

# High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix CT-001-00001\_Part 1

## **Cross-topic**

Environmental Impact Assessment Scope and  
Methodology Report - Part 1 of 3

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Environmental Impact Assessment Scope and  
Methodology Report - Part 1 of 3



## Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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## Executive summary

High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. It will transform intercity and long distance passenger rail travel in the UK, providing the first major increase in intercity rail capacity for over a century and freeing up substantial capacity for rail travel and freight on the conventional rail network. London, Birmingham, Manchester, and cities in the Midlands, the North and Scotland will be served by high speed trains running at speeds of up to 360kph (225mph) on HS2 lines and on the existing conventional rail network.

The hybrid Bill for Phase One of the HS2 network, between London and the West Midlands, was the subject of an ES deposited in November 2013. The Phase One hybrid Bill received Royal Assent in February 2017. The main works on Phase One commenced in April 2020.

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017. The Phase 2a Bill received Royal Assent in February 2021.

This document is the Environmental Impact Assessment (EIA) Scope and Methodology Report (SMR) and forms part of the Environmental Statement (ES) that accompanies the deposit of the High Speed Rail (Crewe – Manchester) hybrid Bill. This SMR is published in three separate parts: Part 1, Part 2 and Part 3 of which this document is Part 1.

The Proposed Scheme that is the subject of this SMR consists of:

- the HS2 Phase 2b Western Leg from Crewe to Manchester, including:
  - new stations at Manchester Airport and Manchester Piccadilly;
  - a depot north of Crewe;
  - maintenance facilities north of Crewe and at Ashley; and
  - a connection onto the West Coast Main Line (WCML) near Bamfurlong;
- the Crewe Northern Connection, connecting the route of the Proposed Scheme with the WCML and enabling future Northern Powerhouse Rail (NPR) services to connect with HS2;
- provision for the NPR London to Liverpool, Manchester to Liverpool, and Manchester to Leeds junctions, to enable these future NPR routes to connect with HS2; and
- a number of works at locations beyond the Western Leg route corridor, referred to as ‘off-route works’, which include:
  - works to enable HS2 trains to call at existing stations further north on the WCML;
  - construction of depots to provide overnight stabling for HS2 trains serving the north of England and Scotland.

In 2017, HS2 Ltd consulted on a draft of the SMR which covered the full Phase 2b scheme. The full Phase 2b scheme comprised the route from:

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- the HS2 Phase 2b Western Leg from Crewe to Manchester (as described above and referred to in this SMR as the 'Proposed Scheme'); and
- the West Midlands to Leeds via the East Midlands and South Yorkshire (referred to as the 'HS2 Phase 2b Eastern Leg') which will be legislated for separately.

This consultation was to enable consultees and the public to comment on the approach proposed to the EIA<sup>1</sup>. Following consultation, the draft SMR was revised, taking into consideration comments received where appropriate. In October 2018, the Phase 2b EIA Scope and Methodology Report was published<sup>2</sup>.

This SMR provides an update to the version of the SMR published in October 2018 and is focused on the Proposed Scheme (i.e. the HS2 Phase 2b Western Leg).

The SMR is a technical document which outlines the proposed methodological approach to the development of the EIA, and subsequent ES, for the Proposed Scheme. The ES will accompany the deposit of the hybrid Bill in Parliament and will be considered alongside the draft legislation to authorise the Proposed Scheme<sup>3</sup>.

Parliament's Private Business Standing Order 27A (SO27A)<sup>4</sup> requires the preparation of an ES to inform the decision-maker (Parliament) of the likely significant effects of the Proposed Scheme on the environment.

The EIA must fulfil the requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/571) (the 'EIA Regulations 2017'), which reflect the European Union (EU) EIA Directive (2014/52/EU) (the 'EIA Directive 2014') requirements for assessment of the effects of certain public and private projects on the environment.

This SMR sets out the methodology that is proposed for determining the likely environmental impacts and effects; and for assigning values of magnitude and significance to them. It also sets out the approach to the reporting of reasonable alternatives in the ES. It sets out, in Part A, the key changes made since the SMR published in October 2018; general EIA methodology and scope of assessment, covering temporal, geographic and technical scope; approach to mitigation; cumulative effects; defining significant effects; and notes assumptions and limitations in undertaking the EIA. It provides a description of the approach to the study of reasonable alternatives.

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<sup>1</sup> High Speed Two Ltd (2017), *HS2 Phase 2b draft Environmental Impact Assessment Scope and Methodology Report*. Available online at: <https://www.gov.uk/government/consultations/hs2-phase-2b-draft-environmental-impact-assessment-scope-and-methodology-report>.

<sup>2</sup> High Speed Two Ltd (2018), *HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report*. Available online at: <https://www.gov.uk/government/publications/hs2-phase-2b-environmental-impact-assessment-scope-and-methodology-report>.

<sup>3</sup> It should be noted that the purpose of the SMR is to outline the approach that will be taken to the assessment in the EIA. The SMR does not include assessment findings. Findings will be contained within the ES.

<sup>4</sup> House of Commons (2019), *Standing Orders of the House of Commons - Private Business*, London: The Stationery Office.

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In Part B of this SMR, the scope and methodology for each environmental topic section is described. The environmental topics addressed are:

- agriculture, forestry and soils;
- air quality;
- climate change;
- community;
- ecology and biodiversity;
- electromagnetic interference;
- health;
- historic environment;
- land quality;
- landscape and visual;
- major accidents and disasters;
- socio-economics;
- sound, noise and vibration;
- traffic and transport;
- waste and material resources; and
- water resources and flood risk.

Part C provides an outline of the structure of the ES and annexes including:

- a list of consultee organisations and groups;
- maps showing the Proposed Scheme; and
- technical notes which provide the detailed assessment methodology for the environmental topics under assessment, where required.

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# Part A



# 1 Introduction

## 1.1 Purpose of this SMR

1.1.1 The HS2 Phase 2b draft Environmental Impact Assessment (EIA) Scope and Methodology Report (SMR) was published for consultation in July 2017<sup>5</sup> (referred to as the '2017 SMR'). An updated SMR, taking account of the consultation, was published alongside the Phase 2b working draft Environmental Statement (ES) in October 2018 (referred to as the '2018 SMR')<sup>6</sup>. The 2017 SMR and the 2018 SMR related to the full Phase 2b scheme which comprised the route from:

- Crewe to Manchester with connections onto the WCML (the 'HS2 Phase 2b Western Leg'); and
- the West Midlands to Leeds via the East Midlands and South Yorkshire with a connection onto, and part electrification and upgrade of, the Midland Main Line (MML) and a connection onto the East Coast Mainline (ECML) (the 'HS2 Phase 2b Eastern Leg').

1.1.2 This document is the EIA SMR for the HS2 Phase 2b Western Leg which includes:

- new stations at Manchester Airport and Manchester Piccadilly;
- a depot north of Crewe;
- maintenance facilities north of Crewe and at Ashley; and
- a connection onto the West Coast Main Line (WCML) near Bamfurlong;
- the Crewe Northern Connection, connecting the route of the Proposed Scheme with the WCML and enabling future Northern Powerhouse Rail (NPR) services to connect with HS2;
- provision for the NPR London to Liverpool, Manchester to Liverpool, and Manchester to Leeds junctions, to enable these future NPR routes to connect with HS2; and
- a number of works at locations beyond the Western Leg route corridor, referred to as 'off-route works', which include:
  - works to enable HS2 trains to call at existing stations further north on the WCML;
  - construction of depots to provide overnight stabling for HS2 trains serving the north of England and Scotland.

1.1.3 Collectively, these are referred to in this SMR as the 'Proposed Scheme'. The powers for the Proposed Scheme will be sought through a hybrid Bill with an accompanying ES.

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<sup>5</sup> High Speed Two Ltd (2017), *HS2 Phase 2b draft Environmental Impact Assessment Scope and Methodology Report*. Available online at: <https://www.gov.uk/government/consultations/hs2-phase-2b-draft-environmental-impact-assessment-scope-and-methodology-report>.

<sup>6</sup> High Speed Two Ltd (2018), *HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report*. Available online at: <https://www.gov.uk/government/publications/hs2-phase-2b-environmental-impact-assessment-scope-and-methodology-report>.

Construction of the Proposed Scheme is assumed to commence in approximately 2025, with operation assumed to start in 2038.

- 1.1.4 This SMR provides an update to the 2017 SMR and 2018 SMR and is a technical document that sets out the scope and methodology for the EIA for the Proposed Scheme<sup>7</sup>. An overview of the main changes that form the update are set out in Section 2.4. This SMR is published as part of the ES deposited alongside the hybrid Bill.
- 1.1.5 This SMR provides an outline description of the Proposed Scheme and sets out the scope of the environmental effects considered during the EIA. For each environmental topic in the SMR there is a description of the spatial and temporal scope. Consideration is given to effects that would arise during construction and operation of the Proposed Scheme including temporary, permanent, direct, indirect, and cumulative effects.
- 1.1.6 This SMR also sets out the methodology used to determine the likely environmental impacts and effects, and for assigning values of magnitude and significance to them. It also sets out the approach to the reporting of reasonable alternatives in the ES.
- 1.1.7 In keeping with the approach adopted for previous phases of HS2, including Phase One (London to West Midlands) and Phase 2a (West Midlands to Crewe), this SMR is supplemented by a series of technical notes. The technical notes provide detailed methodologies for the assessment of environmental topics and, where relevant, have been developed in liaison with the Government's statutory authorities to provide a robust basis for the EIA.
- 1.1.8 This SMR is published in three separate parts: Part 1, Part 2 and Part 3 of which this document is Part 1.

## 1.2 Legislative framework for the EIA

- 1.2.1 The Proposed Scheme will be subject to authorisation through the hybrid Bill process. The objectives of EIA will, therefore, be pursued through the Parliamentary process. Under Parliament's Private Business Standing Order 27A (SO27A)<sup>8</sup>, an ES must be deposited at the same time as the Bill is introduced. The EIA must fulfil the requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/571)<sup>9</sup> (the

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<sup>7</sup> It should be noted that the purpose of the SMR is to outline the approach that will be taken to the assessment in the EIA. The SMR does not include assessment findings. Findings will be contained within the ES.

<sup>8</sup> House of Commons (2019), *Standing Orders of the House of Commons - Private Business*, London: The Stationery Office.

<sup>9</sup> *Town and Country Planning (Environmental Impact Assessment) Regulations 2017*. SI 2017 No. 571. London, Her Majesty's Stationery Office. The Standing Orders require the ES to be compliant with the EIA Directive and refers to the Town and Country Planning (EIA) Regulations 2017 (England), but there is no substantive difference between these and the Town and Country Planning (EIA) (Scotland) Regulations 2017 as they both transpose the EIA Directive.

‘EIA Regulations 2017’) which reflect the European Union (EU) EIA Directive (2014/52/EU)<sup>10</sup> (the ‘EIA Directive 2014’) requirements for assessment of the effects of certain public and private projects on the environment.

- 1.1.1 For off-route works falling within Scotland, as there is no substantive difference between the English EIA Regulations 2017 and the Town and Country Planning (EIA)(Scotland) Regulations 2017. Standing Orders refer to the English Regulations, the English EIA Regulations 2017 will be followed. However, relevant Scottish legislation, policy and guidance and any relevant data provided by Scottish government, local authorities and statutory bodies will be applied to the assessment of works in Scotland and the ES will adopt the equivalent terminology for relevant topics, as described in this SMR.
- 1.1.2 The UK has now left the EU following the end of the transition period on 31 December 2020. The European Union (Withdrawal) Act 2018 converts the body of existing EU law into domestic law and preserves the laws made in the UK to implement EU obligations. This body of retained EU law includes the EIA Regulations and other relevant domestic environmental legislation, such as the Conservation of Habitats and Species Regulations 2017 (SI 2017/1012) and the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017/407) (as amended).
- 1.2.2 This SMR and the ES may refer to the original EU Directive or to the relevant domestic Regulations and it is to be taken as a reference to the relevant retained EU law in each case.

## 1.3 Structure of this SMR

1.1.3 This SMR is divided into four main parts:

- Part A, including:
  - an introduction to the Proposed Scheme;
  - the background from the HS2 Phase Two Sustainability Statement<sup>11,12</sup>;
  - an outline of the hybrid Bill process;
  - an overview of changes between the EIA process for Phase One, Phase 2a and Phase 2b, changes to the scope and methodology since the 2017 and 2018 SMRs;
  - a summary of stakeholder engagement and consultation undertaken;

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<sup>10</sup> Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. Strasbourg, European Parliament and European Council.

<sup>11</sup> High Speed Two Ltd (2013), *Consultation on the route from the West Midlands to Manchester, Leeds and beyond. Sustainability Statement*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/401154/pc205\\_vol\\_1\\_sustainability\\_statement\\_180713.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401154/pc205_vol_1_sustainability_statement_180713.pdf).

<sup>12</sup> High Speed Two Ltd (2016), *Phase 2b Preferred Route Sustainability Statement including Post Consultation Update*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/568547/D25\\_WEB\\_C331\\_Sustainability\\_Statement\\_Including\\_Post\\_Consultation\\_Update\\_Volume\\_1\\_Main\\_Report\\_WEB\\_VERSION.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/568547/D25_WEB_C331_Sustainability_Statement_Including_Post_Consultation_Update_Volume_1_Main_Report_WEB_VERSION.pdf).

- a general description of the EIA process (including the overall scope of the assessment); and
- a description of the approach to the reporting of reasonable alternatives;
- Part B, which describes the environmental topic sections and the scope and methodology for each environmental topic;
- Part C, which provides an outline of the structure of the ES; and
- Annexes, including:
  - a list of consultee organisations and groups;
  - maps showing the Proposed Scheme; and
  - technical notes which provide the detailed assessment methodology for the environmental topics under assessment, where required.

## 1.4 Description of the Proposed Scheme

- 1.4.1 The route of the Proposed Scheme will run from Crewe to Manchester and to the WCML near Bamfurlong, as shown in Figure 1. The total length of the route is 84.5km (52.5 miles). The route will begin to the south of the existing Crewe Station, south of the A500 Shavington Bypass, where it will connect to HS2 Phase 2a. It will then enter the Crewe tunnel, which will include two vent shafts: at Cowley Way and Middlewich Street. The route will re-emerge to the north of the B5076 Bradfield Road. The Crewe Northern Connection will be provided to the north of Crewe tunnel to connect the route of the Proposed Scheme to the WCML and enable future NPR services to connect with HS2. The HS2 Phase 2a route will also connect to the WCML to the south of Crewe Station and so integrates the existing station into the HS2 route.
- 1.4.2 Crewe North rolling stock depot (RSD) and Crewe North infrastructure maintenance base – rail (IMB-R) will be located between the route of the Proposed Scheme and the WCML where they diverge to the east of Walley's Green. The RSD will serve as an operational and maintenance hub for HS2 rolling stock. The IMB-R will be an infrastructure maintenance facility and storage area for the Proposed Scheme. Reception tracks will connect the RSD with both the WCML and the route of the Proposed Scheme. Access to and from the IMB-R will be via the HS2 reception tracks.
- 1.4.3 The route of the Proposed Scheme will continue north passing between the towns of Winsford and Middlewich on a series of embankments and viaducts to the west of Lostock Green and east of Higher Shurlach, Rudheath, Lostock Gralam and Higher Wincham. The route will then cross the M6 on a viaduct. The HS2 WCML connection will then diverge from the HS2 spur to Manchester. The Proposed Scheme also includes the London to Liverpool junction at this location. This junction will be provided to enable future NPR services between London and Liverpool to connect to HS2.
- 1.4.4 The HS2 WCML connection will continue north towards the M56. Earthworks will be provided on both sides of the route to the south of the M56 to enable a future NPR route between Manchester and Liverpool to cross over the route of the Proposed Scheme. The HS2 WCML

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connection will pass beneath the M56, which will be carried on an overbridge, before crossing the Manchester Ship Canal on a viaduct to the east of Hollins Green. It will then continue north to cross the M62 on viaduct and pass to the west of Culcheth, before continuing through Lowton and connecting with the WCML south of Bamfurlong.

- 1.4.5 The HS2 Manchester spur will continue in a north-easterly direction towards Manchester. After crossing under the A556 Chester Road, it will run in an easterly direction, broadly parallel with the M56, passing to the north of Rostherne Mere. The Proposed Scheme includes the NPR Manchester to Liverpool junction at this location. This junction will enable a future NPR route between Manchester and Liverpool to connect to HS2. Ashley IMB-R will also be located adjacent to the route in this area. Ashley IMB-R will be a maintenance facility and storage area for the Proposed Scheme.
- 1.4.6 Continuing in an easterly direction, the HS2 Manchester spur will cross the Mid-Cheshire Line on a viaduct. It will then turn northwards before passing beneath the M56 in a box structure to the east of Warburton Green.
- 1.4.7 The HS2 Manchester spur will then continue to Manchester Airport High Speed station. The station will be located adjacent to the M56 and north-west of Manchester Airport. It will include four platforms, two of which will be for future NPR services. A section of viaduct will be constructed across the station to enable future provision of a Metrolink (a light rail network operated by Transport for Greater Manchester) stop at the station. Two Metrolink platforms will be provided on the viaduct.
- 1.4.8 The HS2 Manchester spur will enter the Manchester tunnel to the north of Manchester Airport High Speed station, near Davenport Green. The tunnel will pass beneath south Manchester in a northerly direction and will include four vent shafts: at Altrincham Road, Palatine Road, Wilmslow Road and Birchfields Road.
- 1.4.9 The northern portal of the tunnel will be located in the Ardwick area, with the route re-emerging into a box structure and cutting. The Proposed Scheme also includes the NPR Manchester to Leeds junction at this location. This junction will enable a future NPR route between Manchester and Leeds to connect to HS2.
- 1.4.10 The HS2 Manchester spur will then rise onto embankment and continue on viaduct before terminating at the proposed Manchester Piccadilly High Speed station, a six-platform station for HS2 and future NPR services, with its southern edge adjoining the existing Manchester Piccadilly Station. The Proposed Scheme in the area will include the relocation of the existing Piccadilly Metrolink stop, which will be located at sub-surface level beneath the HS2/NPR platforms. It will also include the realignment of existing Metrolink tracks and provision for a new Metrolink stop, called Piccadilly Central.

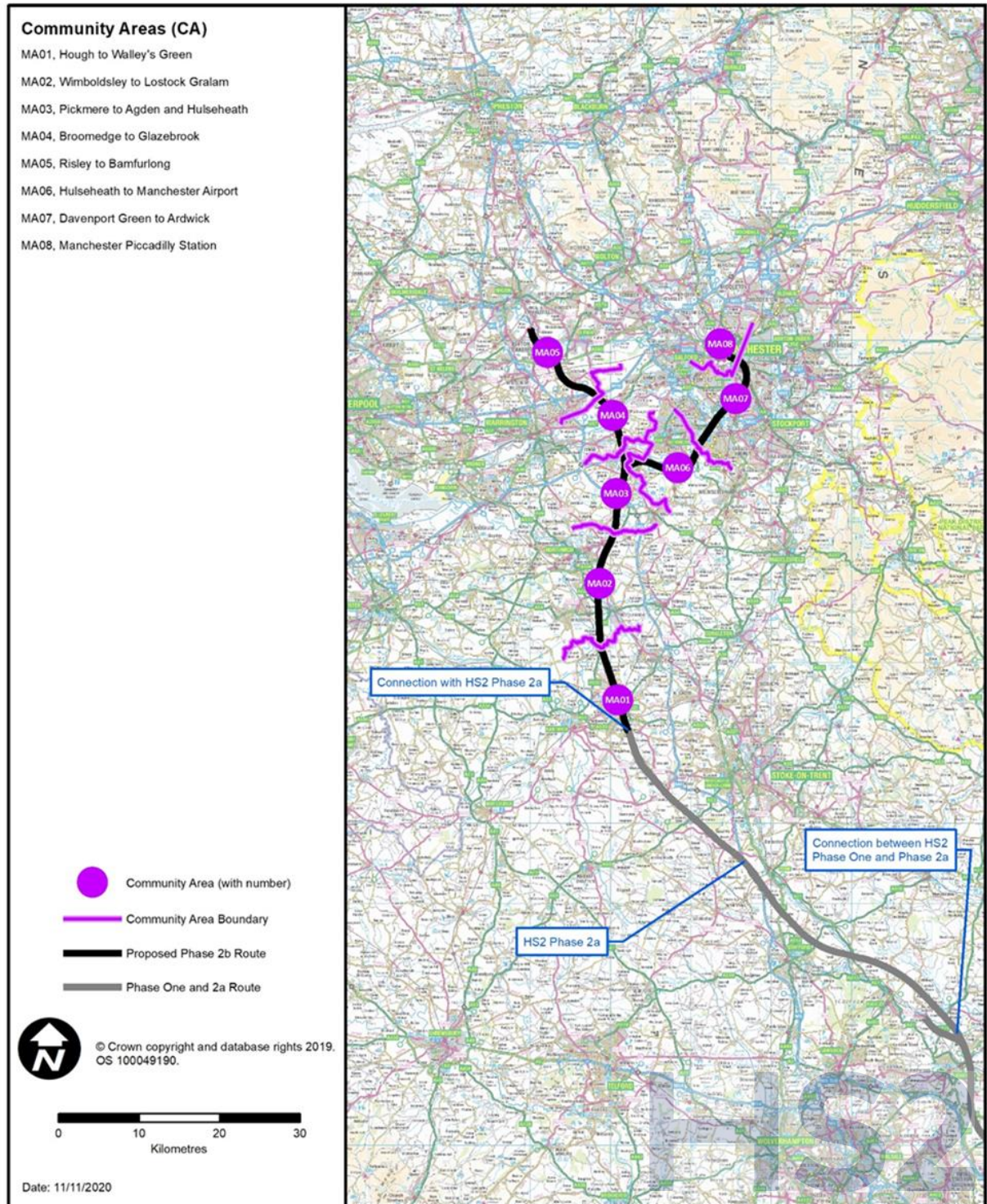


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Figure 1 - The Proposed Scheme



1.4.11 In addition, the following works will form part of the Proposed Scheme. These are referred to as 'off-route works' and include:

- works to enable HS2 trains to call at Preston and Carlisle;
- construction of stabling facilities for HS2 trains serving the north of England and Scotland at Annandale depot (near Gretna in southern Scotland); and

- minor enhancement to existing facilities at Polmadie Depot (Glasgow) to provide overnight stabling for HS2 trains serving the north of England and Scotland.

## 1.5 Interfaces between the Proposed Scheme and other Phases of HS2

- 1.5.1 The route of Phase 2a will include and terminate at the end of the retained cutting leading to Crewe tunnel southern porous portal<sup>13</sup>, which will be constructed as part of the Proposed Scheme. The Proposed Scheme will continue in that tunnel underneath Crewe towards Manchester. Phase 2a also includes spurs from the route of the Proposed Scheme connecting to the WCML south of Crewe and into Crewe Station.

## 1.6 Previous environmental appraisal work on the Proposed Scheme

- 1.6.1 HS2 Ltd has examined a substantial number of route-wide and more local alternatives to the Proposed Scheme. This work has been supported by an independent appraisal of sustainability (AoS). The scope of the AoS included the sections of route between Crewe and Manchester (the Proposed Scheme to which this SMR is relevant) as well as the sections of Phase 2b scheme between the West Midlands and Leeds.
- 1.6.2 The AoS process reflects the first stages of the early development/optioneering work that has been used to appraise and report on the sustainability performance of Phase One and Phase Two (Phase 2a and full Phase 2b scheme) proposals throughout their development up until the EIA process. The AoS covered a range of sustainability topics in a way that enabled appraisal and comparison of a large number of options.
- 1.6.3 Four underlying sustainable development priorities were used for the assessment:
- reducing greenhouse gas emissions and combating climate change;
  - protecting natural and cultural resources and providing environmental enhancement;
  - creating sustainable communities; and
  - enabling sustainable consumption and production.
- 1.6.4 Beneath these priorities sat the 18 sustainability topics, covering matters such as noise and vibration, flood risk, greenhouse gases and resource use.

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<sup>13</sup> Perforated structures at tunnel portals (entrances), usually formed of concrete, designed to allow the passage of air from the tunnel. These reduce both air pressure changes and the noise generated when a high speed train enters or leaves a tunnel.

