2023)[16]

Local Authority / Region	2018		2019		2020		2021		2022	
	Openings	Closures	Openings	Closures	Openings	Closures	Openings	Closures	Openings	Closures
Oxford	585	460	595	445	545	485	560	440	575	560
Cherwell	760	585	750	640	755	645	865	705	800	810
Buckinghamshire	3,340	2,885	3,375	3,095	3,070	3,045	3,285	3,205	3,075	3,620
Milton Keynes	2,070	1,480	1,875	2,245	1,640	1,940	1,795	1,805	1,570	1,890
Central Bedfordshire	2,160	1,450	1,485	2,695	1,285	1,435	1,450	1,310	1,315	1,490
Bedford	880	760	925	790	850	710	960	870	965	1,025
Huntingdonshire	1,045	790	1,090	760	710	905	805	910	835	840
South Cambridgeshire	1,020	755	1,015	835	755	860	890	830	685	955
City of Cambridge	545	485	615	495	595	470	570	475	560	555

Table 11: Life Expectancy (2021)[17]

	Life Expectancy (years)		Life expectancy in most deprived areas (years)			
Local Authority	**Male**	**Female**	**Male**	**Female**	**Difference (male)**	**Difference (female)**
Oxford	79.5	84.4	66.5	75.4	13	9
Cherwell	80.1	84.0	72.7	77.3	7.4	6.7
Buckinghamshire	80.9	84.3	74.4	77.9	6.5	6.4
Milton Keynes	78.7	82.4	71.2	76.8	7.5	5.6
Central Bedfordshire	80.7	84.0	72.3	75.2	8.4	8.8
Bedford Borough	77.5	82.1	65.9	75.7	11.6	6.4
Huntingdonshire	81.2	84.3	76	80.9	5.2	3.4
South Cambridgeshire	82.8	85.7	78.3	83.9	4.5	1.8
City of Cambridge	82.8	85.8	75.1	79.6	7.7	6.2
England	78.8	82.8	N/A	N/A	N/A	N/A

Table 12: Health and wellbeing indicators *[17]

	Oxford	Cherwell	Buckinghamshire	Milton Keynes	Central Bedfordshire	Bedford Borough	Huntingdonshire	South Cambridgeshire	City of Cambridge	England
Long-term illness or disability and limited a lot (%)(2021)[18]	7.5	5.6	5.0	6.9	5.8	6.6	6.1	6.6	6.6	7.5
Cancer rates (standardised incident ratio) (2015 – 2019)	98.7	100.6	93.6	104.6	98.2	98.0	94.4	98.3	97.6	100
Rates of low birth rate in babies (%) (2016 – 2020)	5.4	5.4	5.4	7.4	5.9	6.7	6.5	6.1	6.4	6.8
Year 6: prevalence of overweight	33.7	33.1	30.6	35.9	30.7	36.6	30.9	24.9	28.1	35.8

[16] Office for National Statistics (2023) *Business demography UK* [online] Available at: https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/businessdemographyreferencetable
[17] Office for Health Improvements and Disparities (2021) Indicators: maps, data and charts [online] Available at: https://www.localhealth.org.uk/#c=indicator&selcodgeo=E07000178&view=map10
[18] This data for disability did not include significance levels compared to the England average. Therefore these cells have been left blank.

including obesity (%) (2019 – 2020)										
Emergency hospital admissions for all causes (standardised admission ratio)	106.9	104.9	90.1	102.3	97.0	103.6	93.3	77.0	80.7	100
Emergency hospital admissions for coronary heart disease (standardised admission ratio) (2016 – 2021)	83.0	83.5	72.2	**119.3**	86.9	85.7	97.3	83.6	86.2	100
Emergency hospital admissions for strokes (standardised admission ratio) (2016 – 2021)	82.5	88.8	78.9	84.7	83.0	90.1	**93.0**	78.1	85.8	100
Emergency hospital admissions for COPD (standardised admission ratio)(2016 – 2021)	105.5	83.4	54.1	**112.6**	88.6	101.8	81.2	63.5	111.7	100
Emergency hospital admissions for injuries in children under 15 years old (per 10,000 people)(2016 – 2021)	92.9	92.9	92.9	79.2	86.1	76.4	**93.9**	56.0	53.6	90.9
Emergency hospital admissions for intentional self-harm (standardised admission ratio)(2016 – 2021)	109.8	92.4	72.1	70.4	83.8	100.8	102.1	115.7	**143.6**	100

*Red = Significantly worse than England, Orange = Not significantly different than England, Green = Significantly better than England. Cells left blank indicate where significance compared to the England average could not be sought.