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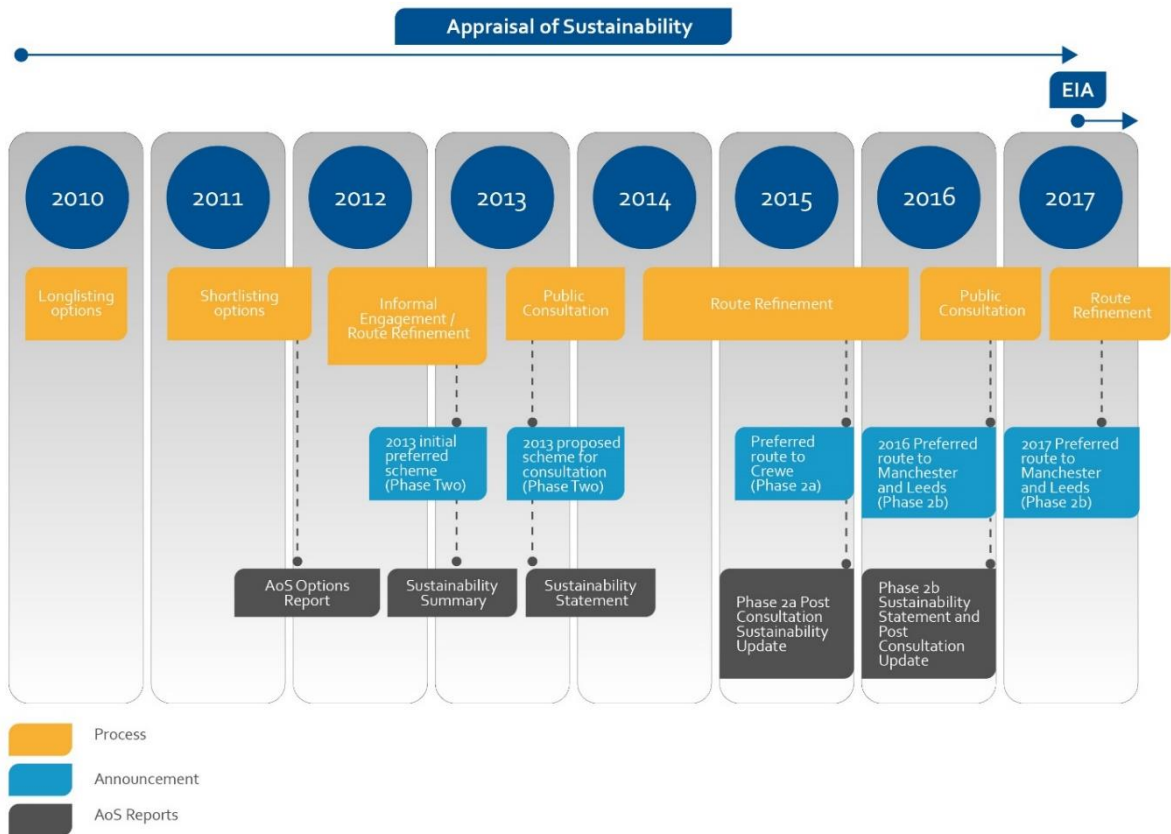
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1.6.5 The AoS has formed a key part of the route sifting process, helping to:

- advise engineers and HS2 Ltd during scheme design in relation to particular sustainability constraints and opportunities;
- inform the engineers in refining scheme proposals to avoid or lessen potential adverse effects;
- advise HS2 Ltd at key decision stages of the relative sustainability advantages and disadvantages of different options, and the consequence of potential impacts; and
- formally report the sustainability performance of the options at each stage.

1.6.6 The AoS process has enabled the independent reporting of sustainability performance throughout this time, with the latest report being the Sustainability Statement produced in November 2016. Two formal consultation exercises have also been conducted, providing access to environmental information including alternatives. These activities are shown on Figure 2 illustrating how the AoS process has underpinned the development of the Proposed Scheme in the period leading up to the start of the EIA stage. Issues raised during consultation on the Sustainability Statement (as part of the full Phase 2b scheme consultation) and its subsequent updates have helped to define the scope of the EIA topics, as described in the consultation section of each environmental topic in Part B of this SMR.

**Figure 2 - The Appraisal of Sustainability process**





1.6.7 The AoS process is described in full in the Sustainability Statement<sup>14,15</sup>. The proposed approach to reporting alternatives in the ES is provided in Section 5 of this SMR.

## 1.7 Monitoring of performance against sustainability and environmental goals

1.7.1 As described above, the AoS process has helped to report on the extent to which the Proposed Scheme, as it evolved, would satisfy sustainable development objectives, and identified some potential positive and negative impacts. During the EIA process, likely significant effects will be reviewed and assessed in the context of the Proposed Scheme.

1.7.2 HS2 Ltd's Sustainability Policy (2019)<sup>16</sup> sets out its priority for sustainable design, which will help to reduce adverse environmental effects. The Sustainability Policy sets out the following principles for sustainability in:

- spreading the benefits: Economic growth and community regeneration;
- opportunities for all: Skills, employment and education;
- safe at heart: Health, safety and wellbeing;
- respecting our surroundings: Environmental protection and management; and
- standing the test of time: Design that is future-proof.

1.7.3 Each of the Sustainability Policy principles is further described in the HS2 Sustainability Approach Document<sup>17</sup>.

1.7.4 Beneath the Sustainability Policy, an Environmental Policy<sup>18</sup> states HS2 Ltd's commitment to "developing an exemplar project through seeking environmental enhancements and benefits whilst limiting negative impacts through design, construction and operation of the railway". The policy also sets out HS2 Ltd's objectives to guide and manage potential environmental impacts.

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<sup>14</sup> High Speed Two Ltd (2013), *Consultation on the route from the West Midlands to Manchester, Leeds and beyond*. Sustainability Statement Volume 1: main report of the Appraisal of Sustainability A report by Temple-ERM for HS2 Ltd (July 2013). Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/401154/pc205\\_vol\\_1\\_sustainability\\_statement\\_180713.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401154/pc205_vol_1_sustainability_statement_180713.pdf).

<sup>15</sup> High Speed Two Ltd (2016), *High Speed Rail: Phase 2b Preferred Route Sustainability Statement including Post Consultation Update*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/568547/D25\\_WEB\\_C331\\_Sustainability\\_Statement\\_Including\\_Post\\_Consultation\\_Update\\_Volume\\_1\\_Main\\_Report\\_WEB\\_VERSION.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/568547/D25_WEB_C331_Sustainability_Statement_Including_Post_Consultation_Update_Volume_1_Main_Report_WEB_VERSION.pdf).

<sup>16</sup> High Speed Two Ltd (2019), *Sustainability Policy*. Available online at: <https://www.gov.uk/government/publications/hs2-sustainability-policy>.

<sup>17</sup> High Speed Two Ltd (2019), *Sustainability Approach*. Available online at: <https://assets.hs2.org.uk/wp-content/uploads/2018/10/19140058/Approach-to-Sustainability.pdf>.

<sup>18</sup> High Speed Two Ltd (2019), *Environmental Policy*. Available online at: <https://www.gov.uk/government/publications/hs2-environmental-policy>.

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- 1.7.5 Practicable measures will be considered further to avoid or reduce the potential environmental effects of the Proposed Scheme as part of a continuing effort to improve the sustainability performance of the new railway during construction and operation. The EIA will identify the likely significant environmental effects of the Proposed Scheme and determine options for further mitigation.
- 1.7.6 As described in Volume 1 of the ES, to ensure that the environmental effects of the Proposed Scheme will not exceed those identified in the ES, the Secretary of State for Transport is expected to establish a set of controls known as Environmental Minimum Requirements (EMRs) for the Proposed Scheme. The EMRs will be contained in a suite of documents that will sit alongside the provisions set out in the hybrid Bill itself. The nominated undertaker is the body to be appointed to take forward the detailed design and implementation of the Proposed Scheme after the hybrid Bill has been enacted. The nominated undertaker will be required to comply with the EMRs and the other hybrid Bill controls.
- 1.7.7 The EMRs, together with the controls in the Bill, will ensure that the impacts identified in the ES will not be exceeded, unless:
- this results from a change in circumstances that was not foreseeable at the time the ES was prepared;
  - any such changes will be unlikely to have significant adverse environmental effects;
  - the relevant works will be subject to a separate consent process and further EIA; or
  - any such change results from a change or extension to the project, where that change or extension does not itself require an EIA.
- 1.7.8 The EMRs will also impose requirements on the nominated undertaker to use reasonable endeavours to adopt measures to further reduce the adverse environmental effects reported in the ES, if this does not add unreasonable cost or delay to the construction or operation of the Proposed Scheme.
- 1.7.9 The EMRs will also detail any specific requirements on the nominated undertaker to monitor the impacts of construction and the post-construction performance of mitigation measures implemented.
- 1.7.10 The EMRs are expected to include:
- a Code of Construction Practice (CoCP), which will set out measures to provide effective planning, management and control during construction;
  - an Environmental Memorandum, which provides a framework for HS2 Ltd and its contractors and stakeholders, such as the Environment Agency and Natural England, to work together to ensure that the design and construction of the Proposed Scheme is carried out with due regard for environmental considerations;
  - a Planning Memorandum, which will set out the agreements between the DfT, the nominated undertaker and the local planning authorities relating to the processing of detailed planning approvals under the provisions of the Bill, including the design and

appearance of stations, depots, bridges, viaducts, tunnel portals, noise fence barriers and earthworks;

- a Heritage Memorandum, which will set out a commitment to limit the impact on the historic environment and will address the elements of the design and construction works that will have a direct impact on heritage assets; and
- undertakings and assurances given during the passage of the hybrid Bill.

1.7.11 The EIA Regulations 2017 make provision for post-EIA monitoring of significant adverse effects on the environment in appropriate cases. HS2 Ltd will work with the relevant responsible authorities to develop the necessary monitoring in appropriate cases.

## **1.8 Hybrid Bill powers**

1.8.1 The Government will deposit a hybrid Bill for the Proposed Scheme for consideration by Parliament in 2022. Upon receiving Royal Assent, the Bill will become an Act of Parliament conferring powers, including deemed planning permission, to build the railway line and thereafter to operate and maintain it. The powers are likely to include:

- authority to nominate an undertaker to build, operate and maintain the railway line;
- authority to construct, operate and maintain the railway and associated major works as described in the Act (and its accompanying plans and sections) and other ancillary works;
- powers of compulsory acquisition or temporary possession of land and properties required for the Proposed Scheme;
- powers to divert or protect gas, water, telecommunications and electricity infrastructure which might be affected by the Proposed Scheme;
- powers over rights of way;
- powers to carry out works to listed buildings and buildings in conservation areas; and
- powers to carry out protective works to buildings and third-party infrastructure.

## 2 Changes between Phase One, Phase 2a and Phase 2b approach to EIA

### 2.1 The Phase One SMR

- 2.1.1 The Phase One EIA SMR was issued in draft for consultation in April 2012 and following the consultation process, was amended and published in September 2012. An EIA for Phase One was carried out and an ES (the main ES) deposited alongside the hybrid Bill in November 2013.
- 2.1.2 For the Phase One main ES, an SMR addendum<sup>19</sup> was published in November 2013 and was supplemented by a series of technical notes, specifying in more detail the assessment process for each environmental topic. Subsequently a series of amendments to the Phase One SMR and some of the technical notes were prepared and published alongside the Phase One Supplementary Environmental Statements (SES) and Additional Provision (AP) ES documents, as follows:
- SMR addendum 2 (July 2015) – appended to the SES and AP2 ES;
  - SMR addendum 3 (September 2015) – appended to the SES2 and AP3 ES; and
  - SMR addendum 4 (October 2015) – appended to the SES3 and AP4 ES.
- 2.1.3 The Phase One ES and subsequent SES and AP ESs were prepared in accordance with Parliamentary Standing Orders, the codified EIA Directive 2011/92/EU and The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (the EIA Regulations 2011).

### 2.2 The Phase 2a SMR

- 2.2.1 The Phase 2a SMR consolidated the Phase One SMR and addenda and introduced a number of updates in line with evolving legislation, guidance and best practice.
- 2.2.2 An addendum to the Phase 2a SMR was published as part of the ES alongside the hybrid Bill for Phase 2a in July 2017.
- 2.2.3 The Phase 2a SMR addendum included a set of technical notes, which contained more detailed assessment methodology for some topics. These were developed in liaison with the Government's statutory environmental advisors, where relevant, to provide a robust basis for the EIA.

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<sup>19</sup> High Speed Two Ltd (2013), *High Speed Rail (London – West Midlands) Environmental Statement, Volume 5, Technical Appendices SMR Addendum, (CT-001-000/2)*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/260153/Vol5\\_Scope\\_and\\_methodology\\_report\\_addendum\\_CT-001-000.2.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/260153/Vol5_Scope_and_methodology_report_addendum_CT-001-000.2.pdf).

2.2.4 In line with being an exemplar project and working to best practice, the Phase 2a ES was prepared in accordance with the EIA Directive 2014 and the emerging UK regulations, even though work on the Phase 2a ES commenced prior to May 2017, when the EIA Directive 2014 was transposed into English legislation.

## 2.3 The Phase 2b SMR

2.3.1 The 2017 and 2018 SMRs were prepared for the full Phase 2b scheme.

2.3.2 The 2017 SMR for Phase 2b consolidated the Phase 2a SMR and addendum and introduced further updates, where relevant, in line with evolving legislation, guidance and best practice. Where relevant, the 2018 SMR included updates or refinements to the technical approach, scope and methodology set out in the 2017 SMR.

2.3.3 Changes to the scope and methodology for the EIA since publication of the 2018 SMR are summarised in Section 2.4 of this SMR. This includes the changes to make this SMR relevant to the Phase 2b Western Leg scheme.

2.3.4 The technical scope has been refined and adapted in accordance with these changes, whilst also considering recent EIA practice for rail and other linear transport infrastructure projects, particularly the Phase One and Phase 2a EIAs.

2.3.5 The environmental topic areas for inclusion in the EIA, as described in Part B of this SMR, are as follows:

- agriculture, forestry and soils;
- air quality;
- climate change;
- community;
- ecology and biodiversity;
- electromagnetic interference;
- health;
- historic environment;
- land quality;
- landscape and visual;
- major accidents and disasters;
- socio-economics;
- sound, noise and vibration;
- traffic and transport;
- waste and material resources; and
- water resources and flood risk.

2.3.6 Technical notes, to supplement the scope and methodology set out in Part B, are provided in the Annexes to this SMR for the following environmental topics:

- air quality;
- community;
- ecology and biodiversity;
- electromagnetic interference;
- health;
- historic environment;
- land quality;
- landscape and visual;
- major accidents and disasters;
- socio-economics;
- waste and material resources; and
- water resources and flood risk.

## **2.4 Changes since publication of the 2018 SMR**

2.4.1 Since the publication of the 2018 SMR, guidance for some topic assessments has been revised and other changes have occurred which affect the technical scope of the assessment and methodology, including:

- changes to legislation;
- changes in external policies and industry best practice guidance;
- further feedback on the outlined methodology received from stakeholders including statutory bodies following the ongoing application of that methodology;
- new technical issues arising from the route and environment through which it passes, specific to the Proposed Scheme;
- refinement to the methodology during preparation of the ES; and
- third party consultation undertaken by HS2 Ltd.

2.4.2 This SMR generally focuses on updates and refinement to:

- the establishment of the baseline and definition of the survey;
- the scope of the assessment; and
- the assessment methodology.

2.4.3 Table 1 summarises where the methodology or approach presented within the 2018 SMR has been amended or refined.

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**Table 1 - Summary of changes since the 2018 SMR**

Part/section number	Section title	Summary of changes made since the 2018 SMR
Part A Section 3	Stakeholder engagement and consultation	Updates to Key stages of engagement and consultation, including Consultation on the 2017 SMR, Consultation on the working draft ES, Consultation on the ES and Ongoing engagement and consultation. Minor update to information on MPs, local authorities and parish councils.
Part A Section 4	EIA methodology	Update to list of community areas to reflect the Proposed Scheme being the Phase 2b Western Leg. Update to temporal scope to construction start date of 2025 and operational start date of 2038, applicable to all topics in Part B. Reference added to Volume 1 of the ES for information on the interaction between the Proposed Scheme and a future Crewe Hub and Northern Powerhouse Rail.
Part A Section 5	Reporting of alternatives	Updates to the case for HS2, the Proposed Scheme and strategic alternatives.
Part B Section 6	Agriculture, forestry and soils	Updates to include reference to land classification in Scotland, methodology in Scotland and stakeholders in Scotland. Update to reflect the Proposed Scheme being the Phase 2b Western Leg.
Part B Section 7	Air quality	Updates to guidance, stakeholders engaged since 2018 and spatial scope of the assessment. Additional details on scope of assessment of modal shift, rail emissions and nitrogen deposition.
Part B Section 8	Climate change	Updates to climate change policy. Update to temporal scope of the assessment, baseline methodology and trends and parameters used in the assessment.
Part B Section 9	Community	Update to reflect the Proposed Scheme being the Phase 2b Western Leg. Update to temporal scope of the assessment. Addition of owners and operators of community resources for inclusion in the EIA. Minor changes to definition of 'community-wide effects'.
Part B Section 10	Ecology and biodiversity	Update to reflect the Proposed Scheme being the Phase 2b Western Leg. Update to temporal scope of the assessment. Updates to guidance and policy. Update to include reference to stakeholders in Scotland and Scottish guidance.
Part B Section 11	Electromagnetic interference	Updates to references to legislation, guidance and standards. Update to reflect acceptable levels of EMI. Update to reflect consultees for the Phase 2b Western Leg. Clarification of limits for public and occupational exposure for assessing health risk. Updated to confirm modelling that will be used as basis of assessment.
Part B Section 12	Health	Minor update to the description of 'vulnerable groups'.
Part B Section 13	Historic environment	Updates to include reference to stakeholders in Scotland and Scottish guidance. Updates to reflect consultees for the Phase 2b Western Leg. Clarifications to factors considered in assessing the significance/value of heritage assets and in assessing impact magnitude.

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Part/section number	Section title	Summary of changes made since the 2018 SMR
Part B Section 14	Land quality	Update to reflect revised guidance and conceptual model terminology. Update to receptor sensitivity in the assessment.
Part B Section 15	Landscape and visual	Update to reflect the Phase 2b Western Leg. Update to assessment guidance. Revision of criteria for determining landscape susceptibility. Updates to magnitude of change.
Part B Section 16	Major accidents and disasters	Updates to reference to HS2 policy and methodology guidance. Updates to text related to level crossings and Network Rail owned and operated infrastructure.
Part B Section 17	Socio-economics	Update to temporal scope of the assessment.
Part B Section 18	Sound, noise and vibration	Updates to assessment guidance. Update to noise screening criteria for noise sensitive non-residential buildings and external amenity spaces.
Part B Section 19	Traffic and transport	Update to temporal scope of the assessment. Updates to assessment guidance. Updates to how significant effects are determined for public transport delays and vulnerable road users. Change to terminology for classification of impacts for non-traffic related severance. Change to terminology for defining the change in amenity and ambience.
Part B Section 20	Waste and material resources	Update to temporal scope of the assessment. Updates to policy and planning framework, including reference to Scottish legislation and applicability to the assessment. Updates to guidance, including implications of the publication of the IEMA 2020 Guidance on the scope and methodology for the Proposed Scheme.
Part B Section 21	Water resources and flood risk	Update to reflect the Phase 2b Western Leg. Update to temporal scope of the assessment. Updates to include reference to Scottish legislation, policy and guidance. Updates to assessment guidance.

2.4.4 Where changes have been made to the technical approach, scope or methodology since the 2018 SMR, these are identified at the beginning of the topic sections in Part B of this SMR. Where no changes are identified in a topic section, no updates have been made to the technical approach, scope or methodology since the 2018 SMR.



## **3 Stakeholder engagement and consultation**

### **3.1 Introduction**

3.1.1 Stakeholder engagement has been an integral and ongoing part of the process of the design and assessment of the Proposed Scheme from its inception. It has enabled the general public, businesses, local authorities, statutory bodies, and expert, technical and specialist stakeholders to respond to, and inform:

- the development of the design, including the consideration of alternatives;
- the scope and methodology of the assessment;
- the collection of relevant baseline environmental information and data;
- the assessment of the significant environmental effects arising from construction and operation of the Proposed Scheme;
- the enhancement of the beneficial effects of the Proposed Scheme;
- the measures identified to avoid, mitigate or compensate for significant adverse effects; and
- monitoring arrangements.

3.1.2 HS2 Ltd's programme of ongoing stakeholder engagement and consultation will provide the opportunity to update and consult stakeholders and the public on the Proposed Scheme design and assessment process.

### **3.2 Key stages of engagement and consultation**

3.2.1 Key engagement and consultation undertaken during the development of the Proposed Scheme will be described in Volume 1 of the ES. Local engagement and consultation will be described in the Community Area reports in Volume 2 of the ES and in Volume 4 of the ES for off-route works.

#### **Consultation on the draft EIA Scope and Methodology Report (the 2017 SMR)**

3.2.2 The 2017 SMR was consulted upon between 17 July and 29 September 2017. It was made available on the gov.uk website, allowing comment by local interest groups and the public. It was also issued to statutory bodies, non-government organisations and local authorities that were relevant at the time of consultation.

- 3.2.3 A total of 107 responses to the 2017 SMR were received. The Phase 2b EIA Scope and Methodology Report Consultation Summary Report (CSR)<sup>20</sup> explained the consultation process and summarised the key themes which emerged from consultation responses and the resultant changes. These changes were incorporated into the 2018 SMR, which was published alongside the Phase 2b working draft ES in October 2018.

## **Consultation on the working draft ES and the 2018 SMR**

- 3.2.4 Consultation on the working draft ES took place from October to December 2018. As part of the process of consultation, stakeholders were invited to comment on the emerging design and assessment. Consultation documents were made available on the gov.uk website. These included the 2018 SMR.
- 3.2.5 A summary of the feedback received on the working draft ES and the 2018 SMR and how this has informed the Proposed Scheme is provided in the Working Draft Environmental Statement Consultation Summary Report (CSR) which will be published as part of the ES<sup>21</sup>. Following formal consultation, further engagement has been undertaken with relevant local authorities and statutory stakeholders in Scotland as the design and assessment has developed.

## **Consultation on the ES**

- 3.2.6 In accordance with Parliamentary Standing Orders, Parliament will consult on the ES after deposit of the hybrid Bill where the public and stakeholders will have the opportunity to comment on the final document. Parliamentary officials will appoint an independent assessor who will summarise responses and provide a report to Parliament before the Second Reading of the hybrid Bill.
- 3.2.7 Engagement, and specifically consultation, will be reported in the ES from a multi-disciplinary perspective. This will focus on the inter-relationships between environment and communities and demonstrate how the Proposed Scheme design has sought to provide solutions for the benefit of both.
- 3.2.8 In doing so, engagement and consultation will enable stakeholders to be fully informed, understand what is proposed in their respective areas and identify predicted impacts arising from the Proposed Scheme. Through focus on the design, stakeholders will have the

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<sup>20</sup> High Speed Two Ltd (2018), *Phase 2b EIA Scope and Methodology Report Consultation Summary Report*.

Available online at:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/745512/HS2\\_Phase\\_2b\\_EIA\\_Scope\\_and\\_Methodology\\_Report\\_Consultation\\_Summary\\_Report.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/745512/HS2_Phase_2b_EIA_Scope_and_Methodology_Report_Consultation_Summary_Report.pdf).

<sup>21</sup> Volume 5: Appendix CT-007-00001, Working Draft Environmental Statement Consultation Summary Report.

opportunity to assist in the identification of mitigation, where appropriate, as a result of a better understanding of the Proposed Scheme itself.

### **3.3 Stakeholder groups**

3.3.1 HS2 Ltd has mapped stakeholders into four key groups, comprising communities; MPs, local authorities and parish councils; expert, technical and specialist groups; and directly affected individuals and major asset owners. These are considered further in the following sections.

3.3.2 Building upon engagement undertaken to date, engagement and consultation will continue during the passage of the Bill through Parliament and designed to meet the needs of these stakeholders, recognising that there will be different requirements and expectations for each group.

#### **Communities**

3.3.3 Communities which may be directly affected by the Proposed Scheme have been engaged in the development of the Proposed Scheme proposals to date and will continue to be a key focus of the engagement and consultation process.

3.3.4 During the design and assessment process, engagement with communities will continue to be carried out to fulfil regulatory and best practice guideline requirements.

3.3.5 The role of ongoing community engagement will be to consider local issues and discuss potential ways to avoid and mitigate impacts of the Proposed Scheme, such as screening views of the railway, managing noise and reinstating highways, and identifying possible community benefits.

3.3.6 Reporting will be undertaken on a community area basis to assist engagement and understanding of the impacts of the Proposed Scheme within local communities across the route. The list of community areas is set out in Section 4.1 of this SMR.

#### **MPs, local authorities and parish councils**

3.3.7 The role of the local authorities and parish councils for the areas through which the Proposed Scheme will pass is two-fold:

- as the holder of data and knowledge critical to informing the design and assessment; and
- providing access to wider stakeholders and communities within the area through local knowledge.

3.3.8 Engagement will be undertaken with local authorities and parish councils throughout the design and assessment processes to maximise the opportunity for local authorities and parish councils to positively inform the development of the Proposed Scheme both in the context of technical input to the assessment and local knowledge and issues.

## **Expert, technical and specialist groups**

- 3.3.9 This group comprises stakeholders with specific expert, technical or specialist knowledge or particular interest in the Proposed Scheme, many of whom will have a high level of influence on the design and assessment process, particularly in relation to technical feasibility and likely environmental and community impacts. This stakeholder group includes national representatives of environmental statutory authorities and government departments, as well as non-statutory technical/specialist organisations at the national, regional and local level. These stakeholders are also likely to help influence project-wide mitigation strategies and principles.

## **Directly affected individuals and major asset owners**

- 3.3.10 The engagement and consultation will have a strong focus on directly affected individuals, particularly landowners. These are recognised as priority stakeholders and there will be a programme of catered and direct engagement throughout the design and assessment development. This stakeholder group will also form a key part of the baseline for the assessment of the Proposed Scheme, both in the consideration of agricultural land and as a component of the health baseline.

## **3.4 Ongoing engagement and consultation**

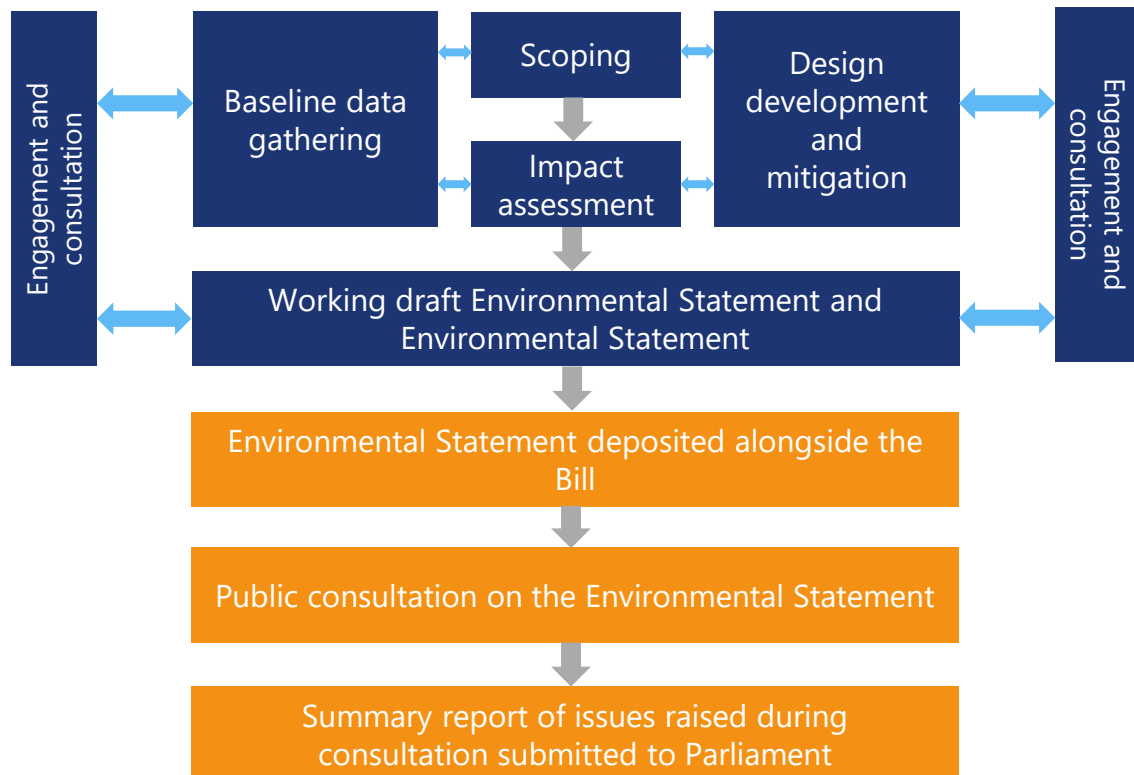
- 3.4.1 The feedback and data received from stakeholders through both ongoing engagement and consultation will be recorded and used to influence the design and assessment of the Proposed Scheme, where appropriate. Ongoing engagement will provide the opportunity to update stakeholders on the design evolution and assessment progress, identifying where feedback has helped inform the Proposed Scheme.

## 4 Environmental Impact Assessment (EIA) methodology

### 4.1 Introduction

- 4.1.1 The EIA is the process that will lead to the production of the ES which will be deposited alongside the hybrid Bill. It will be carried out in accordance with applicable legal requirements and current best practice. The EIA will seek to adopt the principles of the EIA Regulations 2017 and Standing Order 27A (as described in Section 1 of this SMR).
- 4.1.2 The EIA process will comprise a number of related and iterative activities, as illustrated in Figure 3.

**Figure 3 - Proposed Environmental Impact Assessment process**



- 4.1.3 The main stages in the EIA process comprise:
- initial EIA scoping to establish the broad scope and methodology of environmental studies to be carried out for each environmental topic and engage and consult with stakeholders to take account of their views;
  - establishing current baseline conditions (i.e. the environmental conditions that currently exist in the vicinity of the Proposed Scheme). These will be determined from desk-top studies, previous environmental studies, publicly available information, environmental surveys of the area and consultation with groups that have specialist local knowledge;

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- projecting future baseline conditions (i.e. the future conditions without the Proposed Scheme in place). The current baseline will be extrapolated to take account of predicted or anticipated change factors including, but not limited to, changes caused by changing climatic conditions, policy, legislation, proposed development, advances in technology and by other planned infrastructure projects;
- establishing the likelihood of other developments being under construction before or during the construction of the Proposed Scheme;
- consideration of policies, guidelines and legislation and best practice relevant to EIA;
- assessment of the design of the Proposed Scheme in accordance with the methodology outlined for each environmental topic within this SMR, to identify the local extent of potential impacts and the practicable design measures to avoid, reduce or otherwise mitigate significant adverse environmental effects;
- ongoing engagement with environmental, planning and community stakeholders throughout the engineering design and assessment process;
- preparation of the working draft ES;
- public consultation on the working draft ES;
- further assessment in the light of consultation responses and ongoing design development and baseline surveys;
- preparation of the ES; and
- implementing mitigation and monitoring.

4.1.4 The ES will be deposited with Parliament alongside the hybrid Bill for the Proposed Scheme and will allow Parliament to make an informed decision on whether the Proposed Scheme should proceed. Following First Reading of the hybrid Bill and the deposit of supporting documents, Standing Order 224A requires a public consultation on the ES. This consultation will be held over a period of at least 70 days (10 weeks). A summary of comments on the ES will be provided by an independent assessor, appointed by Parliamentary officials, to inform the Second Reading of the hybrid Bill.

4.1.5 The provision of further information to Parliament and further consultation may be required during this legislative process.

4.1.6 In addition to describing the reasonable alternatives considered, the EIA will broadly consider the following two scenarios:

- the likely significant environmental effects of the construction, existence and operation of the Proposed Scheme at various times (see Temporal scope in Section 4.2 of this SMR); and
- the likely significant environmental effects of the Proposed Scheme in addition to other schemes that are either consented or under construction at that time (but are not included in the projected future baseline) and are identified as having the potential to result in significant cumulative impacts and resultant effects (see Section 4.4 Cumulative effects of this SMR).

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- 4.1.7 The EIA will consider both the beneficial and adverse environmental and community effects of the Proposed Scheme in the short, medium and long-term. It will consider both temporary and permanent effects caused directly and indirectly by the Proposed Scheme. It will also address cumulative effects, as defined in Section 4.4 of this SMR.
- 4.1.8 A description of the mitigation measures envisaged in order to prevent, reduce and where possible offset any significant adverse effects will be provided in the ES.
- 4.1.9 The methodologies for the assessments provided in this SMR vary from topic to topic. In general however, all of the assessments will involve a process of interaction between engineering design, planning, environmental and community considerations with a view to avoiding or reducing significant adverse effects on the environment during construction and operation. Mitigation measures will be considered and incorporated within the Proposed Scheme wherever appropriate and practicable. The extent and scale of mitigation will be designed to control and minimise significant adverse environmental effects as well as identify opportunities to promote positive environmental effects.
- 4.1.10 There will inevitably be some uncertainties in predicting future impacts and effects, especially given that operation would not be due to commence until 2038.
- 4.1.11 Where it is not possible or appropriate to quantify impacts or their consequential effects, qualitative assessments will be carried out, based on professional experience and judgement. Where uncertainty exists, this, together with any assumptions relied upon, will be noted in the relevant assessment and any limitations to the EIA work will be reported in the ES.
- 4.1.12 Given the scale of the Proposed Scheme, to aid reporting and assist stakeholders find and digest information that is of relevance to them, the output from the EIA will be reported in relation to a series of geographical areas along the route, known as community areas. The community areas, as shown in Figure 4 are:
- MA01 Hough to Walley's Green;
  - MA02 Wimboldsley to Lostock Gralam;
  - MA03 Pickmere to Agden and Hulseheath;
  - MA04 Broomedge to Glazebrook;
  - MA05 Risley to Bamfurlong;
  - MA06 Hulseheath to Manchester Airport;
  - MA07 Davenport Green to Ardwick; and
  - MA08 Manchester Piccadilly Station.

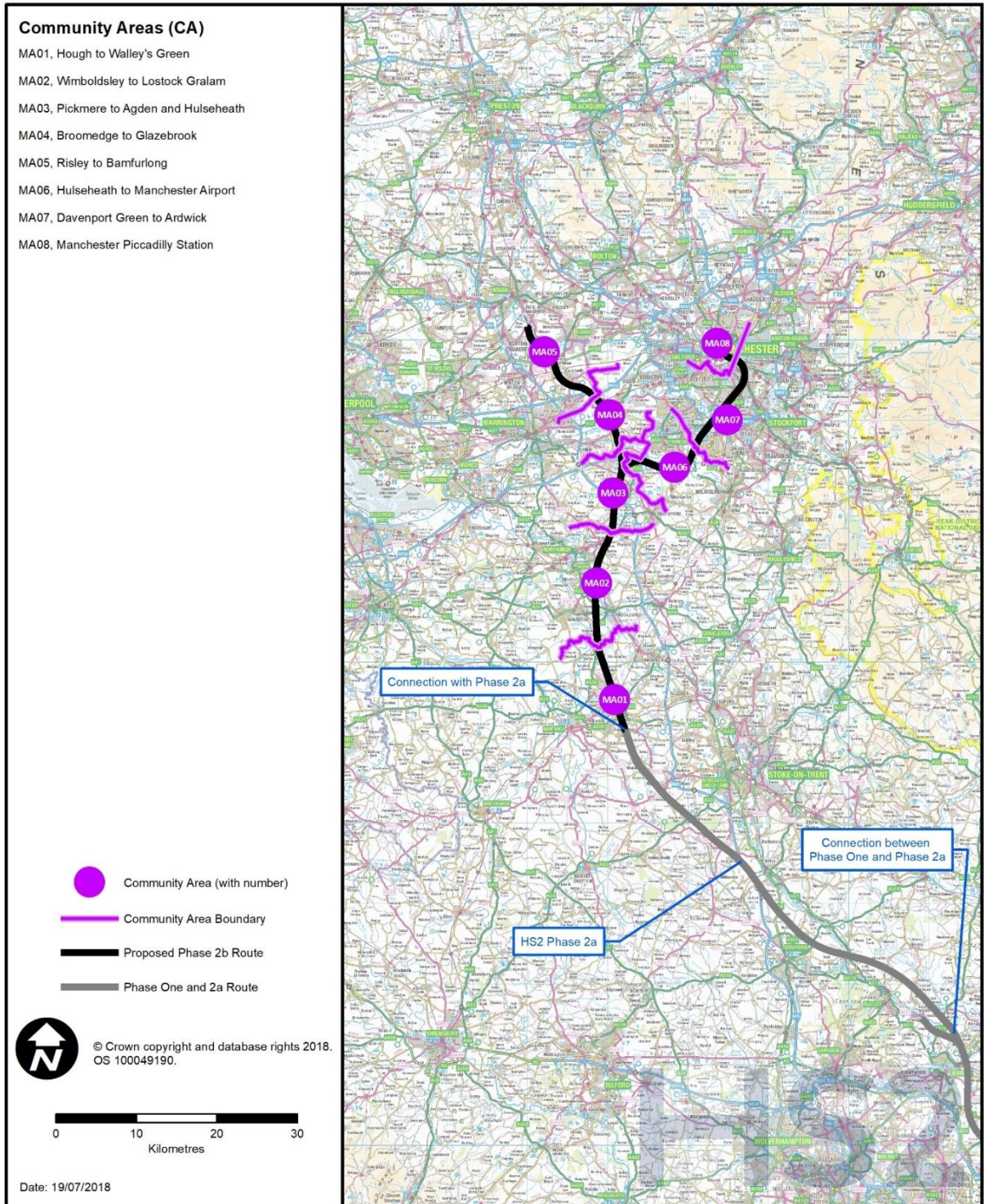


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Figure 4 - Proposed Scheme community areas



4.1.13 Environmental impacts and effects will be reported in the community area where they are experienced, whether they arise from inside that area, or from an adjoining area. If effects arise on a receptor (for example an ancient woodland) which straddles the boundary between two areas, the effects will be reported in both community areas. Any environmental impacts and effects that are experienced outside of the community areas will be reported in an 'Off-route' volume to the ES.



## 4.2 Scope of the assessment

4.2.1 The following section defines the temporal, geographic and technical scope of the assessment of the Proposed Scheme.

### Temporal scope

- 4.2.2 The main construction works for the Proposed Scheme are expected to take place between 2025 and 2038 (including a period of testing and commissioning), although the duration, intensity and scale of construction along the route will vary over this period. The ES will set out the proposed construction programme in order to establish the likely duration of works in each location. The assessment of construction effects will then relate to the programme described.
- 4.2.3 Trains are currently assumed to start operating on the Proposed Scheme in 2038. The ES will describe the predicted frequency, speed and length of trains.
- 4.2.4 Effects arising from longer term considerations after the opening of Phase One, Phase 2a and the Proposed Scheme, the progressive growth in background road traffic or the maturing of mitigation (e.g. growth of planting or habitat creation) will be considered. Where this applies, the environmental topic sections in Part B of this SMR identify the appropriate temporal scope that will be adopted, taking account of these factors.
- 4.2.5 The EIA will establish the baseline environment as it exists at present, and then take account of likely changes to the baseline for the future scenarios defined within this section.

### Geographic scope

4.2.6 The term geographic scope (also called spatial scope) means the area over which the EIA will consider effects. In general, this will consider the distance from the Proposed Scheme over which changes to the environment are likely to occur as a result of the construction or operation of the Proposed Scheme. In addition to the land required permanently, it will also address land required for construction (both for short and long-term periods) and then returned to an agreed condition afterwards. In addition to the physical extent of the works, the geographic scope is influenced by two principal factors:

- the nature of the baseline environment; and
- the manner in which the effects are likely to be propagated.

In addition, the EIA will consider any significant effects caused by activities such as:

- HS2 services on the 'conventional network' north of Crewe and north of Golborne on the WCML;
- changes to HS2 passenger levels on Phase One and Phase 2a as a result of the Proposed Scheme and consequential effects; and

- consequential changes to rail traffic on the 'conventional network', especially on the WCML between Crewe and the north.

4.2.7 Transboundary effects are significant environmental effects caused in other countries (i.e. other than the UK). There are no direct connections between HS2 and other countries. Therefore, it is considered unlikely that the Proposed Scheme will result in any significant effects on the environment of another country and thus transboundary effects will not be considered further unless individual environmental topic areas identify any such significant effects.

## Technical scope

4.2.8 The environmental topic areas to be considered and the extent of the assessment work proposed for each is referred to as the technical scope. The technical scope of the EIA for the Proposed Scheme will seek to meet the requirements of the EIA Regulations 2017 as described in Section 1 of this SMR. The EIA will assess the likely significant effects of the Proposed Scheme on the following environmental topics:

- agriculture, forestry and soils;
- air quality;
- climate change;
- community;
- ecology and biodiversity;
- electromagnetic interference;
- health;
- historic environment;
- land quality;
- landscape and visual;
- major accidents and disasters;
- socio-economics;
- sound, noise and vibration;
- traffic and transport;
- waste and material resources; and
- water resources and flood risk.

4.2.9 These environmental topics have been evaluated as part of this scoping exercise in order to determine the extent to which they should be included in the EIA, having regard to whether there are likely to be significant effects that relate to them. Part B of this SMR provides further details for each environmental topic regarding the assessment approach to be applied during the EIA.

4.2.10 This SMR sets the overarching framework for the scope of the EIA for the Proposed Scheme and the methodology to be applied. Detailed methodologies for the environmental topics

will also be developed in conjunction with environmental statutory authorities and government departments and presented in technical notes for each environmental topic to be assessed. These technical notes are provided in the annexes to this SMR.

## **Integrated assessment**

- 4.2.11 An integrated assessment is proposed to support the Proposed Scheme. This will take the form of one assessment process which will consider relevant issues concerning environment, health and wellbeing together from the outset.
- 4.2.12 In addition to meeting the requirements of the EIA and health assessment processes, the integrated approach also addresses stakeholder expectations that the proposals are assessed collectively, to assist in understanding the interplay of environmental and human factors. Stakeholder engagement will be pivotal to this integrated assessment process (see Section 3).

## **4.3 Approach to mitigation**

- 4.3.1 The ES will set out mitigation measures that would help to avoid, prevent, reduce, repair or, where appropriate, offset significant adverse effects. The EIA Regulations 2017 require an ES to include “a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment”. Such measures will be described generally in the ES as mitigation measures. Priority has been given to avoiding or preventing effects; and then (if this is not possible), to reducing or abating them; and then, if necessary, to offsetting them through restoration or compensation.
- 4.3.2 The mitigation measures and policies to be considered in the assessment can be divided into three types:
- mitigation that is provided through the planning and design of the Proposed Scheme, which is not shown explicitly as such on the scheme drawings;
  - mitigation that requires additional physical features, which is shown on the scheme drawings; and
  - mitigation to be delivered through further measures in accordance with HS2 Ltd policies.
- 4.3.3 The EIA process is iterative, which is likely to enable further refinement of the Proposed Scheme, with the objective of avoiding or reducing significant adverse environmental effects. Mitigation measures will be identified by regularly reviewing the likely significant adverse environmental effects identified during the ongoing assessment process and considering these at design workshops within the HS2 project teams. Design modifications will be considered to avoid or reduce significant adverse effects.

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- 4.3.4 During the EIA process, HS2 Ltd will develop the mitigation incorporated into the Proposed Scheme through:
- the HS2 Sustainability Policy - to set environmental standards which the Proposed Scheme should aim to achieve, thereby structuring and guiding the design;
  - collaborative working between environmental assessment, engineering design teams and engagement teams - to achieve improved and integrated design outcomes;
  - community engagement and consultation - to allow local people, environmental organisations and responsible authorities to raise issues and propose design and mitigation changes to be considered within the Proposed Scheme;
  - recording proposed mitigation along the route to gauge the consistency of approach applied along the route; and
  - CoCP - an HS2 Ltd document to describe the approach to be taken during construction to reduce adverse effects on communities and the environment, including through the use of Local Environmental Management Plans.
- 4.3.5 The proposed mitigation measures will be described in the ES, together with the significant effects remaining after mitigation (termed the residual effects). Where the Proposed Scheme is likely to improve environmental conditions (over and above the baseline), these effects will be identified as enhancements.

## 4.4 Cumulative effects

- 4.4.1 Cumulative effects are broadly defined as incremental effects that result from the accumulation of a number of individual effects. They may result either from:
- a combination of effects arising from the Proposed Scheme (intra-project effects). For example, intra-project effects may arise during construction in cases where the occupiers of a group of neighbouring residential properties experience noise, visual and traffic effects, resulting from construction activities and the passage of construction vehicles on the local road network; or
  - from an interaction between the effects of the Proposed Scheme with the effects of other developments that are likely to be under construction or to have been completed during construction or operation of the Proposed Scheme (inter-project effects). For example, construction of the Proposed Scheme and Phase One may give rise to inter-project effects at the interface between the two schemes.
- 4.4.2 Cumulative effects can be either temporary or permanent and can broadly arise from:
- intra-project effects – i.e. where works may give rise to ‘in-combination’ effects on a particular receptor (e.g. through noise, visual and transport effects);
  - ‘cumulative effects’ of the Proposed Scheme with other developments in the area which are under construction, have planning permission or are subject to site allocation in a statutory development plan, by including those other developments within the future baseline against which the Proposed Scheme is assessed; and

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- 'cumulative effects' of the Proposed Scheme by including HS2 Phase 2a as part of the future baseline. Consideration will also be given to the potential combined effects of all phases of HS2 against a no-HS2 baseline for relevant topics, where possible.
- 4.4.3 The ES will include an explanation of how the Proposed Scheme will interact with the proposed Crewe Hub and future Northern Powerhouse Rail (NPR) provision.
- 4.4.4 HS2 Ltd will continue to work with Transport for the North (TfN) and Network Rail to make sure that plans are co-ordinated and make the most of the opportunities presented by the NPR programme.
- 4.4.5 The geographical scope of other schemes to be included in the cumulative assessment depends on the context (e.g. rural or urban) and on the characteristics of the environmental topic concerned. This will be defined for each scheme and for each environmental topic in the course of the EIA process in engagement with appropriate stakeholders.
- 4.4.6 Where relevant, potential cumulative effects arising will be identified in each environmental topic assessment, which will include details of the cumulative assessment methodology and results.

## 4.5 Defining significant effects

- 4.5.1 This SMR refers to both environmental impacts and environmental effects. The general approach taken is that the Proposed Scheme has the potential to cause an impact on the receiving environment or its neighbours either through physical change (such as the land used for the project or change in land form) or through changes in sound or noise levels, air quality, or socio-economic factors. The extent to which an impact causes a significant environmental, socio-economic or community (including health) effect to occur will depend on a number of factors. In the main, it is likely significant effects that are reported in the ES, but in the EIA process much of the attention is on assessing the level of impacts that give rise to the effects and determining how to avoid or reduce them (in line with the mitigation hierarchy).
- 4.5.2 The predicted effects will be classified according to whether they are considered to be major, moderate or minor; and beneficial or adverse. This will provide a consistent approach to expressing the results of the assessments undertaken as part of the EIA. The terms used are defined as follows:
- beneficial - advantageous or positive change to an environmental resource or receptor;
  - adverse - detrimental or negative change to an environmental resource or receptor;
  - minor - slight, very short-term or highly localised impact;
  - moderate - limited impact (by extent, duration or magnitude); and
  - major - considerable impact (by extent, duration or magnitude) of more than local importance or in breach of recognised standards, policy or legislation.

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- 4.5.3 The duration of impacts may be categorised as short, medium or long-term, where they are not permanent. There is no definition of these terms in EIA practice and it is recognised that the use of the terms would depend on the viewpoint of the user, especially where the user is subjected to the impact or effect. It is therefore important that in addition to using these descriptors, the EIA also gives an indication of the duration. In general, and given the length of the construction programme, the EIA will consider those impacts that last a matter of months to be 'short-term' and those that continue through to the commencement of operations as 'long-term'.
- 4.5.4 Some impacts would arise directly from construction or operation of the Proposed Scheme and others would arise more indirectly from activities associated with the Proposed Scheme or resulting as a consequence of it. Whether an impact arises directly or indirectly does not affect whether the resulting effects are considered to be significant or not.
- 4.5.5 Potential variants to the foregoing approach are described as appropriate in the environmental topic sections in Part B of this SMR.
- 4.5.6 Where it is not possible or appropriate to quantify impacts or their consequential effects, qualitative assessments will be carried out, based on professional experience and judgement. Where uncertainty exists this, together with any assumptions relied upon, will be noted in the relevant assessment and any limitations to the EIA work will be reported in the ES.
- 4.5.7 The significance of effects will be evaluated with reference to recognised standards and accepted criteria for each assessment topic, where these are available. Where no recognised standards or criteria exist, professional judgement will be used to develop an appropriate approach to undertake a robust and appropriate assessment, as explained below. Each environmental topic section in this SMR describes the approach to be taken. In determining whether a resulting effect is significant due consideration will be given to:
- spatial extent (e.g. local, district, regional, national or international);
  - magnitude;
  - duration (short, medium or long-term);
  - frequency of occurrence;
  - nature of the effect (direct or indirect, permanent or reversible);
  - whether it occurs in isolation, is cumulative or interactive;
  - sensitivity and number of receptors affected;
  - value of a resource affected;
  - performance against environmental quality standards; and
  - compatibility with environmental policies.
- 4.5.8 Where effects are considered to be significant, the ES will show the geographic (or spatial) level at which they are viewed as significant (for example, at a community level or a regional or national level).

4.5.9 The EIA is being undertaken by independent qualified and competent experts from a number of consultancies with sufficient expertise to ensure the completeness and quality of the assessment. The assessment leads for each environmental topic, from the appointed consultancies, meet regularly to discuss the methodology being applied, the issues, impacts and effects arising, and the solutions available. National representatives of environmental statutory authorities and government departments are also involved in these discussions. This approach enables experienced EIA practitioners to apply expert professional judgement where appropriate on a consistent basis.

## 4.6 Assumptions and limitations

4.6.1 General assumptions and limitations will be included in Volume 1 of the ES. Each environmental topic section in Volume 2 of the ES will include a section to explain area-specific assumptions and limitations made in undertaking the assessments.

4.6.2 During the preparation of the EIA there could be some circumstances that result in factors that may limit the information available to inform the assessment process. Any limitations, and the consequences on the completeness or potential accuracy of conclusions, will be described in the relevant environmental topic section of the ES.

4.6.3 Broadly, EIA assumptions and limitations can be divided into three categories;

- general assumptions and limitations that apply to several, many or all topics (key general assumptions and limitations are listed below);
- topic specific assumptions that apply to all locations (key topic specific assumptions are described in the topic sections of this report); and
- location specific assumptions and limitations (location specific assumptions and limitations will be described in the ES).

4.6.4 Key general assumptions are:

- the existing land uses along the route of the Proposed Scheme will remain largely unchanged should the Proposed Scheme not proceed, with the exception of natural changes to the environment and changes from other schemes which are under construction, have been consented or are commitments in statutory development plans. The EIA will therefore consider the likely future baseline conditions of the environment;
- assessment of effects will take account of incorporated mitigation such as noise barriers, landscaping and planting. Incorporated mitigation includes measures set out in the draft CoCP; and
- where available information and field survey data is limited, the assessment and development of mitigation will take a precautionary approach employing a reasonable worst case for the assessment.

4.6.5 If there are reasons why these general assumptions do not apply to a particular assessment, then this will be explained in the ES.

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- 4.6.6 It is likely that there will be topic specific limitations due to gaps in data sets and lack of survey data where access to land has not been obtained. Such limitations will be set out in the ES. Assessments may employ professional judgement, where the definition of baselines is constrained by lack of data; use of professional judgement will be made explicit in the ES.



## 5 Reporting of alternatives

### 5.1 Introduction

- 5.1.1 This section provides an overview of the case for HS2 and sets out the approach that will be taken in relation to the reporting of reasonable alternatives that have been studied in the ES.

### 5.2 The case

- 5.2.1 The case for HS2 revolves around four key elements: extra capacity, improved connectivity, local growth and direct opportunities for people and businesses.
- 5.2.2 A summary of the case for HS2 will be described in Volume 1 of the ES.

### 5.3 Reporting of alternatives

- 5.3.1 The Proposed Scheme reflects work by HS2 Ltd undertaken since 2010 to examine a substantial number of possible strategic, route-wide rail and local alternatives to the proposed route alignment.
- 5.3.2 The case for a high speed rail network has already been accepted in the High Speed Rail (London-West Midlands) Act 2017 and the High Speed Rail (West Midlands-Crewe) Act 2021. The alternatives to a high speed rail network will be summarised but will not be revisited in detail in the ES for the Proposed Scheme, as these were presented in the Alternatives report for the Phase One ES published in November 2013<sup>22</sup>.
- 5.3.3 The main alternatives that have been considered for Phase Two, as a whole, and the Proposed Scheme are set out in a number of reports, which will be referenced in Volume 1 of the ES. The information contained within these reports will inform the main alternatives reported in the ES.
- 5.3.4 These reports describe the alternatives considered up to the route announcement made in July 2017. The information within these reports will inform the description of strategic, route-wide rail, route corridor and local alternatives considered up to July 2017 (see Sections 5.6, 5.7 and 5.8 of this SMR). Thereafter, the ongoing design and EIA work will provide the basis for the reporting of local alternatives to the Proposed Scheme (see Section 5.8 of this SMR).

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<sup>22</sup> High Speed Two Ltd (2013), *High Speed Rail (London – West Midlands) Environmental Statement, Volume 5 Technical Appendices, Alternatives Report* (CT-002-000). Available online at: <https://www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-5-alternatives-report>.

5.3.5 The reporting of alternatives will:

- summarise the reasons for choosing the Proposed Scheme, in the light of the other reasonable alternatives identified; and
- outline the reasons for selecting the alternatives identified, including a description of how the assessment was undertaken including any difficulties encountered in compiling the required information.

5.3.6 The reporting of alternatives will also:

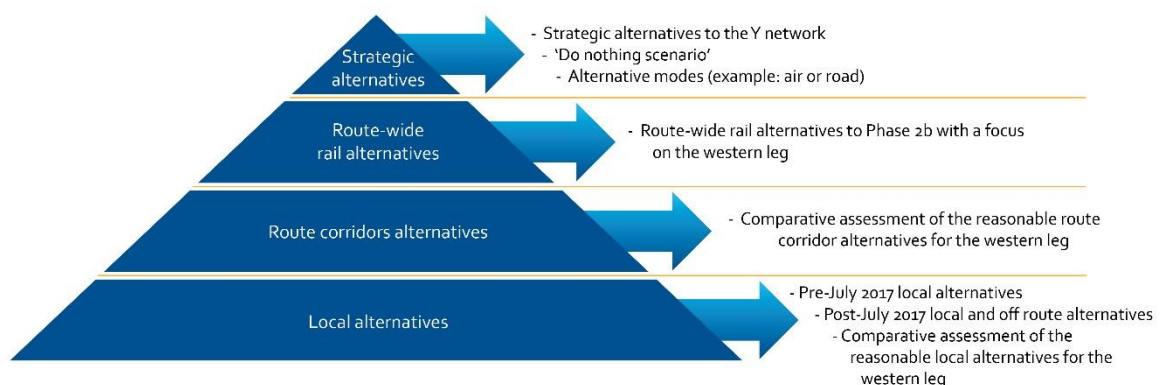
- describe the reasonable alternatives in terms of design, technology, location, size and scale;
- include a comparison of the environmental effects of the relevant alternatives; and
- outline the likely evolution of the current state of the environment without implementation of the Proposed Scheme (baseline scenario) (refer to individual environmental topics under Part B of this SMR).

5.3.7 In addition to environmental appraisal, a supporting narrative will be provided, where appropriate, on how the relevant alternatives considered have been evaluated, including from an engineering and operational perspective, with a clear justification for those options taken forward.

## 5.4 The alternatives

5.4.1 The reasonable alternatives to be described will be set out in accordance with the hierarchy in Figure 5. The geographic scope and level of detail provided for the alternatives will vary depending on which level of the hierarchy they form a part.

**Figure 5 - Hierarchy of alternatives considered**



5.4.2 Pre- July 2017 strategic alternatives, route-wide rail alternatives and route corridors will be reported in Volume 1. Local alternatives will be reported within the Volume 2 community area reports and Volume 4 Off-route works report of the ES. The reasonable alternatives to any borrow pits included within the Proposed Scheme will be reported within a Borrow Pits report in Volume 5 of the ES.

## **5.5 Strategic alternatives**

5.5.1 The reporting of strategic alternatives to the high speed rail network will describe, in outline, alternatives to the full Phase 2b scheme, including:

- a 'do nothing' scenario; and
- alternative modes (air or road).

## **5.6 Route wide rail alternatives**

5.6.1 The reporting of route-wide rail alternatives will describe high speed and conventional rail alternatives to the Proposed Scheme.

## **5.7 Route corridor, station and depot location alternatives**

5.7.1 A comparison of the environmental effects of different route corridor, station and depot location alternatives, and the reasons for the subsequent selection of the Preferred Scheme as announced in July 2017 and taken forward for EIA will be reported in the ES. The Proposed Scheme subject to EIA and taken forward in the hybrid Bill will be the Phase 2b Western Leg scheme only. Therefore, the comparison will concentrate on the relevant route corridor alternatives along the Phase 2b Western Leg scheme between Crewe and Manchester Piccadilly via Manchester Airport (including connections to the WCML). It will also concentrate on the depot and stations along the route and at the terminus points of the route.

## **5.8 Local alternatives**

5.8.1 This section will be split into two parts. The first part will report on those reasonable local alternatives for routes, stations and depots considered in the development of the Preferred Scheme (as announced in July 2017). The second part will report on the reasonable local alternatives for routes, stations and depots considered for the Proposed Scheme as the EIA progresses. In both cases the ES will report local, geographically specific reasonable route alternatives considered in the development of the Proposed Scheme. The reporting of local alternatives will consider factors such as construction feasibility and programme, cost and environment in determining the preferred option to be taken forward into the Proposed Scheme.

5.8.2 There will continue to be refinement to the design in response to environmental assessment and the stakeholder engagement planned by HS2 Ltd, to address local environmental sensitivities and local issues raised through consultations and other factors such as engineering feasibility and cost. These would include, for example, the location of construction site compounds, the access routes to and from construction sites, and the

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location of environmental mitigation. Where appropriate and feasible, localised alternatives for these types of features will be considered in the ES in order to determine their most suitable location.

- 5.8.3 The outcomes of the appraisal for local alternatives, with a clear justification of options taken forward, will be reported in the ES.

## 5.9 Mitigation

- 5.9.1 The process by which environmental considerations have informed and been integrated into the design of the reasonable alternatives and the Proposed Scheme, including environmental mitigation measures, will be reported. This will include those measures or features which were considered to avoid, prevent or reduce any likely significant effects on the environment.

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# Part B

## 6 Agriculture, forestry and soils

### 6.1 Introduction

**Table 2 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 6.1	Introduction	Updated to include reference to best quality land classification in Scotland.
Section 6.2	Establishment of baseline and definition of survey	Updated to be relevant to the Proposed Scheme being the Phase 2b Western Leg. Updated to include reference to methodology in Scotland.
Section 6.3	Consultation and engagement	Updated to include stakeholders in Scotland.
Section 6.6	Assessment methodology	Updated to include reference to guidance and approach to methodology in Scotland. Updated to clarify reporting of effects on high sensitivity holdings.

- 6.1.1 This section of the SMR covers agriculture, forestry and soils which includes the environmental topic areas of soil, agricultural and forestry land, and farm and farm-based enterprises. In particular, it considers the potential impacts of the requirements for land in terms of agricultural land quality, soil resources, local rural businesses and on-farm enterprises, and agri-environment schemes. The potential impacts on forestry, in the context of this topic, only relate to commercial forestry as a receptor.
- 6.1.2 The approach that will be adopted to assess agricultural impacts is derived from national planning policy and the EIA Regulations 2017.
- 6.1.3 The principal feature of national policies regarding agricultural land use is the emphasis on safeguarding scarce natural resources in the long-term national interest. Consequently, policies for development in the countryside give a measure of protection to the best and most versatile agricultural land (defined as Grades 1, 2 and 3a in the Agricultural Land Classification (ALC) system). In Scotland, agricultural land quality is assessed using the Land Capability Classification for Agriculture in Scotland developed by the James Hutton Institute with best quality land in Classes 1, 2 and 3.1.
- 6.1.4 National policy advises that the economic and other benefits of the best and most versatile agricultural land should be taken into account in decisions on development. Where substantial development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be used in preference to higher quality land.
- 6.1.5 Land quality is not the sole consideration in assessing how development proposals affect agriculture. Other factors to be considered include the conservation of displaced soil resources and the impacts on farm holdings.

- 6.1.6 There have been no changes to legislation, guidance or best practice specific to agriculture, forestry and soils which has changed the scope or methodology for assessment since the Phase 2a SMR.

## 6.2 Establishment of baseline and definition of survey

- 6.2.1 A high-level description of the baseline environment for the Phase 2b Western Leg scheme is contained in paragraph 5.13.1 of the Phase 2b post-consultation Sustainability Statement<sup>23</sup>. This indicates that the appraisal of sustainability process has sought to limit the loss of the highest quality, Grades 1 and 2, agricultural land, according to the five-grade ALC system described below.
- 6.2.2 There are well-established methodologies for classifying the quality of agricultural land, contained within guidance issued by the then Ministry of Agriculture, Fisheries and Food (MAFF) in 1988<sup>24</sup> and in Scotland developed by the James Hutton Institute<sup>25</sup>.
- 6.2.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics of the soil or location impose long-term limitations on agricultural use. Grade 1 land is 'excellent quality' agricultural land with very minor or no limitations to agricultural use, and Grade 5 is 'very poor quality' land, with severe limitations due to adverse soil, relief, climate or a combination of these. Grade 3 land is subdivided into Subgrade 3a ('good quality' land) and Subgrade 3b ('moderate quality' land).
- 6.2.4 MAFF produced a Provisional ALC of England and Wales in the late 1960s/early 1970s at a scale of 1:63,360 (1 inch to 1 mile). This information is now shown on [magic.gov.uk](http://magic.gov.uk) (at a scale of 1:250,000) and was used to inform the Phase Two Sustainability Statement. This ALC information was based on reconnaissance field surveys and was intended to provide general strategic guidance on agricultural land quality. It is not, however, sufficiently accurate for use in the assessment of individual developments and should not be used other than as general guidance. In addition to limitations of scale, this classification was undertaken using a system that has since undergone two fundamental revisions and does not distinguish between the subgrades of Grade 3, which has important policy implications.

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<sup>23</sup> High Speed Rail (2016), *Phase 2b Preferred Route Sustainability Statement including Post Consultation Update*. Available online at:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/568547/D25\\_WEB\\_C331\\_Sustainability\\_Statement\\_Including\\_Post\\_Consultation\\_Update\\_Volume\\_1\\_Main\\_Report\\_WEB\\_VERSION.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/568547/D25_WEB_C331_Sustainability_Statement_Including_Post_Consultation_Update_Volume_1_Main_Report_WEB_VERSION.pdf).

<sup>24</sup> Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land*, MAFF.

<sup>25</sup> James Hutton Institute, *Land Capability for Agriculture in Scotland*. Available online at: <https://www.hutton.ac.uk/learning/exploringscotland/land-capability-agriculture-scotland>.



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- 6.2.5 Since the publication of the Provisional ALC, certain areas of the country (usually those proposed for non-agricultural development) have been surveyed in greater detail. Those surveys carried out by MAFF and its successors are available from Natural England and are also shown on [magic.gov.uk](http://magic.gov.uk).
- 6.2.6 Land in Scotland is graded between 1 and 7. Four of the classes are further subdivided into divisions. Class 1 represents land that has the highest potential flexibility of use, whereas Class 7 land is of very limited agricultural value. A detailed Land Capability Classification for Agriculture survey has been carried out by the James Hutton Institute at a scale of 1:50,000, which is available on the Scottish Government web portal<sup>26</sup> and is used to inform the Environmental Statement (ES).
- 6.2.7 The approach to the agricultural land quality survey of all land to be acquired or used for the Proposed Scheme will be undertaken in two parts. Firstly, an interpretation of published geological, topographical, soil and agro-climatic information will be undertaken in the light of the agricultural land quality assessment guidelines to provide a prediction of the likely grades and classes of agricultural land that will be affected. Then the predictive agricultural land quality will be augmented with the results of detailed surveys undertaken by MAFF or Department for Environment, Food and Rural Affairs (Defra) and by other recognised sources within or adjacent to the route corridor of the Proposed Scheme. The predictive agricultural land quality survey will also be augmented with the findings of detailed field survey along the route of the Proposed Scheme to validate its findings, where required and where practicable.
- 6.2.8 The soil surveys for agricultural land quality and soil resource plans will involve the examination of soil profiles using hand-held augers and spades. 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.
- 6.2.9 The soil surveys will inform this topic and will collect data on soil physical properties within woodlands and other open land, where practicable, in order to inform the potential selection of compensation areas for woodland affected by the Proposed Scheme, particularly ancient woodland. The surveys will collect nutrient, pH and organic matter samples within all open areas in order to inform proposals for landscape mitigation planting, habitat creation and translocation.
- 6.2.10 The soils data collected will provide detailed baseline information on the pre-construction agricultural land quality grade or class 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 in of climate change resilience for soils and provide the necessary detail to assess the suitability of the different soil materials for agricultural and

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<sup>26</sup> Scottish Government (2014), *Land Capability for Agriculture partial cover map 1:50,000*. Available online at: <https://map.environment.gov.scot/sewebmap/>.

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other restored land uses. The survey data will also inform recommendations on appropriate methods for handling and storing soils in order to protect their main functions during construction to be set out in a HS2 Ltd Phase 2b Western Leg Information Paper, Soil handling for land restoration<sup>27</sup>.

- 6.2.11 A risk assessment will be prepared to ensure that health and safety hazards relating to the agricultural land quality and soil surveys are considered. Defra guidance on biosecurity for visits to premises with farm animals will be followed<sup>28</sup>. Biosecurity guidance for visits to woodland habitat will also be followed<sup>29</sup>.
- 6.2.12 The term ‘farm holding’ is used in a wide sense and is taken to include land associated with arable cropping, livestock rearing, field-scale and glasshouse horticulture (of edible and non-edible crops), farm woodland enterprises such as wood fuel production, and private and commercial equestrian enterprises. Non-agricultural, land-based enterprises will be those within the control of the main occupier of the farm holding.
- 6.2.13 Information on the existing use of land to be acquired or used will be obtained primarily from the owners and occupiers of the land. Where land is within a written tenancy, this information will be obtained mostly from the tenant as it is the effects of the Proposed Scheme on occupiers of land and/or owners of the businesses affected that will be assessed for the EIA. This will involve face-to-face interviews based on a standard set of questions which will cover:
- a description of the existing size, location and use of farm holdings;
  - a description of the existing scale and nature of agricultural and non-agricultural enterprises based on farm holdings and their associated capital and labour inputs;
  - a discussion of the physical impacts on the structure and operation of the farm holding;
  - a discussion about potential options to mitigate such impacts; and
  - a discussion about potential options for mitigating significant environmental effects identified on an individual farm holding.
- 6.2.14 Where practicable, a representative of the HS2 Ltd stakeholder engagement team will attend the interviews alongside the agricultural surveyor. In order to minimise the number of visits to individual farm holdings, questions relating to other environmental matters may be raised within the interview as appropriate.
- 6.2.15 Information on the presence of any agri-environment schemes (such as Environmental Stewardship, the England Woodland Grant Scheme and Countryside Stewardship) will be

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<sup>27</sup> High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper E19: Soil handling for land restoration*.

<sup>28</sup> Department for Environment, Food and Rural Affairs (Defra) (2008), *Biosecurity Guidance to Prevent the Spread of Animal Diseases*, Defra.

<sup>29</sup> Forestry Commission England (2016), *Biosecurity – Keep it Clean*. Available online at: <https://www.forestry.gov.uk/england-keepitclean>.

obtained from magic.gov.uk, the Natural England website<sup>30</sup>, the Scottish Government website<sup>31</sup> and from individual landowners and occupiers, who will also be asked for details of the nature, requirements and duration of such schemes on the whole farm.

- 6.2.16 In addition to data collected from landowners and occupiers, information on woodlands affected by the Proposed Scheme will be obtained from the National Forest Inventory<sup>32</sup>. No woodland in Scotland is affected by the Proposed Scheme.

## 6.3 Consultation and engagement

### Engagement as part of the EIA process

- 6.3.1 It is intended to continue engagement with representatives from (but not exclusively):
- Natural England;
  - Forestry Commission;
  - the National Farmers' Union;
  - the National Farmers Union of Scotland;
  - the Country Land and Business Association;
  - the Central Association of Agricultural Valuers; and
  - the Confederation of Forest Industries.
- 6.3.2 The owners and occupiers of land to be acquired or used for the construction and operation of the Proposed Scheme would be consulted as part of the EIA process.
- 6.3.3 Consultation with owners and occupiers will be used to develop detailed design of the Proposed Scheme to avoid or reduce impacts on farm holdings and rural business where reasonably practicable.
- 6.3.4 A farmer pack will be developed for the Proposed Scheme which will build on that established for Phase One and Phase 2a<sup>33</sup>. The pack will provide a bespoke Farmers Record, the scope and content of which will reflect the individual circumstances of each landowner or occupier. It will include maps of the construction works and the permanent works on each holding and will set out assurances and commitments made by HS2 Ltd, together with agreements reached between HS2 Ltd and the landowner or occupier. The pack will also set out a broad timeline of HS2 activities, including the estimated date of entry to the land for

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<sup>30</sup> Natural England (2016), *Our Work; Farming and Land Stewardship; Funding for Land Management*. Available online at: <http://www.naturalengland.org.uk/ourwork/farming/funding/default.aspx>.

<sup>31</sup> The Scottish Government (2021), *Farming and rural*. Available online at: <https://www.gov.scot/farming-and-rural/>

<sup>32</sup> Forest Research (2016), *The National Forest Inventory*. Available online at: <http://www.forestry.gov.uk/inventory>.

<sup>33</sup> High Speed Two Ltd (2019), *Guide for Farmers and Growers*. Available online at: <https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers>

the commencement of construction, the construction programme and the opening of the Proposed Scheme. The third part of the pack will comprise a Guide for Farmers and Growers, which sets out HS2 policies and guidance in relation to agricultural matters, including acquisition, compensation, land management during construction, land restoration and other matters.

## 6.4 Key aspects of the Proposed Scheme for the topic

6.4.1 The key aspects of the Proposed Scheme that will affect agricultural land, forestry and soil interests will involve:

- permanent and temporary requirements for all grades of agricultural land; permanent land requirements will affect the nation's stock of agricultural land, which may include areas of high quality land;
- permanent and temporary displacement of soils in other land uses (e.g. woodland and land in agri-environment schemes); permanent loss of such soils will reduce the ability to support particular habitats. The ecology and climate change assessments consider the impacts and effects on biodiversity and carbon storage properties; see Sections 8 (Climate change) and 10 (Ecology and biodiversity);
- permanent requirement of commercial forestry land as a land use and management feature; permanent forestry land requirements will affect the nation's stock of forestry resource. The impacts on the ecological, historic environment and landscape and visual receptors relating to woodland are covered in Sections 10 (Ecology and biodiversity), 13 (Historic environment) and 15 (Landscape and visual);
- the sustainable re-use of soils displaced by the Proposed Scheme; soil is a finite resource which fulfils a number of functions and services. These include food and fibre production; environmental interaction with air and water, particularly marked with peats and highly organic soils; support of ecological habitats and biodiversity; support for the landscape; protection of the historic environment; and provision of raw materials. The temporary displacement of soils introduces the risk of downgrading the quality of land during soil handling. Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, 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;
- permanent and temporary severance of agricultural land and loss of agricultural access; the severance of land may affect the continued ability to farm or otherwise use the land to its potential;
- permanent and temporary severance of commercially-managed woodlands affecting access for management and the continued viability of woodland management;

- loss of farm dwellings, farm buildings and other on-farm infrastructure; farm capital may support substantial areas of land and the loss of this capital may affect the continued ability to farm or otherwise use this land to its potential;
- permanent and temporary disruption or loss to drainage, irrigation and water supplies; such disruption or loss will affect agricultural land quality if permanent, and hence land use; or lead to short-term land use change; and
- construction impacts, e.g. dust and pollution, on adjacent agricultural land which may affect the ability of that land to continue in its present land use; the likelihood of such impacts will be assessed, in the first instance, under the relevant topics. For example the air quality assessment considers the effects and impacts of dust; see Section 7 (Air quality).

## 6.5 Scope of assessment

### Spatial scope

- 6.5.1 The study area will need to be defined for the agriculture, forestry and soils prior to assessment. For most of the key issues identified, the study area is likely to be restricted to the limits of the land to be acquired or used for the construction and operation of the Proposed Scheme, although there may be the potential for effects on neighbouring farmland during the construction and operational phases.
- 6.5.2 Baseline agricultural land quality and farm holding data will initially be collected for a 200m-wide corridor centred on the Proposed Scheme route, as the full extent of the study area (which equates to all agricultural land required for the construction of the Proposed Scheme) will be uncertain at the time of baseline work, although there will be a need for flexibility in the study area where off-site works are anticipated to extend beyond this limit.

### Temporal scope

- 6.5.3 The temporal scope for this topic is outlined in Section 4.2 (Scope of the assessment) of this SMR. Agriculture, forestry and soil effects will be assessed for the construction period (2025 to 2038) and the year of opening in 2038. The temporal scope will be extended for areas of re-instated agricultural land; typically, agricultural aftercare on restored land lasts for five years following soil placement in order to ensure that soil structure has stabilised satisfactorily.
- 6.5.4 The methodology and timeframes for assessing climate change impacts on sensitive receptors and significant effects assessed by the agriculture, forestry and soils topic are set out in Section 8 (Climate change).

## Technical scope

- 6.5.5 The EIA Regulations 2017 and national planning policy will form the basis of the assessment of effects of the Proposed Scheme on agriculture, forestry and soils, and will define the scope of the assessment, namely:
- the quantity and quality of agricultural and forestry land that would be affected, both temporarily and permanently;
  - the quantity of forestry land that would be affected, both temporarily and permanently; the nature and use of the agricultural and non-agricultural soil resource that would be affected (and displaced) by the Proposed Scheme; and
  - the physical impact of land loss and severance and other impacts on agricultural enterprises and farm-based non-agricultural enterprises.

## 6.6 Assessment methodology

### Legislation

- 6.6.1 Although there remains no specific UK legislation for the protection of soil and agricultural land, Defra issued the Soil Strategy for England – Safeguarding our Soils<sup>34</sup> in 2009. The aims of the Strategy have been incorporated into the Natural Environment White Paper, *The natural choice: securing the value of nature*<sup>35</sup> and set out Defra’s vision that by 2030 all England’s soils will be managed sustainably and degradation threats tackled successfully in order to improve the quality of England’s soils and safeguard their ability to provide essential services for future generations.
- 6.6.2 In Scotland, there is no overarching soil protection policy, although a Scottish Soil Framework was published in 2009<sup>36</sup> and soils-related guidance is set out on the Scottish Government’s Scotland’s soils website<sup>37</sup>.
- 6.6.3 Both governments set out priorities for action in respect of:
- better protection of agricultural soils;
  - protecting and enhancing stores of soil carbon;
  - building the resilience of soils to a changing climate;

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<sup>34</sup> Department for Environment, Food and Rural Affairs (Defra) (2009), *Safeguarding our Soils: A Strategy for England*, Defra.

<sup>35</sup> Department for Environment, Food and Rural Affairs (Defra) (2011), *The Natural Environment White Paper, The natural choice: securing the value of nature*. London: The Stationery Office.

<sup>36</sup> The Scottish Government (2009), *The Scottish Soil Framework*. Available online at: <https://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/resource/doc/273170/0081576.pdf>.

<sup>37</sup> The Scottish Government (2021), Scotland’s soils. Available online at: <https://soils.environment.gov.scot/>.

- preventing soil pollution;
- effective soil protection during construction and development; and
- dealing with the legacy of contaminated land.

## Planning policy

- 6.6.4 The National Planning Policy Framework<sup>38</sup> (NPPF) advises at paragraph 109 that the planning system should contribute to, and enhance the natural and local environment by, amongst other matters, protecting and enhancing soils.
- 6.6.5 Paragraph 112 of the NPPF indicates that the economic and other benefits of the best and most versatile agricultural land should be taken into account in development decisions. Where significant development of agricultural land is demonstrated to be necessary, poorer quality land should be used in preference to higher quality land.
- 6.6.6 In Scotland, the National Planning Framework<sup>39</sup> and Scottish Planning Policy<sup>40</sup> set the Government's long term planning vision and recognise the importance of soil as a physical asset stating that such natural assets should be respected, enhanced and made responsible use of. Policy identifies the need to consider the implications of development on soil quality and states that the planning system should seek to protect soils from damage. Paragraph 79 of Scottish Planning Policy states that "development on prime agricultural land, or land of lesser quality that is locally important should not be permitted except where it is essential". Prime agricultural land is defined as agricultural land identified as Class 1, 2 or 3.1 in the land capability classification for agriculture developed by the James Hutton Institute.
- 6.6.7 There is no guidance in policy with regard to the effects of development proposals on farm holdings, although paragraph 28 of the NPPF emphasises the need to support economic growth in rural areas to create jobs and prosperity by, amongst other means, promoting the development and diversification of agricultural and other land-based rural businesses.

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<sup>38</sup> The NPPF is not applicable to the Proposed Scheme as consent is being sought through a hybrid Bill. However, for best practice and to achieve a sustainable scheme, the principles within the NPPF were followed during the design and assessment process. At the time of assessment, the relevant version of the NPPF was Department for Communities and Local Government (2019). National Planning Policy Framework. Available online at: <https://www.gov.uk/government/collections/revised-national-planning-policy-framework>. In July 2021, an updated version of the NPPF was published: Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/100575/9/NPPF\\_July\\_2021.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/100575/9/NPPF_July_2021.pdf). The key principles of sustainable development set out in NPPF 2019 have been retained in NPPF 2021 and therefore it is considered the NPPF 2019 remains an appropriate basis to influence the assessment and design of the Proposed Scheme for the ES. Where reference is made to NPPF in this SMR or the ES, it refers to the NPPF 2019.

<sup>39</sup> The Scottish Government (2014), *National Planning Framework 3*. Available online at: <https://www.gov.scot/publications/national-planning-framework-3/>.

<sup>40</sup> The Scottish Government (2020), *Scottish Planning Policy*. Available online at: <https://www.gov.scot/publications/scottish-planning-policy/>.



6.6.8 Although Natural England's Technical Information Note (TIN) 049 (2012)<sup>41</sup> indicates that land quality is not the sole consideration in how development proposals affect agricultural land in the planning system, it no longer refers to other relevant factors such as the impact on farm size and structure, the use of buildings and other fixed equipment, or any stimulus a development might give to rural economic activity. TIN 049 indicates that planning authorities are guided by the NPPF to protect and enhance soils more widely, including, for example, conserving soil resources during construction and preventing soil from being adversely affected by pollution.

## Guidance

- 6.6.9 The National Planning Practice Guidance (NPPG)<sup>42</sup> was issued in March 2014 and repeats policy in paragraph 112 of the NPPF in respect of the quality of agricultural land in England.
- 6.6.10 The guidance indicates that the ALC provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system, with direction given to Natural England for further information on ALC. The guidance also confirms that Natural England has a statutory role in advising local planning authorities about agricultural land quality issues. In Scotland, the method for assessing agricultural land quality is set out in the James Hutton Institute's land capability classification for agriculture.
- 6.6.11 The guidance also repeats policy in the NPPF in respect of soils and states that the planning system should protect and enhance valued soils because they are an essential finite resource that provides important ecosystem services, such as a growing medium for food, timber and other crops, a store for carbon and water, a reservoir of biodiversity and a buffer against pollution.
- 6.6.12 Guidance on classifying agricultural land is contained in 'Agricultural Land Classification of England and Wales, Revised guidelines and criteria for grading the quality of agricultural land', prepared by MAFF in 1988 and summarised in Natural England's TIN 049.
- 6.6.13 Good practice guidance on soil handling and management during the construction phase, to minimise potential adverse impacts on the soil resource, is found in MAFF's 'Good Practice Guide for Handling Soils'<sup>43</sup>, Defra's 'Construction Code of Practice for the Sustainable Use of

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<sup>41</sup> Natural England (2012), *Agricultural Land Classification: protecting the best and most versatile agricultural land*. Technical Information Note TIN049, Second edition. Available online at: [www.naturalengland.org.uk](http://www.naturalengland.org.uk).

<sup>42</sup> Department for Communities and Local Government (2016), *Planning Practice Guidance*. Available online at: <http://planningguidance.communities.gov.uk/>.

<sup>43</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (2000), *Good Practice Guide for Handling Soils*.

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Soils on Construction Sites<sup>44</sup> and Defra's 'Guidance for Successful Reclamation of Mineral and Waste Sites'<sup>45</sup>.

- 6.6.14 Guidance on the assessment of effects on farm holdings, such as severance and fragmentation which could affect viability, is provided in the Design Manual for Roads and Bridges (DMRB)<sup>46</sup>. Although developed for highways projects, the DMRB has developed methodologies that are also useful for other linear developments.
- 6.6.15 Guidance on the sustainable management of forestry soils is provided in the United Kingdom Forestry Standard (UKFS) guidelines on Forests and Soil<sup>47</sup>.

### Significance criteria

- 6.6.16 In order to assess the effects of the Proposed Scheme on agricultural resources, significance criteria are adopted which relate to the effects on agricultural land and soils, on farming and other farm-based enterprises, and on commercially-managed forestry land.
- 6.6.17 The significance level attributed to each effect will be assessed based on the magnitude of change due to the Proposed Scheme, the sensitivity of the affected receptor/receiving environment to change, and the relative scarcity or abundance of the resource/receptor in the locality, as well as in a wider context, given that some receptors or features may group or converge in a particular locality.
- 6.6.18 The significance criteria are based on available guidance and have been developed following consultation with Defra, Natural England, and the Forestry Commission.
- 6.6.19 The assessment will set out the predicted physical impacts on individual farm holdings, including the land required in each holding during the construction phase, the area of land severed, the area to be restored to agriculture and the resulting permanent requirement for land from each holding, including the permanent requirement for land for landscape planting and habitat creation. The effects will be expressed primarily in physical terms and will reflect the degree of operational change required following construction of the Proposed Scheme.
- 6.6.20 The ALC survey will provide a statement of the amount and quality of agricultural land within the land to be acquired or used for the construction and operation of the Proposed Scheme. The magnitude of change will be reflected in the land required permanently and temporarily

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<sup>44</sup> Department for Environment, Food and Rural Affairs (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*, Defra.

<sup>45</sup> Department for Environment, Food and Rural Affairs (2004), *Guidance for Successful Reclamation of Mineral and Waste Sites*, Defra.

<sup>46</sup> Highways Agency et al. (2001), *Design Manual for Roads and Bridges*, Volume 11, Section 3, Part 6 Land Use (now withdrawn). It is considered that this remains an appropriate basis for the Agriculture, forestry and soils assessment and retains consistency with HS2 Phase One and Phase 2a.

<sup>47</sup> Forestry Commission (2011), *United Kingdom Forestry Standard guidelines on Forests and Soil*. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/687147/The\\_UK\\_Forestry\\_Standard.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/687147/The_UK_Forestry_Standard.pdf).

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for the Proposed Scheme and the sensitivity of the agricultural land resource will be reflected in its grading relative to the abundance of best and most versatile land within a 4km corridor in each community area. At the route-wide level, the proportion of each grade of agricultural land that would be required for the Proposed Scheme will be compared to national estimates of all grades of agricultural land as a measure of the significance of effect on the national resource of agricultural land.

- 6.6.21 This topic will consider the conservation and reinstatement of displaced soil resources. Natural and undisturbed soils on agricultural land, forestry/woodland and ecologically valuable areas that are disturbed by the Proposed Scheme are a distinct and important subset of excavated materials. Their separate handling (where required for agricultural/forestry/ecological re-use) will be subject to different and higher standards of management than other excavated material in order to reflect and retain their greater environmental value and potential. As such, they will be handled differently from other excavated materials.
- 6.6.22 It is common practice for EIA significance criteria to set an absolute threshold for the loss of a certain area of best and most versatile agricultural land (typically 20 or 50 hectares). However, such an approach will be inappropriate for a project of this scale; instead the local significance of loss of best and most versatile land will be related to the abundance or special value of such land in the relevant community area, as described below.

## Agricultural receptors (farms and other rural land-based businesses)

- 6.6.23 The nature of impacts will comprise primarily the requirement of land from the farm holding (permanent and temporary), the severance of parcels of agricultural land (permanent and temporary), the loss of key farm infrastructure (dwellings, buildings and other structures such as irrigation reservoirs and slurry pits) and the imposition of disruptive effects, such as noise and dust, on land uses and the holding's operations.
- 6.6.24 Guideline criteria for assessing the magnitude of impacts are presented in Table 3. Where a farm holding experiences different levels of impact for different types of impact, the higher level will be assigned. Thus, for example, a farm holding that will lose 15% of its land (medium impact) but will retain access to severed land via a private means of access (low impact) will be assessed as incurring a medium impact.

**Table 3 - Impact magnitude criteria for farm holdings**

Impact magnitude	Definitions			
	Land required	Severance	Infrastructure	Disruption
High	>20% of all land farmed	No access available to severed land	Direct loss of farm dwelling, building or structure substantially affecting the flexibility of farm management	Disruption discontinues land use or enterprise

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Impact magnitude	Definitions			
Medium	>10% - 20% of all land farmed	Access available to severed land via the public highway	Loss of or damage to infrastructure affecting the flexibility of farm management	Disruption necessitates substantial change to scale or nature of land use or enterprise
Low	> 5% - 10% of all land farmed	Access available to severed land via private way	Infrastructure loss/damage does not affect the flexibility of farm management	Disruption necessitates some changes to scale or nature of land use or enterprise
Negligible	5% or less of all land farmed	No new severance	No permanent impact on farm infrastructure	Disruption does not affect land use or enterprise

6.6.25 The sensitivity of receptors will be determined by the extent to which they have the capacity to absorb or adapt to impacts, which will be determined primarily by their nature and scale.

6.6.26 In general terms, larger farm holdings will have a greater capacity to absorb impacts and will be less sensitive. However, the scale of the land holding is reflected in the magnitude of impact and the percentage of land required from the farm. For example, the loss of 100 hectares from a 400 hectare (1,000 acre) farm would be a high impact (25%) whereas the same area of land required from a 1,000 hectare farm would be low (10%). The sensitivity criteria therefore concentrate on the nature of the receptor in order to avoid giving undue weight to the scale of operations. They are presented in Table 4.

**Table 4 - Agriculture receptor sensitivity criteria**

Receptor sensitivity	Definition
High	<p>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.:</p> <ul style="list-style-type: none"> <li>• dairying, in which milking cows travel between fields and the parlour at least twice a day;</li> <li>• irrigated arable cropping and field-scale horticulture, which are dependent on irrigation water supplies; and</li> <li>• intensive livestock or horticultural production which is undertaken primarily within buildings, often in controlled environments.</li> </ul>
Medium	<p>Farm types in which there is a degree of flexibility in the normal course of operations, e.g.:</p> <ul style="list-style-type: none"> <li>• combinable arable farms; and</li> <li>• grazing livestock farms (other than dairying).</li> </ul>
Low	Farm types and land uses undertaken on a non-commercial basis.

6.6.27 The significance of an effect will be a product of the magnitude of the impact and the sensitivity of the receptor, as summarised in Table 5.

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**Table 5 - Significance of effect criteria**

Significance		Impact magnitude			
		High	Medium	Low	Negligible
Sensitivity of receptor	High	Major – significant	Major/Moderate – significant	Moderate– significant	Minor – not significant*
	Medium	Major/Moderate – significant	Moderate – significant	Minor – not significant	Negligible – not significant
	Low	Moderate – significant	Minor – not significant	Negligible – not significant	Negligible – not significant

\* Where there is no impact on a high sensitivity holding, a negligible effect will be reported in the ES.

## Agricultural land

6.6.28 Guideline criteria for assessing the magnitude of impacts are presented in Table 6. The magnitude of impact is assessed according to the proportion of best and most versatile agricultural land required by the Proposed Scheme within each community area.

**Table 6 - Impact magnitude criteria for agricultural land**

Impact magnitude	Definitions
High	More than 60% of agricultural land required for the construction or operation of the Proposed Scheme is best and most versatile land
Medium	20% - 60% of agricultural land required for the construction or operation of the Proposed Scheme is best and most versatile land
Low	Less than 20% or less than 10ha of agricultural land required for the construction or operation of the Proposed Scheme is best and most versatile land
Negligible	Less than 2% of agricultural land required for the construction or operation of the Proposed Scheme is best and most versatile agricultural land

6.6.29 The sensitivity of resources affected will be determined by their inherent value, as reflected in the proportion of best and most versatile land within each community area, within the context of the abundance of best and most versatile agricultural land in the locality, defined as a 4km corridor centred on the Proposed Scheme, as shown in Table 7.

**Table 7 - Agriculture resources sensitivity criteria**

Resource sensitivity	Definition
High	Best and most versatile agricultural land where 'Low Likelihood of best and most versatile agricultural land' is the most extensive category in a 4km-wide corridor according to the Defra Likelihood maps. In Scotland, replace "best and most versatile" with "prime agricultural" on the national scale land capability for agriculture map
Medium	Best and most versatile agricultural land where 'Moderate Likelihood of best and most versatile agricultural land' is the most extensive category in a 4km-wide corridor according to the Defra Likelihood maps. In Scotland, replace "best and most versatile" with "prime agricultural" on the national scale land capability for agriculture map
Low	Best and most versatile agricultural land where 'High Likelihood of best and most versatile agricultural land' is the most extensive category in a 4km-wide corridor according to the Defra Likelihood maps. In Scotland, replace "best and most versatile" with "prime agricultural" on the national scale land capability for agriculture map

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- 6.6.30 The Defra database and maps, 'Likelihood of Best and Most Versatile Agricultural Land' show:
- areas of High Likelihood, where more than 60% of the land is likely to be Best and Most Versatile;
  - areas of Moderate Likelihood, where 20% to 60% of the land is likely to be Best and Most Versatile; and
  - areas of Low Likelihood, where less than 20% of the land is likely to be Best and Most Versatile.
- 6.6.31 Scotland's national scale land capability for agriculture map shows areas of land falling into the prime agricultural classes and the likelihood of impact is assessed from this source.
- 6.6.32 The significance of an effect will be a product of the magnitude of the impact and the sensitivity of the receptor, as summarised in Table 5. At the route-wide level, the proportion of each grade of agricultural land that would be required for the Proposed Scheme will be compared to national estimates of all grades of agricultural land as a measure of the significance of effect on the national resource of agricultural land. At the local level, the quality of land required for the Proposed Scheme will be related to the abundance of Best and Most Versatile Land or prime agricultural land within a 4km corridor in each community area or off-route work.

## Forestry land

- 6.6.33 Woodlands are an important natural resource as they offer soil protection, water regulation and carbon storage, provide wood products and support forest industries.
- 6.6.34 This assessment will consider the quantitative impact on commercial forestry land as a land use and management feature. It will not assess the other impacts related to woodland, for which reference needs to be made principally to the ecology and biodiversity, historic environment and landscape and visual assessments; see Sections 10 (Ecology and biodiversity), 13 (Historic environment) and 15 (Landscape and visual) respectively.
- 6.6.35 The nature of the impact will comprise the direct requirement for forestry land. The areas of forestry land that will be affected by the Proposed Scheme will be measured and also expressed as a percentage of the total land requirements within the community area, as shown in Table 8.

**Table 8 - Impact magnitude criteria for forestry land**

Impact magnitude	Definitions
High	More than 10% of land required for the construction or operation of the Proposed Scheme is forestry land
Medium	6% - 10% of land required for the construction or operation of the Proposed Scheme is forestry land
Low	Less than 6% of land required for the construction or operation of the Proposed Scheme is forestry land
Negligible	Less than 1% of land required for the construction or operation of the Proposed Scheme is forestry land

6.6.36 The sensitivity of commercial forestry, as a land use, will be determined within the context of the abundance of forestry land in the locality, as measured within a 4km-wide corridor, following the approach taken with agricultural land. The abundance will be related to the average woodland coverage in England of 10%, as shown in Table 9.

**Table 9 - Forestry land sensitivity criteria**

Resource sensitivity	Definition
High	Forestry land where there is less than the national average forestry cover (<6%) within a 4km wide corridor within the community area
Medium	Forestry land where there is the national average forestry cover (6-10%) within a 4km wide corridor within the community area
Low	Forestry land where there is above the national average forestry cover (>10%) within a 4km wide corridor within the community area

6.6.37 The significance of an effect will be a product of the magnitude of the impact and the sensitivity of the receptor, as summarised in Table 5.

## Soil resources

6.6.38 The impact on the soil resource will reflect the degree to which disturbed soil resources are reused on and, if necessary, off the Proposed Scheme in a manner that enables the resource to continue to fulfil one or more of the primary soil functions of:

- the production of food and biomass, and the provision of raw materials;
- the storage, filtration and cycling of water, carbon and nitrogen in the biosphere;
- the support of ecological habitats and biodiversity;
- the support for the landscape;
- the protection of the historic environment; and
- the provision of a platform for human activities, particularly construction and recreation.

6.6.39 Peat has a higher organic matter content than other soils and represents a large reservoir of organic carbon. It is recognised that substantial peat deposits to the west of Manchester will be disturbed by the construction of the Proposed Scheme. Particular care will be taken to



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ensure that peat and peaty soils are handled under appropriate soil moisture conditions to reduce damage to their physical characteristics and reduce CO<sub>2</sub> emissions.

- 6.6.40 The assessment will consider the key functions identified for soil in a particular location and use the criteria for assessing the magnitude of impact as shown in Table 10.

**Table 10 - Impact magnitude criteria for soils**

Impact magnitude	Definitions
High	The soil displaced from the Proposed Scheme is unable to fulfil one or more of the primary soil functions
Medium	The soil displaced from the Proposed Scheme mostly fulfils the primary soil functions off-site or has a reduced capacity to fulfil the primary functions on site
Low	The soil displaced from the Proposed Scheme mostly fulfils the primary soil functions on-site
Negligible	The soil retains its pre-existing functions on-site

- 6.6.41 The sensitivity of displaced soil will reflect its textural characteristics, in the light of local rainfall conditions, and its susceptibility to the effects of handling during construction and the re-instatement of land, as shown in Table 11.

**Table 11 - Soil sensitivity criteria**

Resource sensitivity	Definition
High	Soils with high clay and silt fractions (clays, silty clays, sandy clays, heavy silty clay loams and heavy clay loams) and organic and peaty soils where average annual rainfall is 700mm or greater; and silty loams, medium silty clay loams, medium clay loams and sandy clay loams where average annual rainfall is 1,000mm or greater. Soils in Wetness Classes IV, V and VI.
Medium	Clays, silty clays, sandy clays, heavy silty clay loams and heavy clay loams where average annual rainfall is lower than 700mm; silty loams, medium silty clay loams, medium clay loams, sandy clay loams where average rainfall is 1,000mm or greater. Soils in Wetness Classes III
Low	Soils with a high sand fraction (sands, loamy sands, sandy loams and sandy silt loams) where average annual rainfall is less than 1,000mm. Soils is Wetness Classes I and II.

- 6.6.42 The significance of an effect will be a product of the magnitude of the impact and the sensitivity of the receptor, as summarised in Table 5.

## Construction effects

- 6.6.43 Construction effects on agricultural and forestry land and farm and land-based enterprises will include land requirements; severance of agricultural and forestry land and farm holdings; the loss of, or disruption to, buildings and operational infrastructure such as drainage; and the use of the soil resource displaced by the construction of the Proposed Scheme.
- 6.6.44 Other construction effects will include: the deposition of dust on sensitive crops, land uses or buildings; disruption to drainage, irrigation and water supply systems; unintentional pollution of soil and water courses or bodies, used for crop irrigation or livestock drinking

water supplies; spread of injurious weeds to adjacent agricultural land from soil and material stockpiles; and construction noise on farm and farm-based enterprises.

- 6.6.45 Construction effects will be distinguished between temporary and permanent effects. Temporary construction effects will comprise the land required to construct the Proposed Scheme which will include: the land returned to agricultural, or forestry use after construction; the temporary severance of land during the construction period; and the effects of disruption, principally from construction noise and dust, on land uses and enterprises.
- 6.6.46 Permanent construction effects will comprise: the net area of agricultural and forestry land required to operate the Proposed Scheme, following the construction period and the restoration of land required temporarily to agricultural and forestry uses; the permanent severance of land; and the permanent loss of or effect on farm infrastructure such as property, buildings and structures, and the consequential effects on land uses and enterprises.

## Operational effects

- 6.6.47 Operational effects on agricultural and forestry land and farm and farm-based enterprises may include sound emanating from moving trains and the propensity of operational land to harbour noxious weeds.
- 6.6.48 The sound, noise and vibration assessment considers the effects on agricultural livestock receptors; see Section 18 (Sound, noise and vibration).
- 6.6.49 The following screening criteria for the predicted operational airborne sound levels will be used to identify potential adverse effects upon agricultural livestock:
- daytime 70 dB  $L_{pAeq, 16hour}$ ;
  - night-time 60 dB  $L_{pAeq, 8hour}$ ; and
  - during a train pass-by 90 dB  $L_{pAFmax}$ <sup>48</sup>.
- 6.6.50 Since grazing livestock is able to move freely away from the sound source, the assessment will concentrate on identifying and assessing effects on fixed livestock buildings or other enclosures within 40m of the nearest track.

## Cumulative effects

- 6.6.51 The construction of the Proposed Scheme, combined with the construction Phase 2a of HS2 and developments that are already taking place or anticipated along the route of the Proposed Scheme, may result in increased pressure on agricultural and forestry land and farm businesses. Cumulative effects will be assessed in relation to other substantial projects that have received consent at the time of the assessment.

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<sup>48</sup> Where the animal is habituated to the source then this screening criterion is not applicable.

## **6.7 Assumptions**

- 6.7.1 The assessment within this topic area considers soils as a medium for food and fibre production and excludes an assessment of soil quality from the perspective of contamination, which is detailed in Section 14 (Land quality) of this SMR. Soil also fulfils a number of functions, such as environmental interaction with air and water; support for ecological habitats and biodiversity; support for the landscape; and protection of the historic environment. These aspects will be assessed under the relevant environmental topics within the ES.
- 6.7.2 This assessment also considers the effects on all farms (including horticulture), equestrian units, farm woodland and forestry enterprises, farm-based recreational and tourist uses and farm diversification projects that are either ancillary to the main agricultural use or within the control of the farm business. Other rural enterprises are assessed in Sections 9 (Community) and 17 (Socio-economics) of this SMR.

## 7 Air quality

### 7.1 Introduction

**Table 12 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 7	Throughout	Updates to references of guidance documents.
Section 7.3	Consultation and engagement	Updates to reflect stakeholders engaged with since 2018.
Section 7.5	Spatial scope	Additional explanation of spatial assessment scope
Section 7.5	Modal shift assessment	Additional explanation of assessment scope.
Section 7.6	Rail emissions	Additional explanation of assessment scope.
Section 7.6	Nitrogen deposition	Additional explanation of assessment scope.

- 7.1.1 This section of the SMR covers air quality which includes the environmental topic area of local air quality and air pollution. It describes the methodologies that will be used to identify the potential for impacts and effects upon sensitive human and ecological receptors.
- 7.1.2 Air quality changes would occur during construction as a result of the construction activities, associated traffic movements and highway interventions. During operation, the main changes in air quality would arise as a result of changes to road layouts and traffic flows.
- 7.1.3 The assessment will focus on air pollutants that are likely to arise from the construction and operation of the Proposed Scheme. These pollutants are oxides of nitrogen (NO<sub>x</sub>), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>) and dust.

### 7.2 Establishment of baseline and definition of survey

- 7.2.1 The Proposed Scheme runs through both rural and urban areas. In rural areas, air quality is generally good but elevated pollutant concentrations exist in urban areas mainly related to vehicle emissions from heavily trafficked roads. Where concentrations are elevated, local authorities have declared Air Quality Management Areas (AQMAs).
- 7.2.2 The air quality assessment will include a review of existing AQMAs and potential Clean Air Zones (CAZ) that may exist within the study area.
- 7.2.3 Baseline air quality information will be obtained from background maps published by Defra, air quality monitoring data from local authority and national networks and local authority air quality reports. Where required, further monitoring will be undertaken mainly for model verification purposes and/or to gather more information on existing air quality.

## **7.3 Consultation and engagement**

### **Engagement as part of the EIA process**

- 7.3.1 The key stakeholders to be engaged with in relation to air quality assessment methodology are environmental health departments at local and regional authorities where:
- the Proposed Scheme will pass through;
  - the Proposed Scheme maintenance depots will be located;
  - the Proposed Scheme stations will be located;
  - significant changes in operational or construction traffic will occur; and
  - there are construction activities in general.
- 7.3.2 Natural England will also be consulted in relation to air quality impacts at designated ecological sites that are sensitive to air quality pollutants.

## **7.4 Key aspects of the Proposed Scheme for the topic**

- 7.4.1 The main air quality effects from the Proposed Scheme during its construction would arise from:
- emissions associated with site plant and vehicles;
  - emissions from construction traffic;
  - changes in traffic emissions arising from local diversions and road realignments; and
  - dust arising from activities such as use of haul routes, wind erosion of temporary stockpiles, earth moving operations, and demolition activities.
- 7.4.2 The above aspects would have the potential to cause changes in NO<sub>2</sub> and PM<sub>10</sub>/PM<sub>2.5</sub> concentrations and may cause dust deposition at sensitive human receptor locations. In addition, some have the potential to cause changes in NO<sub>x</sub> concentrations at ecologically sensitive habitats. Ozone will not be considered in this assessment as it is formed at a regional level and the expected changes in pollutant emissions are unlikely to have a significant effect on its formation in the atmosphere.
- 7.4.3 Air quality effects from the operation of the Proposed Scheme can be categorised into direct and indirect effects. Direct effects would arise from the changes in traffic flows on the highway network, as well as emissions from buildings. Indirect effects would arise from changes in emissions brought about by a modal shift from car to rail services, which may have a beneficial effect on air quality.

## 7.5 Scope of assessment

### Spatial scope

- 7.5.1 Assessment of the effects of emissions arising from local traffic diversions and construction traffic around worksites and stations would be limited to receptors located along roads that meet any of the criteria detailed below, taken from current and previous versions of the Design Manual for Roads and Bridges (DMRB) guidance<sup>49</sup>. These criteria will be applied along the length of the route of the Proposed Scheme to identify where further assessment is required, and comprise:
- road alignment change by 5m or more;
  - daily traffic flows change by 1,000 annual average daily traffic (AADT) or more;
  - heavy duty vehicle (HDV) flows change by 200 AADT or more;
  - daily average traffic speed change by 10kph or more; or
  - peak hour traffic speed change by 20kph or more.
- 7.5.2 The assessment of dust emissions arising from construction sites associated with the Proposed Scheme will be carried out in accordance with the Institute of Air Quality Management (IAQM) guidance<sup>50</sup>. These include areas around worksites where there are sensitive receptors within 350m from the construction site boundary and/or within 50m of the routes used by construction vehicles on the public highway and up to 500m from construction site entrances.
- 7.5.3 The assessment of dust emissions associated with any mineral extraction during construction undertaken as part of the Proposed Scheme will be carried out in accordance with the IAQM mineral dust guidance<sup>51</sup>.
- 7.5.4 Assessment of nitrogen deposition will be required for ecologically sensitive sites within 200m of roads screened in for further assessment. Ecological resources and other ecological issues are described in Section 10 (Ecology and biodiversity) of this SMR.
- 7.5.5 Assessment of health effects from air pollution will be undertaken for NO<sub>2</sub> and PM<sub>2.5</sub> concentrations for the population within 200m of the roads screened in for further assessment. The health effects in relation to air quality are also described in Section 12 (Health) of this SMR.

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<sup>49</sup> Highways England (2019), *Design Manual for Roads and Bridges, Sustainability and Environmental Appraisal*, LA 105 Air Quality, The Stationery Office.

<sup>50</sup> Institute of Air Quality Management (2016), *Guidance on the assessment of dust from demolition and construction*, v1.1.

<sup>51</sup> Institute of Air Quality Management (2016), *Guidance on the assessment of mineral dust impacts for planning*, v1.1.

## Temporal scope

- 7.5.6 The assessment of air quality effects due to changes in traffic during construction of the Proposed Scheme will be undertaken for the following scenarios:
- future 'without the scheme' traffic emissions for the peak year(s) during the construction period; and
  - future 'with the scheme' traffic emissions for the peak year(s) during the construction period.
- 7.5.7 The assessment of air quality effects due to changes in traffic during operation of the Proposed Scheme will be undertaken for the following scenarios:
- future 'without the scheme' traffic emissions during the opening year of operation; and
  - future 'with the scheme' traffic emissions during the opening year of operation.

## Technical scope

- 7.5.8 The assessment will not include the transboundary effects of the Proposed Scheme on air quality, as the likely changes in atmospheric emissions would be negligible in this context.

## Modal shift assessment

- 7.5.9 A route-wide air quality assessment will be undertaken for changes brought about by passenger modal shift from the operation of the Proposed Scheme.

## 7.6 Assessment methodology

### Legislation

- 7.6.1 The assessment will take into account the following legislation, and any subsequent changes to this legislation:
- Part 4 of the Environment Act 1995;
  - The Air Quality (England) (Amendment) Regulations 2002<sup>52</sup>, the Air Quality Standards Regulations 2010<sup>53</sup> and the Air Quality Standards (Amendment) Regulations 2016<sup>54</sup>;

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<sup>52</sup> *The Air Quality (England) (Amendment) Regulations 2002 (SI 2002 No. 3043)*. London: The Stationery Office.

<sup>53</sup> *The Air Quality Standards Regulations 2010 (SI 2010 No. 1001)*. London: The Stationery Office.

<sup>54</sup> *The Air Quality Standards (Amendment) Regulations 2016 (SI 2016 No. 1184)*. London: The Stationery Office.



- Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe<sup>55</sup>; and
- NPPF 2019<sup>56</sup> and NPPG 2019<sup>57</sup>.

## Guidance

7.6.2 The assessment will take into account the following guidance:

- Defra Local Air Quality Management (LAQM) Technical Guidance TG16<sup>58</sup>;
- Defra LAQM Policy Guidance (PG16) (April 2016) (referred to as 'Defra PG16 guidance')<sup>59</sup>;
- DMRB LA 105 Air Quality;
- IAQM and Environmental Protection UK (EPUK) guidance on land-use planning and development control<sup>60</sup>;
- Greater London Authority (GLA) Supplementary Planning Guidance on the Control of Dust and Emissions during Construction and Demolition<sup>61</sup>;
- IAQM guidance on the assessment of dust from demolition and construction;
- IAQM guidance on the assessment of mineral dust impacts for planning; and
- IAQM guidance on the assessment of air quality impacts on designated nature conservation sites<sup>62</sup>.

## Air quality standards

7.6.3 Air quality limit values and objectives are quality standards for clean air with the aim to protect human health and the natural environment. These limit values and objectives will be used as assessment criteria for determining the significance of any potential changes in local air quality resulting from the Proposed Scheme. Some pollutants have standards expressed as annual average concentrations and others have standards expressed as 24-hour, 1-hour

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<sup>55</sup> Directive 2008/50/EC of the European Parliament and of the Council of the 21 May 2008 on ambient air quality and cleaner air for Europe. Strasbourg, European Parliament and European Council.

<sup>56</sup> Department for Communities and Local Government (2019), National Planning Policy Framework. Available online at:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/779764/NPPF\\_Feb\\_2019\\_web.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf).

<sup>57</sup> Department for Communities and Local Government (2019), *National Planning Practice Guidance - Air Quality*.

<sup>58</sup> Department for Environment, Food and Rural Affairs (2018), *Local Air Quality Management Technical Guidance (TG16)*.

<sup>59</sup> Department for Environment, Food and Rural Affairs (2016), *Local Air Quality Management Policy Guidance (PG16)*.

<sup>60</sup> Institute of Air Quality Management (2017), *Land-Use Planning & Development Control: Planning for Air Quality*, v1.2.

<sup>61</sup> Greater London Authority (2014), *Supplementary Planning Guidance, Control of Dust and Emissions during Construction and Demolition*.

<sup>62</sup> Institute of Air Quality Management (2020), *A guide to the assessment of air quality impacts on designated nature conservation sites*, v1.1.

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or 15-minute average concentrations. Some pollutants have standards expressed in terms of both long-term and short-term concentrations.

- 7.6.4 Table 13 sets out the EU air quality limit values and UK national air quality objectives for the pollutants relevant to this study (NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>). In the ES, the term 'air quality standards' will be used to refer to both the English air quality objectives and the air quality limit values introduced in the UK based on EU Directives.

**Table 13 - UK and EU air quality standards**

Pollutant	Averaging period	Limit value / Objective
NO <sub>x</sub> (for protection of vegetation)	Annual mean	30µg/m <sup>3</sup>
NO <sub>2</sub>	Annual mean	40µg/m <sup>3</sup>
NO <sub>2</sub>	1 hour mean	200µg/m <sup>3</sup> not to be exceeded more than 18 times a year (99.8th percentile)
PM <sub>10</sub>	Annual mean	40µg/m <sup>3</sup>
PM <sub>10</sub>	24 hour mean	50µg/m <sup>3</sup> not to be exceeded more than 35 times a year (90.4th percentile)
PM <sub>2.5</sub>	Annual mean	25µg/m <sup>3</sup>

## Construction effects

### Dust emissions

- 7.6.5 The construction effects will be assessed through an investigation of potential sources of air pollutant emissions from construction activities and through the formulation of appropriate mitigation and control measures. An environmental risk assessment of construction effects will be carried out using the risk-based approach from the IAQM guidance, as described in the air quality Technical Note: Guidance on assessment methodology (Annex C).
- 7.6.6 An assessment of dust emissions associated with any mineral extraction activities will be carried out using the risk-based approach from the IAQM mineral dust guidance as described in the air quality Technical Note: Guidance on assessment methodology.
- 7.6.7 The assessment will identify where particular mitigation measures are required to address local issues. These mitigation measures will be detailed in the Local Environmental Management Plans being developed for each local authority area.

### Traffic emissions

- 7.6.8 With regard to assessment of the effects of emissions arising from changes in traffic flows during construction, traffic data will be screened using the criteria described in Section 7.5. Following this screening exercise, roads meeting any of these criteria would be subject to a detailed assessment using the atmospheric dispersion model ADMS-Roads to investigate the effects of changes in traffic flows. Dispersion modelling would use the latest vehicle emission data from Defra and take into account information in the National Atmospheric Emissions

Inventory (NAEI), as appropriate. Comparison of the results with and without the construction traffic and local diversions in the future years would allow the effect to be determined.

- 7.6.9 This assessment would comply with the requirements of Defra's LAQM Technical Guidance and would address the issues related to model verification and sensitivity analysis. This will only be considered in relation to areas where detailed air dispersion modelling is required, and it will not be necessary elsewhere on the route of the Proposed Scheme. The approach for assessing traffic emissions is further described in the air quality Technical Note: Guidance on the assessment methodology.

## **Rail emissions**

- 7.6.10 The Defra Technical Guidance TG16 includes guidance for local authorities on when and how emissions from moving and stationary diesel trains should be considered in relation to LAQM duties. In the absence of any other specific guidance, this will be used to inform the assessment of potential air quality impacts from construction related train operations. Defra's guidance addresses locations with relevant exposure where there is risk of exceedance of the short-term air quality standards for NO<sub>2</sub> and sulphur dioxide (SO<sub>2</sub>). Such locations are within 30m of railway tracks but only where the background annual mean NO<sub>2</sub> concentration is above 25µg/m<sup>3</sup> for moving diesel locomotives, and within 15m of diesel or steam locomotives that are stationary for periods of 15 minutes or more. In the context of the Proposed Scheme, these locations may occur in the vicinity of temporary construction sidings and railheads where diesel locomotives are used for construction related activities.

## **Operational effects**

- 7.6.11 Operational effects due to changes in traffic flows and diversion of traffic along the route of the Proposed Scheme and at off-route locations would be assessed using the methodology described in paragraph 7.6.8. The assessment of emissions from other sources, such as emissions from buildings, will be assessed using the ADMS dispersion model if a significant impact is expected. This is further described in the air quality Technical Note: Guidance on assessment methodology. An initial appraisal will be undertaken that will examine the magnitude and location of the emissions to determine the need for dispersion modelling.

## **Nitrogen deposition**

- 7.6.12 An assessment of nitrogen deposition near to sensitive sites will be undertaken for both the construction and operational assessments. Any changes in nitrogen deposition will be reported in terms of the percentage change relative to the critical load and level for ecosystem protection. Any potential impacts on ecological systems relating to air quality changes will be addressed in the ecological assessment, Section 10 (Ecology and biodiversity).

## **Cumulative effects**

- 7.6.13 Cumulative effects will be largely taken into account in the traffic data used for the assessment which will incorporate likely changes brought about by other proposed and committed developments both during and following construction. Where there is planned development that includes significant emissions to the atmosphere then these emissions would be included within the air quality modelling undertaken for the Proposed Scheme if these are likely to result in cumulative effects.
- 7.6.14 Where there is the potential for more than one site to contribute to construction dust impacts, the cumulative effects will be considered in the assessment.

## **7.7 Assumptions**

- 7.7.1 The air quality assessment assumes that details of construction activities will be available for the construction sites.
- 7.7.2 The air quality assessment will take into account HS2 Ltd's policies on vehicles emissions, i.e. the use of Euro VI HGVs and Euro 4/6 petrol/diesel cars and LGVs during construction of the Proposed Scheme.

## 8 Climate change

### 8.1 Introduction

**Table 14 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 8.3	Greenhouse gases – Introduction	Updated to reflect changed climate change policy in the UK.
Paragraph 8.4.7	Greenhouse gases - Assessment methodology	Updated temporal scope of the assessment.
Paragraph 8.5.6	In-combination climate change impacts – Introduction	Update to reflect completion of EU Adaptation Strategy.
Paragraph 8.5.9	In-combination climate change impacts – Introduction	Updated status of climate change allowances to be used in flood risk assessments.
Section 8.5	In-combination climate change impacts – Establishment of baseline	Amendments to section to reflect updated baseline methodology.
Section 8.5	In-combination climate change impacts – Technical scope	Updated to reflect climate trends used in the assessment.
Section 8.5	In-combination climate change impacts – Temporal scope	Update to temporal scope for the assessment.
Section 8.5	In-combination climate change impacts – Assessment methodology	Amendments to section to reflect updated assessment methodology.
Section 8.6	Climate change resilience – Establishment of baseline	Amendments to section to reflect updated baseline methodology.
Section 8.6	Climate change resilience – Technical scope	Updated to reflect climate parameters used in the assessment.
Section 8.6	Climate change resilience – Temporal scope	Update to temporal scope for the assessment.
Section 8.6	Climate change resilience – Assessment methodology	Amendments to section to reflect updated assessment methodology.

8.1.1 This section of the SMR addresses the scope and methodology for the three route-wide assessments to be undertaken within the climate change topic:

- the greenhouse gas (GHG) assessment;
- the in-combination climate change impacts assessment; and
- the climate change resilience assessment.

8.1.2 The GHG assessment relates to the effects of the Proposed Scheme on GHG emissions contributing to climate change. The in-combination climate change impacts assessment

relates to the combined effect of the impacts of the Proposed Scheme and potential climate change impacts on the receiving environment. In line with IEMA guidance<sup>63</sup>, the combined effect of the impacts of the Proposed Scheme and potential climate change impacts on the receiving environment are referred to as 'in-combination impacts' and 'in-combination effects'. This is distinct from uses of the terms 'combined effects' and 'cumulative effects' used elsewhere in the SMR. The climate change resilience assessment relates to the resilience of the Proposed Scheme to climate change impacts.

- 8.1.3 For purposes of clarity, this section addresses the three climate change topic assessments separately, except for the sub-section on stakeholder engagement and consultation processes.
- 8.1.4 As stated in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) Synthesis Report<sup>64</sup>, mitigation (i.e. reducing GHG emissions) and adaptation (i.e. responding to climate change impacts) are complementary approaches to reducing risks of climate change impacts over different timescales. Mitigation, in the short-term and medium-term, can substantially reduce climate change impacts in the latter decades of the 21st century. Benefits from adaptation can be realised now to address current risks and can be realised in the future to address emerging risks. Innovation and investments in environmentally sound infrastructure and technologies can both reduce GHG emissions and enhance resilience to climate change.
- 8.1.5 The climate change assessments rely on a range of forecasts and assumptions around future impacts and changes to the efficiency and emissions associated with a range of transport and manufacturing processes.

## 8.2 Consultation and engagement

### Engagement as part of the EIA process

- 8.2.1 Key stakeholder groups are to be included during the engagement and consultation process for the GHG assessment, the in-combination climate change impacts assessment and the climate change resilience assessment. The consultees will be identified according to the geographic scope and nature of the issues.

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<sup>63</sup> Institute of Environmental Management and Assessment (IEMA) (2020), *IEMA Environmental Impact Assessment Guide To Climate Change Resilience And Adaptation*. Available at: <https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020>.

<sup>64</sup> Intergovernmental Panel on Climate Change (2014), *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Available online at: [http://ar5-syr.ipcc.ch/topic\\_summary.php](http://ar5-syr.ipcc.ch/topic_summary.php).

8.2.2 The key stakeholder groups include:

- central government departments and agencies;
- non-governmental organisations;
- construction industry stakeholders; and
- rail industry stakeholders.

## 8.3 Greenhouse gases

### Introduction

- 8.3.1 This section of the SMR covers GHG which includes the environmental topic area of GHG emissions reported in the form of the 'carbon footprint'. A carbon footprint is the total GHG emissions associated with a particular scheme, policy or development. The GHG emissions are converted into tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) which standardises the global warming potential of the main GHG<sup>65</sup> into one index based on the global warming potential of carbon dioxide (CO<sub>2</sub>). Hereafter the term carbon is used to refer to the combined GHG emissions.
- 8.3.2 The Proposed Scheme will be assessed within the context of the UK's evolving carbon agenda. The Climate Change Act 2008 was updated in 2019, setting the UK carbon target to 'Net Zero', or a 100% reduction in GHG emissions by 2050<sup>66,67</sup>. To ensure that regular progress is made towards the target, the Climate Change Act established a system of carbon budgets. The first five carbon budgets, leading to 2032, have been set in law. Meeting the fourth (2023 - 2027) and fifth (2028 - 2032) carbon budgets will require that carbon emissions are reduced by 50% (by 2025) and 57% (by 2030) respectively relative to 1990 levels.
- 8.3.3 The Climate Change Committee has recommended that the UK Government set the sixth carbon budget<sup>68</sup> (covering the period 2033-37) at a level that will require a 78% reduction in carbon emissions (by 2035) relative to 1990 levels.
- 8.3.4 The GHG assessment will quantify and report – in the form of a 'carbon footprint' – the reasonable worst case scenario carbon emissions associated with the construction and operation of the Proposed Scheme. The carbon footprint will be reported in tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e). The Proposed Scheme's carbon footprint will be

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<sup>65</sup> The seven main GHGs are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>) according to the National Atmospheric Emissions Inventory, Overview of greenhouse gases. Available online at: <http://naei.defra.gov.uk/overview/ghg-overview>

<sup>66</sup> *Climate Change Act 2008 (c.27) (2050 Target Amendment)*. Her Majesty's Stationery Office, London.

<sup>67</sup> In Scotland the Net Zero target date is 2045.

<sup>68</sup> Committee on Climate Change (2020), *The Sixth Carbon Budget – The UK's path to Net Zero*. Available online at: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>.



compared to UK national and sector GHG emissions in order to provide context for the scale of the carbon footprint.

## **Establishment of baseline and definition of survey**

8.3.5 Scenarios of current and future baselines will be built on the work of the Sustainability Statement. The baseline GHG assessment will cover the following aspects:

- changing travel patterns and modal shift; and
- projected UK grid power carbon emissions.

8.3.6 Baseline transport data will be based on the latest PLANET Framework Model (PFM). The PFM transport model reports on travel patterns by mode (road and rail) on the route of the Proposed Scheme and will also consider air travel. Transport efficiency improvements over time will also be considered. The impact that the Proposed Scheme has on freight will be assessed separately.

## **8.4 Key aspects of the Proposed Scheme for the topic**

8.4.1 Key aspects of the Proposed Scheme for this topic include:

- earthworks – includes all excavated material, backfill volumes and any soil treated throughout the construction process. Carbon emissions will arise from the energy used by plant equipment in the extraction of material, as well as from logistical operations transporting material along the route of the Proposed Scheme;
- land use, land use change and forestry (LULUCF) – includes carbon emissions that are either captured or released, resulting from direct human-induced changes in land use during construction and operation;
- demolition – to accommodate the Proposed Scheme, demolition and re-development of sites (e.g. local businesses and residential properties) will be required. Carbon emissions associated with the transport of demolition waste will be included in the GHG assessment;
- construction – covers the embedded carbon of construction materials used in structures such as tunnels, bridges, viaducts, rail lines and supporting infrastructure. This will include the logistical impact of delivering materials to site and removal of waste from site. Depending on data availability, fuel used by plant equipment during construction (such as tunnel boring machines) will also be included;
- operation – covers energy consumption of infrastructure such as stations, depots, signalling, lighting and tunnel fans;
- rolling stock– energy use, and consequential GHG emissions, from the running of the trains will depend on, but not be limited to, the following factors: train weight, acceleration, traction efficiency, braking performance, regenerative braking, train

resistance, tunnel resistance aerodynamic factors, passenger loads and speed. The embedded impact of the rolling stock will also be included in the GHG assessment;

- maintenance – covers the day-to-day upkeep of the railway (track, bridges, tunnels etc.) as well as the trains. Maintenance activities, similar to construction, involve plant equipment, materials and transport;
- energy supply –the construction and operational assessment will take account of grid decarbonisation; and
- modal shift – this assessment will consider road, rail and air efficiency improvements likely to have occurred by the time the Proposed Scheme is in operation, as well as the likely impact on road, conventional rail and domestic air travel carbon emissions.

## Scope of GHG assessment

8.4.2 The scope of the GHG assessment is summarised in Table 15. Best practice criteria for the exclusion of inputs and outputs (cut-off rules) will be applied. Any application of the criteria for the exclusion of inputs and outputs will be documented.

**Table 15 - Scope of GHG assessment broken down by life cycle stages, consistent with the principles set out in BS EN 15978:2011 and PAS 2080:2016**

Life cycle assessment boundary stages	Description
Pre-construction stage (module A0)	Represents preliminary studies and works such as strategy and brief development, architecture, design efforts, EIA and cost planning. Most if not all these functions will be largely office based.  For example, GHG emissions associated with office energy use and consultants travel.
Product stage (modules A1 – A3)	Represents the embedded GHG emissions associated with the extraction, processing and manufacturing of the Proposed Scheme’s construction material for permanent assets. This includes all energy and GHG emissions from manufacturing plants, primary and secondary manufacturing stages as well as any transport emission between these stages.  For example, concrete manufacturing includes energy and GHG emissions linked to all key stages: quarrying, aggregate crushing, transport of aggregates to ready-mix concrete plants and asphalt plants. This final stage includes emissions associated with the adding of water and cement mixes.
Construction process - transport stage (module A4)	Represents transport related GHG emissions associated with the delivery of construction material, such as concrete and steel, and construction equipment to construction sites along the Proposed Scheme from the point of production (or point of storage in the case of plant and machinery).
Construction process –on-site stage (module A5)	Represents GHG emissions from construction site works activities including: 1. temporary works, ground works, and landscaping; 2. materials storage and any energy or otherwise need to maintain necessary environmental conditions; 3. transport of materials and equipment on site; 4. installation of materials and products into the infrastructure asset; 5. emissions associated with site water demand;

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Life cycle assessment boundary stages	Description
	<p>6. waste management activities (transport, processing, final disposal) associated with waste arising from the construction site;</p> <p>7. production, transportation, and waste management of materials/products lost during works; and</p> <p>8. GHG implications associated with land use change.</p>
Use stage – installed products and materials (module B1)	Represents the GHG emitted directly from the fabric of products and materials once they have been installed as part of the Proposed Scheme. Includes carbon sequestration from tree planting.
Use stage (modules B2 – B5)	Represents the GHG emissions resulting from activities of works and new materials for the maintenance, repair, replacement and refurbishment of the Proposed Scheme during the use stage/operation.
Use stage - operational energy (modules B6)	Represents the GHG emissions resulting from the energy used by the Proposed Scheme’s infrastructure and building-integrated systems (e.g. fans, pumps, lights), minus any electricity generated through on-site low carbon energy sources not exported to the grid.
Use stage - operational water (modules B7)	Represents the GHG emissions resulting from the provision of water required by the Proposed Scheme to enable it to operate and deliver its service. It will include all water used and its treatment (pre- and post-use) during the normal operation of the Proposed Scheme. For example this includes water used in the maintenance and cleaning of the rolling stock.
Use stage - other operational processes (module B8)	Represents other process GHG emissions arising from the Proposed Scheme to enable it to operate and deliver its service including management of operational waste.
Use stage – users utilisation (module B9)	Represents the GHG emissions associated with the operation of the rolling stock and un-regulated energy consumption not required for the technical and functional performance of the infrastructure (e.g. plug-in appliances, such as computers, refrigerators, audio, TV and production or process-related energy use).
End of life stage (module C1)	Represents the GHG emissions resulting from activities of deconstructing, demolishing and decommissioning the Proposed Scheme. Essentially these are on-site GHG emissions from plant equipment.
End of life stage (modules C2 – C4)	Represents the activities associated with transport, waste management and final disposal of materials associated with the site and materials of the Proposed Scheme.
Benefits and loads beyond the infrastructure life cycle (module D)	<p>Includes:</p> <ol style="list-style-type: none"> <li>1. avoided GHG emission impacts associated with the Proposed Scheme including potential for re-use, recovery and recycling of materials and/or energy beyond the system boundary;</li> <li>2. savings in GHG emissions from modal shift of passenger and freight journeys associated with the Proposed Scheme; and</li> <li>3. electricity and fuel use for surface access journeys to the Proposed Scheme.</li> </ol>

## Assessment methodology

- 8.4.3 Although there is no specific standard for reporting infrastructure GHG emissions in EIA, a variety of existing standards will be used to guide this assessment:
- the European Commission (EC) guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment<sup>69</sup>;
  - the Publicly Available Specification (PAS) 2080<sup>70</sup> on carbon management in infrastructure;
  - BS EN 15804<sup>71</sup> which outlines the requirement for quantifying and reporting emissions at a product level;
  - BS EN 15978<sup>72</sup> which outlines the calculation method to assess performance at the buildings level, based on life cycle assessment (LCA); and
  - IEMA's guide to assessing GHG emissions and evaluating their significance in EIA<sup>73</sup>.
- 8.4.4 The GHG assessment will use the guiding principles of existing standards and guidance. This will be supported by a combination of carbon modelling tools, lifecycle software, publicly available information including the University of Bath's Inventory of Carbon and Energy<sup>74</sup> on construction materials, and specific figures from environmental product declarations (EPDs).
- 8.4.5 Depending on data availability the reporting unit will be in tonnes of carbon dioxide equivalents (tCO<sub>2</sub>e) covering the seven main GHGs<sup>75</sup> listed by the Greenhouse Gas Protocol accounting standard<sup>76</sup>.
- 8.4.6 The approach used will be to:
- define carbon emission sources;
  - gather information and appropriate GHG coefficients; and
  - calculate carbon emissions.

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<sup>69</sup> European Commission (2013), *Integrating Climate Change and Biodiversity into Environmental Impact Assessment*. Available online at: <http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf>.

<sup>70</sup> British Standard Institute (2016), *PAS 2080:2016, Carbon management in infrastructure*.

<sup>71</sup> British Standard Institute (2013), *BS EN 15804+A1:2013. Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products*.

<sup>72</sup> British Standard Institute (2011), *BS EN 15978:2011. Sustainability of construction works – assessment of environmental performance of buildings – Calculation method*.

<sup>73</sup> Institute of Environmental Management and Assessment (2017), *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance*.

<sup>74</sup> Hammond, G.P. and Jones, C.I (2008), *Inventory of Carbon & Energy (ICE) Version 1.6a*, University of Bath, UK.

<sup>75</sup> Direct GHGs: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>).

<sup>76</sup> Greenhouse Gas Protocol (2013), *Required Greenhouse Gases in Inventories – Accounting and reporting standard amendment*. WRI and WBCSD, USA. Available online at: [http://www.ghgprotocol.org/sites/default/files/ghgp/standards\\_supporting/Required%20gases%20and%20GWP%20values\\_0.pdf](http://www.ghgprotocol.org/sites/default/files/ghgp/standards_supporting/Required%20gases%20and%20GWP%20values_0.pdf).

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- 8.4.7 The GHG assessment will report the carbon footprint from construction (start year 2025) and 120 years of operation to align with the assumed design life.
- 8.4.8 Construction related emissions will be based on the construction and logistics information for the Proposed Scheme. This includes information relating to specific design elements (such as viaducts or bridges) across the entire route in terms of:
- volume (m<sup>3</sup>) of construction materials;
  - type of construction material (e.g. concrete, imported fill, steel, gravel);
  - transport distances (km) of construction material; and
  - volume (m<sup>3</sup>) of waste generated (both construction and demolition).
- 8.4.9 The excavation and movement of excavated materials along the Proposed Scheme will be modelled separately. This assessment will provide volumes of materials along with distances travelled and modes of transport.
- 8.4.10 Data collection will capture the following information for design elements such as a viaduct or bridge:
- volume of materials;
  - life span of design element and replacement/ maintenance strategy where applicable;
  - GHG coefficients;
  - overall carbon emissions of each design element; and
  - functional units (e.g. tonnes of carbon dioxide CO<sub>2</sub>e per metre and year of design element) if available.
- 8.4.11 Construction site carbon emissions relating to fuel and energy use by plant equipment will be calculated using appropriate assumptions. These assumptions will consider carbon emissions associated with machinery and plant used.
- 8.4.12 Transport related carbon emissions will be based on the latest PFM transport model, and will include:
- conventional rail network: change in train movements on the conventional network as a result of uptake of services on the Proposed Scheme;
  - modal shift: transfers from domestic air trips to the Proposed Scheme; and
  - modal shift: transfer from road onto the Proposed Scheme.
- 8.4.13 The carbon benefits associated with the released capacity on the conventional network for freight transport will also be assessed.

## Assumptions

- 8.4.14 Predictions of future GHG emissions from the Proposed Scheme and for the baseline will be based on a range of assumptions, for example in relation to the future carbon footprints of power generation, and vehicle fleet mixes and efficiencies. In addition, a series of alternative future scenarios will be assessed in order to illustrate the sensitivity of the Proposed

Scheme's carbon footprint to these key assumptions; this assessment will be set out in the ES.

## 8.5 In-combination climate change impacts

### Introduction

- 8.5.1 These sections address the in-combination climate change impacts assessment, which assesses the combined effects of the impacts of the Proposed Scheme and potential climate change impacts on the receiving environment.
- 8.5.2 As part of the assessment, a review will be undertaken of the most recent climate change legislation, policy, best practice guidance, publicly available research and previous climate change impact and risk assessments for high-speed rail and major infrastructure projects. For example, infrastructure and other asset specific guidance including that published by Rail Safety Standards Board<sup>77</sup>, Network Rail<sup>78</sup> and the Cabinet Office<sup>79</sup> will be considered. This review will be relevant to both the in-combination and resilience assessments.
- 8.5.3 At present, no international legislation or policy framework exists that specifies the scope and methodology to be used as part of the in-combination climate change impacts assessment within the EIA process. However, there are several guidance reports that provide relevant background (see for example guidance by the Food and Agriculture Organisation<sup>80,81</sup> and the World Health Organization<sup>82</sup>).
- 8.5.4 The EIA Regulations 2017, which reflect the EIA Directive 2014<sup>83</sup>, identify the important role that the EIA process can play in assessing climate change impacts. They state that EIAs shall identify, describe and assess the direct and indirect significant effects of climate, and the risk of major accidents and/or disasters that are relevant to the project, including those caused

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<sup>77</sup> Rail Safety and Standards Board (2016), *Tomorrow's Railway and Climate Change Adaptation: Phase 1 Summary Report (T1009)*. Available online at: <https://www.rssb.co.uk/research-development-and-innovation/research-and-development/research-project-catalogue/t1009>.

<sup>78</sup> Network Rail (2017), *Climate change and weather resilience*. Available online at: <https://www.networkrail.co.uk/communities/environment/climate-change-weather-resilience/>.

<sup>79</sup> Cabinet Office (2011), *Keeping the country running: natural hazards and infrastructure*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/61342/natural-hazards-infrastructure.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61342/natural-hazards-infrastructure.pdf).

<sup>80</sup> Food and Agriculture Organization of the United Nations (2013), *Climate-smart agriculture sourcebook*. Available at: <http://www.fao.org/docrep/018/i3325e/i3325e.pdf>.

<sup>81</sup> Food and Agriculture Organization of the United Nations (2013), *Climate change guidelines for forest managers*. Available at: <http://www.fao.org/docrep/018/i3383e/i3383e00.htm>.

<sup>82</sup> The World Health Organisation (2016), *Climate change and health*. Available online at: <http://www.who.int/mediacentre/factsheets/fs266/en/>.

<sup>83</sup> *Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment*. Strasbourg, European Parliament and European Council.

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by climate change. The methodology for identifying and assessing the likely significant environmental effects that would arise from the Proposed Scheme if it were to be affected by a major accident or disaster is detailed in Section 16 of this SMR.

- 8.5.5 The EC guidance on Integrating Climate Change and Biodiversity into EIAs<sup>84</sup> carried out under the EIA Directive 2014, includes climate change and biodiversity related guidance for screening and scoping, analysing evolving baseline trends, identifying alternative and baseline measures, monitoring and adaptive management. There are also several publications by the EC addressing climate change impacts for EIA topics, such as agriculture, ecology and biodiversity, health, landscape and water. The publications provide background information on climate change impacts in Europe and suggest potential mitigation measures<sup>85,86,87,88</sup>.
- 8.5.6 The EC undertook an evaluation of the EU Adaptation Strategy, which was completed in November 2018. The evaluation found that the strategy has delivered on its objectives, with progress recorded against each of its individual actions, including ensuring more resilient infrastructure and encouraging all Member States to adopt comprehensive adaptation strategies<sup>89</sup>.
- 8.5.7 At a national level, the Climate Change Act 2008 requires the UK Government to undertake a national Climate Change Risk Assessment (CCRA) every five years. The second CCRA was published in 2017<sup>90</sup> and provides assessments of climate change risks for different sectors of society, including infrastructure, people and the built environment, natural environment and natural assets, business and industry as well as international dimensions and cross-cutting issues. The assessment builds upon the CCRA 2012<sup>91</sup> and aims to assess the urgency of further action to tackle different climate change risks for the UK, as well as realise potential opportunities. The most urgent climate change risks for the UK include flooding and coastal change risks; risks to health, well-being and productivity from high

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<sup>84</sup> European Commission (2013), *Integrating Climate Change and Biodiversity into Environmental Impact Assessment*. Available online at: <http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf>.

<sup>85</sup> European Commission (2009), *Human, Animal and Plant Health Impacts of Climate Change*. Available online at: [http://ec.europa.eu/health/climate\\_change/policy/index\\_en.htm](http://ec.europa.eu/health/climate_change/policy/index_en.htm).

<sup>86</sup> European Commission (2015), *EU Agriculture and Climate Change*. Available online at: [http://ec.europa.eu/agriculture/climate-change/factsheet\\_en.pdf](http://ec.europa.eu/agriculture/climate-change/factsheet_en.pdf).

<sup>87</sup> European Commission (2016), *Adapting the management of Water and Environmental Resources in response to Global Change*. Available online at: [http://ec.europa.eu/environment/water/adaptation/index\\_en.htm](http://ec.europa.eu/environment/water/adaptation/index_en.htm).

<sup>88</sup> VOS, C. et al. (2008), *Adapting landscapes to climate change: examples of climate-proof ecosystem networks and priority adaptation zones*. *Journal of Applied Ecology*. 45. 1722-1731.

<sup>89</sup> European Commission (2018) *Evaluation of the EU Strategy on adaptation to climate change*. Available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018SC0461>

<sup>90</sup> Committee on Climate Change (2017), *Progress in preparing for climate change*. Available online at: <https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/>.

<sup>91</sup> Department for Environment, Food and Rural Affairs (2012), *CCRA - UK Climate Change Risk Assessment 2012 - GA0204*. Available online at: <http://randd.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=15747>.



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temperatures; risks of shortages in the public water supply and for agriculture, energy generation and industry, risks to natural capital, including terrestrial, coastal marine and freshwater ecosystems, soils and biodiversity; risks to domestic and international food production and trade; and new and emerging pests and diseases and invasive non-native species, affecting people, plants and animals.

- 8.5.8 Following the CCRA 2012, the first National Adaptation Programme (NAP)<sup>92</sup> was published, detailing the Government's long term strategy to address the main climate change risks and opportunities for the UK. The NAP is published every 5 years and was last updated in 2018. The Climate Change Committee (CCC) and its Adaptation Sub-Committee conduct an independent assessment of progress by the NAP every two years<sup>93</sup>. These progress reports contribute towards the wider understanding of national climate change risks, including risks specific to the transport sector and rail infrastructure. Further national-level research specific to climate change and rail includes the RSSB project *Tomorrow's Railway and Climate Change Adaptation* (TRaCCA), which explores rail specific climate change impacts and discusses a range of adaptation approaches. Further understanding of UK climate change impacts can be obtained through the reports submitted under the UK Adaptation Reporting Power (ARP) in the first and second rounds of reporting<sup>94</sup>. Reports are produced by organisations with functions of a public nature and statutory undertakers and include the identification and examination of climate change impacts and risks relevant to water, agriculture and forestry, health and wellbeing, and the natural environment.
- 8.5.9 IEMA has published guidance on climate change resilience and adaptation<sup>63</sup> in response to the requirements specified in the EIA Directive 2014. This guidance provides an approach to undertaking assessments of in-combination climate change impacts and climate change resilience within the EIA process in the UK.
- 8.5.10 The Environment Agency provides guidance on climate change allowances to be used in flood risk assessments. This advice includes climate change allowances for peak river flow and peak rainfall intensity for flood risk assessments for different UK river basin districts, flood zones and land use sensitivities. Flood risk assessments for the Proposed Scheme will take account of the content of this guidance. These assessments will be reported in the ES within the water resources and flood risk sections of the community area reports with separate stand-alone flood risk assessments prepared for each community area. A route-wide assessment demonstrating alignment with NPPF policies will also be included in the

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<sup>92</sup> Department for Environment, Food and Rural Affairs (2013), *The National Adaptation Programme: Making the country resilient to a changing climate*. HM Government, London: The Stationery Office.

<sup>93</sup> Committee on Climate Change (2015), *Reducing emissions and preparing for climate change: 2015 Progress Report to Parliament*. Available at <https://www.theccc.org.uk/publication/reducing-emissions-and-preparing-for-climate-change-2015-progress-report-to-parliament/>.

<sup>94</sup> Department for Environment, Food and Rural Affairs (Defra) (2017), *Climate change adaptation reporting: second round reports*. Available at: <https://www.gov.uk/government/collections/climate-change-adaptation-reporting-second-round-reports>.

water resources and flood risk section of the ES. These assessments will inform the assessments undertaken by the climate change topic.

- 8.5.11 The approach and findings of the HS2 Phase 2a ES are a relevant starting point for the Proposed Scheme in-combination climate change impacts assessment. Volume 3, Section 4 and Volume 5 Appendix CL-002-000, published as part of the Phase 2a ES, include potential in-combination climate change impacts and existing mitigation measures which contribute to climate change resilience.

## **Establishment of baseline**

- 8.5.12 The term ‘baseline’ in this section refers to the description of current and future climate conditions that will inform the assessments of in-combination climate change impacts and climate change resilience. The term ‘future climate baseline’ is not to be confused with the EIA term ‘future predicted baseline’. Future climate baseline refers to the description of the climate in a future time period using climate change projections for climatic variables. Based on experience from Phase One and Phase 2a, climate change impacts on different receptors, in-combination with the impacts of the Proposed Scheme, are not expected to vary notably for the individual community areas, which comprise the proposed route. As such, the in-combination climate change impacts assessment will be route-wide and will be based on a range of current climate data and climate change projection data. Some climate projections are based on information taken across the whole route (i.e. projections for England’s climate). Some projections require more specific locations to be selected and will be sourced for locations along the route – namely Crewe at the southern end and Manchester at the northern end of the route. These locations are considered generally representative of the climate, within which the Proposed Scheme would be located.
- 8.5.13 The in-combination climate change impacts assessment has been informed by the UK Climate Projections 2018 (UKCP18), published in November 2018. These climate change projections have been used to inform the climate change trends used in the assessment for the Proposed Scheme. The format of the current and future climate baselines used for the assessment are determined by the outputs available from UKCP18.

## **Scope of in-combination climate change impacts assessment**

### **Technical scope**

- 8.5.14 The in-combination climate change impacts assessment covers all environmental topics assessed as part of the EIA.

- 8.5.15 The assessment is based on a range of climate trends, including:
- increase in mean, maximum, and minimum daily temperatures across all seasons;
  - increased frequency of heatwaves;
  - decreased frequency of cold weather events (e.g. snow and ice);
  - increased frequency of heavy rainfall events;
  - increased frequency of dry spells;
  - increased frequency of windstorm events in the second half of the 21st century;
  - decrease in relative humidity;
  - hotter and drier conditions in summer;
  - warmer and wetter conditions in winter;
  - changes in temperature and rainfall patterns; and
  - increased frequency of extreme weather events (e.g. dry spells, heavy rainfall events, heatwaves).
- 8.5.16 In addition to this section of the SMR, climate change may also be discussed within other individual topic sections of the SMR where relevant.

## **Spatial scope**

- 8.5.17 The in-combination climate change impacts assessment is a route-wide assessment, covering the entirety of the full Phase 2b scheme. The assessment will take into account the distances either side of the Proposed Scheme, within which other topics are undertaking their own assessment of effects. For example, the landscape topic is considering landscape character effects beyond the route corridor to the extent of the defined character area boundaries. The width of the survey corridor for the ecology and biodiversity topic will be defined by the potential area of ecological impact. This will vary depending on a number of factors, including the engineering of the route, the topography and ecological connectivity of the landscape, and the ecological receptor. In rural sections, the survey corridor for some species could extend up to 500m either side of the land required for construction; in urban sections, the survey corridor will, in general, be much narrower as the zone of impact will be more restricted.

## **Temporal scope**

- 8.5.18 Potential climate change impacts will be assessed for all topics for the construction phase and a 120-year operational life as per the climate resilience assessment.

## **Assessment methodology**

- 8.5.19 The potential climate change impacts relevant to the Proposed Scheme will be considered at the route-wide level for each topic, across all community areas of the Proposed Scheme. The in-combination climate change impacts assessment will include all environmental topics and

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will be carried out by the climate change topic with input from topic specialists. The assessment will be informed by climate change projections for the Proposed Scheme, recent and relevant science, policy and guidance for each topic, and the initial assessment results from all topics' community area (Volume 2) and route-wide (Volume 3) assessments.

- 8.5.20 In addition to the review of documents included in the introduction to Section 8.4, a review will be undertaken as part of the initial assessment of the most recent, publicly available research, evidence and technical knowledge as well as existing legislation and guidance. Relevant European, national and local policies and guidance on climate change impacts, adaptation and resilience will be identified and referenced for each environmental topic, where applicable. For example, topic specific guidance published by the Food and Agriculture Organisation<sup>95</sup>, the Woodland Trust<sup>96</sup>, the Forestry Commission<sup>97</sup>, the Landscape Institute<sup>98</sup>, Public Health England<sup>99</sup> and Defra<sup>100</sup> will be considered.
- 8.5.21 Climate change science is an evolving field of enquiry, and the integration of potential climate change impacts into the EIA process is still a relatively new approach. For many environmental topics, the evidence base is growing but not definitive, or there is insufficiently detailed evidence available at the local level. Conversely, for some environmental topics such as water resources and flood risk there is a relative abundance of evidence and guidance. Thus, it may be difficult to achieve a consistent level of detail in the in-combination climate change impacts assessment for all topics in line with the established EIA methodologies.
- 8.5.22 Following consideration of potential climate change impacts that are relevant to a particular topic, informed professional judgement will be used by topic experts and the climate change topic team to produce high level, qualitative statements about potential topic-specific impacts resulting from projected climate change (i.e. changes and trends in climate averages and extreme weather events), informed professional judgement will be used by topic experts to produce high level, qualitative statements about potential topic-specific impacts resulting from projected climate change (i.e. changes and trends in climate averages and

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<sup>95</sup> Food and Agriculture Organization of the United Nations (2017), *Strengthening Sector Policies for Better Food Security and Nutrition Results*. Available online at: <http://www.fao.org/3/a-i7217e.pdf>.

<sup>96</sup> Woodland Trust (2015), *Climate change - the Woodland Trust's position*. Available online at: <https://www.woodlandtrust.org.uk/publications/2015/06/climate-change/>.

<sup>97</sup> Forestry Commission (2016), *Forests and climate change*. Available online at: <https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2016-introduction/sources/uk-forests-and-climate-change/>.

<sup>98</sup> Landscape Institute (2008), *Landscape architecture and the challenge of climate change*. Available online at: <https://www.landscapeinstitute.org/publication/landscape-architecture-and-the-challenge-of-climate-change-2008/>.

<sup>99</sup> Health Protection Agency (2012), *Health Effects of Climate Change in the UK*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/371103/Health\\_Effects\\_of\\_Climate\\_Change\\_in\\_the\\_UK\\_2012\\_V13\\_with\\_cover\\_accessible.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/371103/Health_Effects_of_Climate_Change_in_the_UK_2012_V13_with_cover_accessible.pdf).

<sup>100</sup> Department for Environment, Food and Rural Affairs (2011), *The England Biodiversity Strategy*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69446/pb13583-biodiversity-strategy-2020-111111.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69446/pb13583-biodiversity-strategy-2020-111111.pdf).

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extreme weather events) for receptors and resources in the area surrounding the Proposed Scheme. These high level, qualitative statements will include recommendations of any mitigation measures necessary to increase the ability of resources and receptors to adapt to climate change beyond those already suggested by each environmental topic. Additionally, allowances for future measures and monitoring to ensure the continued resilience of receptors and resources will also be considered.

8.5.23 Criteria that will be used to complete the initial in-combination climate change impacts assessment are set out in the bullet points below. The assessment will also include any topic specific references identified in addition to those listed in the legal and policy framework section above. These will be considered together with the climate change projections and informed professional judgement for each topic to complete the assessment. The results of the initial in-combination climate change impacts assessment will be presented in a summary table for each EIA topic in the route-wide assessment with the following general headings:

- resources/receptors potentially impacted by the Proposed Scheme;
- effects of Proposed Scheme on receptors/resources identified by topic;
- existing or embedded mitigation measures for these effects;
- potential climate change trend;
- potential for climate change to increase the significance of the residual effect; and
- additional mitigation or monitoring required to address adverse effects.

8.5.24 For any in-combination climate impacts that have been identified as having the potential to increase the significance of the residual effect, additional mitigation measures will be suggested and discussed with the topic team. Wherever possible, these additional mitigation measures will become embedded mitigation measures in order to ensure that climate change does not increase the significance of the residual effect.

8.5.25 In cases where no additional mitigation is identified, or even with additional mitigation it is considered that climate change is likely to increase the significance of the residual effect, these in-combination climate impacts will be reported in Volume 3 of the Environmental Statement.

## Construction effects

8.5.26 The effects of the Proposed Scheme will be assessed for the construction phase, including an assessment of potential in-combination climate change impacts.

## Operational effects

8.5.27 The effects of the Proposed Scheme will be assessed for the operational phase, including an assessment of potential in-combination climate change impacts.

## Mitigation measures

- 8.5.28 If existing mitigation measures<sup>101</sup> are considered insufficient to address the ability of resources and receptors to adapt, then additional mitigation measures will be developed by the climate change topic specialists in collaboration with the environmental topic specialists.

## Monitoring

- 8.5.29 Allowances for future measures and monitoring to ensure the continued resilience of receptors and resources will also be identified.

# 8.6 Climate change resilience

## Introduction

- 8.6.1 These sections address the climate change resilience assessment of the Proposed Scheme.
- 8.6.2 As for the in-combination climate change impacts assessment, a review will be undertaken of the most recent climate legislation, policy, best practice guidance, publicly available research and previous climate change impact and risk assessments for high speed rail and major infrastructure projects.
- 8.6.3 Currently there is no international legislation or policy framework in place to guide the climate change resilience assessment of transport infrastructure. Several guidance reports provide relevant background information, for example the UN and the United States have explored the impact of climate change on transport infrastructure and railways<sup>102,103</sup>.
- 8.6.4 Similarly, at European and national level most legislation and policy framework relevant for the in-combination climate change impacts assessment is also relevant for the climate change resilience assessment.
- 8.6.5 The EIA Directive 2014 states that the vulnerability of projects to climate change needs to be assessed within the EIA process. The EC guidance on Integrating Climate Change and Biodiversity into EIA<sup>104</sup> recommends that alternatives and measures are considered at the planning stage to ensure, amongst other things, that projects are resilient to the impacts of climate change. It highlights a shift in thinking to account for possible long term risks within

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<sup>101</sup> Existing mitigation measures refers to embedded design mitigation measures and environmental mitigation measures identified by topics as part of their assessments.

<sup>102</sup> National Climate Assessment (2014), *Climate Change Impacts in the United States* - Chapter 5: Transportation.

<sup>103</sup> United Nations Economic Commission for Europe (2013), *Climate Change Impacts and Adaptation for International Transport Networks*.

<sup>104</sup> European Commission (2013), *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*. European Union Publications Office. Available online at: <http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf>.

environmental assessments, and the role of resilience in this shift. The EIA process is well placed to aid this progression, showing how a changing baseline can affect a project over time.

- 8.6.6 The EC has also released sector specific guidance<sup>105</sup> on the interface between climate change and infrastructure, including projected impacts and resilience levels. This document accompanies the Communication: An EU strategy for adaptation to climate change<sup>106</sup> and provides further background material supportive of the narrative and arguments put forward in the Communication. This working document also presents, for some areas, an outline of actions that the Commission will be undertaking, as announced in the Communication.
- 8.6.7 As for the in-combination climate change impacts assessment, the following sources provide relevant background information and context at the national level:
- the IEMA guidance on climate change resilience and adaptation<sup>63</sup> provides an approach to incorporating climate change resilience assessments into the EIA process in the UK;
  - relevant reports submitted under the UK ARP in the first and second rounds of reporting<sup>107</sup> (for example, Network Rail, National Grid, and Highways England); and
  - the guidance on climate change allowances published by the Environment Agency, which will be used in the flood risk assessment for the Proposed Scheme.
- 8.6.8 The approach and findings of the HS2 Phase 2a ES are a relevant starting point for the Proposed Scheme climate change resilience assessment. Volume 5 Appendix CL-002-000, published as part of the Phase 2a ES, includes potential climate change risks and existing mitigation measures which contribute to climate change resilience. Further work on the design of HS2 Phase 2a also provides useful additional information for the Proposed Scheme climate change resilience assessment.

## Establishment of baseline

- 8.6.9 The environmental baseline for the climate change resilience assessment will be the same as the baseline defined for the in-combination climate change impacts assessment. It will be based upon current and future climate data available for locations along the route – including Crewe at the southern end and Manchester at the northern end of the route.

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<sup>105</sup> European Commission (2013), *Adapting Infrastructure to Climate Change- Communication from the commission to the European Parliament, the council, the European economic and social committee and the committee of the regions: An EU Strategy on Adaptation to Climate Change*. Available online at: [https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/swd\\_2013\\_137\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/swd_2013_137_en.pdf).

<sup>106</sup> European Commission (2013), *An EU strategy for adaptation to climate change*. Available online at: [https://ec.europa.eu/clima/sites/clima/files/docs/eu\\_strategy\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/docs/eu_strategy_en.pdf).

<sup>107</sup> Department for Environment, Food and Rural Affairs (Defra) (2017), *Climate change adaptation reporting: second round reports*. Available online at: <https://www.gov.uk/government/collections/climate-change-adaptation-reporting-second-round-reports>.



- 8.6.10 Similarly to the in-combination climate change impacts assessment, the climate change resilience assessment will be informed by the UKCP18, published in November 2018.
- 8.6.11 The format of the current and future climate baselines used for the assessment are determined by the outputs available from UKCP18.

## **Scope of climate change resilience assessment**

### **Technical scope**

- 8.6.12 The climate change resilience assessment covers the major asset groups designed as part of the Proposed Scheme.
- 8.6.13 The assessment is based on a range of climate trends, including:
- increase in mean temperature across all seasons;
  - increase in mean daily maximum temperature;
  - increased frequency of heatwaves;
  - decreased frequency of cold weather events (e.g. snow and ice);
  - increase in mean winter rainfall;
  - increased frequency of heavy rainfall events;
  - decrease in mean summer rainfall;
  - increased frequency of dry spells;
  - increased frequency of windstorm events in the second half of the 21st century;
  - increased frequency of lightning events in the second half of the 21st century;
  - decrease in relative humidity;
  - decreased frequency of fog events in the second half of the 21st century; and
  - increase in mean and maximum sea levels.

### **Spatial scope**

- 8.6.14 The climate change resilience assessment is a route-wide assessment, covering the entirety of the Proposed Scheme.

### **Temporal scope**

- 8.6.15 Climate change resilience will be assessed for the construction phase and a 120-year operational life.

## **Assessment methodology**

- 8.6.16 As for the in-combination climate change impacts assessment, the integration of the climate change resilience assessment into the EIA process is still a relatively new approach. For transport infrastructure and assets, the evidence base is growing but not definitive, or there

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is insufficiently detailed evidence available for specific assets. Conversely, for some engineering and design disciplines, such as flood risk engineering, there is a relative abundance of evidence and guidance.

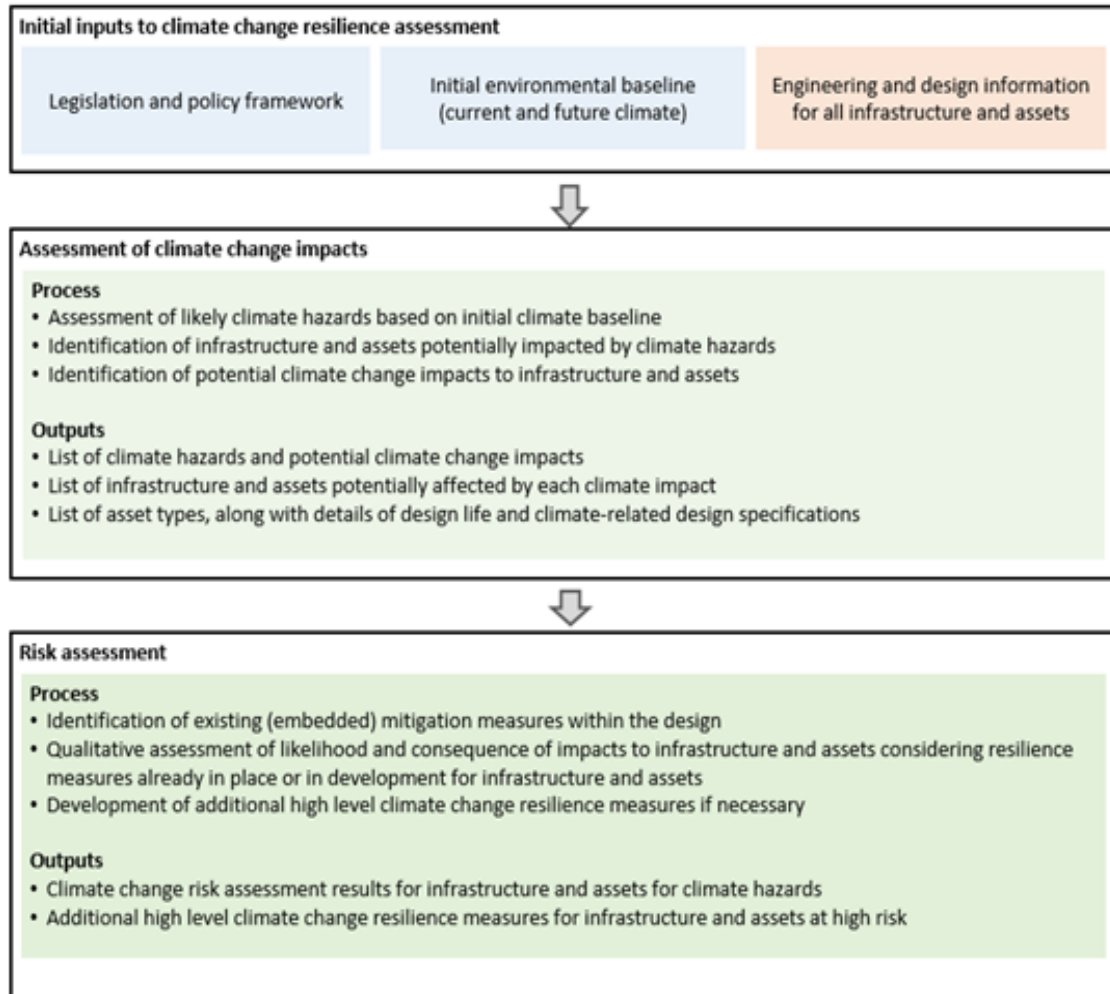
- 8.6.17 The potential climate change impacts will be considered at the route-wide level for each major asset group associated with the Proposed Scheme. Potential weather-related impacts will be identified through a high-level review of relevant literature and technical documentation, and along with future climate baselines, consideration will be given as to how these might change during the construction phase and the operational life of the Proposed Scheme. In the case of flood risk, more detailed planning requirements and design guidance relating to climate change exists. Therefore, an assessment of climate change impacts on flood risk will be carried out within the water resources and flood risk topic assessment at the route-wide and site-specific levels taking into account Environment Agency climate change allowances for increases in peak river flow and rainfall intensity.
- 8.6.18 In order to develop an understanding of the embedded resilience of the Proposed Scheme, the assessment will consider relevant technical documentation and design codes and standards. In addition, any existing resilience measures for each impact, either already in place or in development, for infrastructure and assets will be explored via engagement with relevant asset design engineers and included in the assessment.
- 8.6.19 Figure 6 illustrates the general process of the climate change resilience assessment.

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Figure 6 - Approach to the climate change resilience assessment



8.6.20 The risk and resilience assessment will be based on the likelihood of a hazard having an impact on the Proposed Scheme and the consequence of the impact. The definitions of these terms can be summarised as follows:

- a hazard is an effect of a changing climate, which has the potential to do harm to the infrastructure and assets associated with the Proposed Scheme;
- an impact can be any damage to the infrastructure or assets or an interference with their ability to operate - an impact can be direct, for example flooding of the infrastructure or assets, or indirect, for example heat exhaustion of workers;
- consequence is considered to be a degree of disruption to services; and
- risk is the combination of likelihood of a hazard having an impact on infrastructure assets, taking into account mitigation measures, and the potential consequence resulting from this impact.

## **Risk assessment**

- 8.6.21 The risk assessment will consider the likelihood of a hazard occurring and the consequences of the respective impact on the infrastructure and assets of the Proposed Scheme (major accidents and disasters are considered further in Section 16).
- 8.6.22 The potential likelihood and consequence of impacts to the infrastructure and assets associated with the Proposed Scheme will be scored using a qualitative scale, such as:
- likelihood –likely, possible, unlikely; and
  - consequence of impact – very high, high, medium, low, very low.
- 8.6.23 The resulting risk level could be scored as either high, medium or low.

## **Mitigation measures**

- 8.6.24 The assessment of likelihood and consequence of impact will consider mitigation and resilience measures already in place or in development for infrastructure and assets. Following consideration of potential climate change impacts, informed professional judgement will be used by engineering and design experts to produce high level, qualitative statements about potential infrastructure and asset specific climate change impacts and risks.
- 8.6.25 The risk assessment will identify the need for any additional resilience measures to protect against the effects of climate change, based on those risks assessed as scoring 'high'. High level resilience measures will be designed as part of workshops and focus groups with key engineering and design experts.
- 8.6.26 This level of risk assessment is considered appropriate for the interim preliminary design stage, and may be developed further during future design, construction and operation stages. The assessment will identify where this is the case and will include details in the assessment results.

## **Monitoring**

- 8.6.27 Appropriate weather and climate change resilience monitoring measures will be identified.

## 9 Community

### 9.1 Introduction

**Table 16 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraphs 9.2.2, 9.2.3	Characteristics of communities	Section updated to reflect the Proposed Scheme being the Phase 2b Western Leg. Minor changes to key community characteristics which inform judgement of importance for the purpose of the assessment.
Paragraph 9.3.3	Engagement as part of the EIA process.	Additional bullet point covering owners and operators of community resources.
Paragraph 9.5.3	Temporal scope	Updated to reflect revised dates for construction and operational period.
Paragraph 9.6.15	Cumulative effects	Minor changes to definition of 'community-wide effects'.

- 9.1.1 This section of the SMR covers community which includes the assessment of impacts and effects on residential property and community infrastructure/organisations.
- 9.1.2 Impacts relevant to the community assessment fall broadly within the following categories:
- demolition/construction, direct land required and impacts on property; and
  - intrusion/disturbance to communities and community facilities caused by other environmental impacts.
- 9.1.3 Community resources and receptors are set out in the following sections against the themes of residential property and community infrastructure.

### Residential property

- 9.1.4 This will include private, rented and shared ownership residential dwellings and their surrounding grounds/gardens, student accommodation, extra care/retirement housing, mobile homes (where there are established and recognised locations) and homes used in conjunction with a business or other function.
- 9.1.5 Receptors include the residents or tenants of properties. They also include employees who permanently reside in a residential property, for example, care givers and janitors.
- 9.1.6 Impacts on commercial and industrial property will be addressed as part of the socio-economic assessment within the ES. Impacts on farms and farm-based enterprises will be addressed as part of the agriculture, forestry and soils assessment within the ES.

## **Community infrastructure/organisations**

- 9.1.7 This will include community facilities and infrastructure such as education, health, emergency services, places of worship, sports and recreational facilities, publicly accessible open spaces and recreational public rights of way (PRoW).
- 9.1.8 Receptors include users and beneficiaries of resources which can include local residents, organised (community) groups, pupils, patients, congregations and employees who use community infrastructure. Receptors also include owners and organisations running the resources.

## **9.2 Establishment of baseline and definition of survey**

### **Characteristics of communities**

- 9.2.1 The potential for adverse impacts on communities has influenced the development of the Proposed Scheme.
- 9.2.2 Nevertheless, the proposed route passes through, and potentially affects, a diverse range of communities and people. The main centres of population are Crewe and Greater Manchester, but the route will pass close to a variety of settlements, including towns, villages, hamlets and isolated farmsteads in the countryside.
- 9.2.3 The key community characteristics of relevance include:
- their physical layout, accessibility and scale (e.g. in relation to land required, demolitions and severance);
  - the location, type and use of community facilities; and
  - their demographic profile (including the incidence of deprivation).

### **Baseline data and methods**

- 9.2.4 The baseline will include data collected on both resources and receptors.
- 9.2.5 Potential resources include:
- community infrastructure, including education, health, emergency services, community halls and places of worship;
  - recreation infrastructure, including entertainment facilities, sports facilities, and other leisure activities;
  - publicly accessible open space;
  - residential properties (in terms of their occupation and amenity); and
  - recreational PRoW.

9.2.6 Receptors include:

- individuals using community resources;
- residents;
- community groups;
- owners and organisations with interests in the community resources; and
- local communities as a whole.

9.2.7 Information on resources and receptors to inform the assessment will be drawn from a variety of sources that include:

- data collected during the preparation of the Sustainability Statement, supplemented and updated as appropriate;
- relevant national datasets such as: Index of Multiple Deprivation Access Domain; Census data; Office of National Statistics Neighbourhood Statistics; Sport England's participation dataset; Land Registry information; Valuation Office Agency information; and Yellow Pages and/or similar data sets on local facilities;
- existing local studies and information such as: open space surveys; land-use surveys; housing needs surveys; user surveys; membership lists; registered users;
- analysis and data from relevant topics such as: air quality (Section 7); health (Section 12); landscape and visual (Section 15); socio-economics (Section 17); sound, noise and vibration (Section 18); and traffic and transport (Section 19); and
- new field surveys where appropriate, for example, relating to publicly accessible open spaces and recreational PRoW.

9.2.8 The information collected on community resources and receptors, drawing on the above sources, will be limited by the extent of publicly available data and data obtained through consultation and engagement with communities.

## 9.3 Consultation and engagement

### Engagement as part of the EIA process

9.3.1 In accordance with the consultation and engagement process set out in Section 3, further engagement with relevant organisations and communities will be carried out as part of the assessment. Engagement will be appropriate to each organisation.

9.3.2 Relevant organisations include:

- national government departments and statutory organisations;
- local government including local authorities, combined authorities and parish councils on the line of route of the Proposed Scheme;



- non-governmental organisations including relevant voluntary and community sector organisations and other special interest groups; and
- owners and operators of community resources impacted by the Proposed Scheme.

9.3.3 Stakeholders will also be able to respond to consultation as part of a coordinated EIA approach.

## 9.4 Key aspects of the Proposed Scheme for the topic

9.4.1 The assessment of community effects will consider impacts and effects during both construction and operation of the Proposed Scheme. Impacts can generate the following broadly defined effects on receptors and resources:

- loss or gain: a loss or gain to a resource or receptor. For example, a decrease in housing stock as a result of demolitions;
- displacement: the re-location of receptors and resources from one location to another within the study area. For example, people moved from their homes to replacement homes permanently or temporarily;
- in-combination effects: amenity value relates to the enjoyment of a resource by a receptor. The amenity value that resources offer receptors may be affected by a combination of factors including noise and vibration; HGV traffic; air quality; and visual impacts. The assessment of in-combination effects on community receptors will draw on the conclusions from other assessment topics taking into account professional judgement about the sensitivity of the individual resource or receptors to the predicted effects; and
- isolation: in the context of this assessment isolation is to be measured by the barriers local communities face in making their usual journeys. This includes physical, psychological and social barriers (i.e. non-economic) and the effects of this on local communities. Isolation of commercial and industrial buildings and land, and severance of agricultural property and land, are addressed within the scope of assessments presented in Section 6 (Agriculture, forestry and soils) and Section 17 (Socio-economics).

9.4.2 Integrated working between the EIA community, socio-economic and health assessments and the Equality Impact Assessment (EQIA) will ensure that the assessment methodologies are aligned through:

- establishment of a consistent baseline for the community areas that will meet the requirements for these disciplines; and
- ensuring relevant significant community effects are taken into account as part of the health assessment and the EQIA.

## 9.5 Scope of assessment

9.5.1 The scope for the community assessment draws on the experience and good practice from similar infrastructure projects elsewhere (including Phase One and Phase 2a) and professional judgment of a suitably qualified EIA practitioner.

### Spatial and technical scope

9.5.2 The proposed spatial scope is summarised in Table 17. This scope will be refined as the assessment proceeds (e.g. to ensure consistency with other environmental topics).

**Table 17 - Impacts and effects on resources and receptors and spatial scope**

Resource	Impacts	Effects: Resources	Effects: Receptors	Spatial scope
Residential property	Residential property (including gardens) lost to land requirement	Reduction in housing stock available for people	Displacement of home owners/tenants, inconvenience and loss of their assets	Direct land required by HS2 either for the Proposed Scheme itself or for construction
	In-combination effects of noise and vibration, HGV traffic, air quality and visual impacting on residents <sup>108</sup>	Character or quality of residential properties change as a result, for example due to noise and vibration; HGV traffic; reduction in air quality; visual impacts	Receptors' enjoyment of resource is changed	Relevant impact area from the edge of the route of the Proposed Scheme is a minimum of 250m in both urban and rural areas unless subsequent analysis from other topic areas suggests a greater or lesser extent at specific locations
	Isolation of residential properties from other residential properties and community resources	Visual or physical e.g. islanding or isolation of resource	Reduction in social interaction and/or reduced access to neighbours or community facilities	Anticipated to cover some households up to 1km from the route and construction sites and depending upon specific context and proposals <sup>109</sup>

<sup>108</sup> Noise and vibration; HGV traffic, vibration, pollution, air quality and visuals significant effects have been identified for the in-combination assessment as it is those effects which are most likely to potentially contribute to a change of amenity value of residential property and community infrastructure operations.

<sup>109</sup> The distance of the diversion and duration are factors in determining whether or not there is an impact.

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Resource	Impacts	Effects: Resources	Effects: Receptors	Spatial scope
Community organisations, recreation infrastructure and open/play space	Community resources lost to land requirement	Decline in facilities available for community use or temporary impairment of use	Loss of facilities and benefits for users, workers owners, and groups/organisations	Direct land required by the Proposed Scheme
	Presence of construction workers with consequent requirements for use of community resources or services	Increased demand from construction workers on local community facilities or services	Reduced availability of local resources or services for existing users	Distance to relevant community resources and services likely to be used by construction workers
	In-combination effects of noise and vibration, HGV traffic, air quality and visual impacting on community infrastructure operations <sup>110</sup>	Character or quality of cities/towns/ neighbourhoods changes as a result of noise and vibration; HGV traffic; reduction in air quality; visual impacts	Receptors' enjoyment of resource is changed	Relevant impact area from the edge of the route of the Proposed Scheme is a minimum of 250m in urban and rural areas unless subsequent analysis from other topic areas suggests a greater or lesser extent at specific locations
	Isolation of community resources from users	Visual or physical e.g. islanding or isolation of resource	Reduced access to community resources or effect on use of resources	Catchment area of affected resource where it is subject to isolation <sup>111</sup>

## Temporal scope

9.5.3 The temporal scope for this topic is outlined in Section 4.2 (Scope of the assessment). Community effects will be assessed for the construction period (including a period of commissioning) (2025 to 2038) and for the year of opening in 2038. However, the assessment will also need to reflect the temporal scope of other topic assessments such as Air quality (Section 7); Landscape and visual (Section 15); Sound, noise and vibration (Section 18) and Traffic and transport (Section 19).

<sup>110</sup> Noise and vibration, HGV traffic, air quality and visuals significant effects have been identified for the in-combination assessment as it is those effects which are most likely to potentially contribute to a change of amenity value of residential property and community infrastructure operations.

<sup>111</sup> The distance of the diversion and duration are factors in determining whether or not there is an impact.

## 9.6 Assessment methodology

9.6.1 There are no industry-wide accepted methods for assessing community effects for projects of this nature. Methods have been developed for predicting and assessing effects which draw on existing guidance, analysis and methods established for other railway and large infrastructure projects including Phase One and Phase 2a of HS2.

### Legislation and guidance

9.6.2 Guidance which has informed the methodology for the Community assessment includes:

- Highways Agency (2009) Design Manual for Bridges and Roads: Volume 11 Environmental Assessment<sup>112</sup> and Highways England Interim Advice Notes<sup>113</sup>; and
- industry accepted practice from other major infrastructure project EIAs, for example Phase One and Phase 2a, Crossrail and Thames Tideway Tunnel.

### Significance criteria

9.6.3 The significance of a community effect will be determined by assessing both the:

- magnitude of the impact; and
- the sensitivity of the community resources or receptors.

### Determining magnitude of impacts

9.6.4 To determine the magnitude of impact, the nature of the impact (beneficial or adverse) and characteristics (i.e. whether direct or indirect, secondary, cumulative, short or long-term, permanent or temporary, reversible or irreversible) will be assessed and classified as high, medium, low or negligible.

9.6.5 The magnitude of an impact is its severity or scale. The magnitude of an impact on a resource or receptor reflects consideration of information and analysis relating to the spatial extent (localised/isolated versus widespread with potential secondary effects); the extent (number of groups and/or people or households affected); and the duration (short, medium and long-term).

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<sup>112</sup> Highways Agency (2009), *Design Manual for Roads and Bridges: Volume 11*. London: The Stationery Office. Available online at: <http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/index.htm> (now withdrawn). It is considered that this remains an appropriate basis for the Community assessment and retains consistency with HS2 Phase One and Phase 2a.

<sup>113</sup> Standards for Highways available (now withdrawn or superseded) online at: <https://www.standardsforhighways.co.uk/ha/standards/ians/index.htm>.

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9.6.6 Guideline criteria have been established based on professional judgment and are presented in Table 18. Specific magnitude criteria are included in the Technical Note: Community assessment (provided in Annex D).

**Table 18 - Community impact magnitude criteria**

Impact magnitude	Definition
High	An impact that will be very adverse/beneficial, and very likely to affect large numbers of groups and/or people (with number depending on the local context and nature of the impact), and that will usually continue and effectively constitute long-term impact on the baseline conditions
Medium	An impact that is likely to affect a moderate number of groups and/or people (with the number depending on the local context and nature of the impact)
Low	An impact that is likely to affect a small number of groups and/or people (with number depending on the local context and nature of the impact) and/or the base case is not affected beyond a short or medium-term duration
Negligible	An impact that is temporary in nature and/or is anticipated to have a slight or no effect on the well-being of groups and/or people

## Determining receptor sensitivity

9.6.7 The sensitivity of receptors (people) will be determined by the extent to which individuals have the capacity to experience the effect without a significant loss or gain. This will, in part, be related to the sensitivity of the community resource(s) affected in terms of their importance, scarcity and size. Sensitivity will be classified as high, medium or low.

9.6.8 Guideline criteria have been established using professional judgment to determine the sensitivity of the receptors. These are presented in Table 19. Specific sensitivity criteria are included in the Technical Note: Community assessment, provided in Annex D.

**Table 19 - Community receptor value/sensitivity criteria**

Receptor value and/or sensitivity	Definition
High	Individuals or groups that have little or no capacity to experience the impact without incurring a significant effect
Medium	Individuals or groups that have a limited or average capacity to experience the impact without incurring a significant effect
Low	Individuals or groups that generally have adequate capacity to experience impacts without incurring a significant effect

## Determining the significance of effects

9.6.9 The significance of a community effect is a product of the magnitude of the impact and the sensitivity of the receptor and will be determined based on professional judgement.

9.6.10 The approach to determining the significance of community effects is summarised in Table 20.

**Table 20 - Community - significance of effect criteria**

Significance		Impact magnitude			
		High	Medium	Low	Negligible
Sensitivity of receptor	High	Major adverse /beneficial - significant	Major adverse /beneficial - significant	Moderate adverse /beneficial – significant	Minor adverse /beneficial - not significant
	Medium	Major adverse /beneficial - significant	Moderate adverse /beneficial - significant	Minor adverse /beneficial - not significant	Negligible - not significant
	Low	Moderate adverse/beneficial – significant	Minor adverse/beneficial - not significant	Negligible - not significant	Negligible - not significant

9.6.11 Effects are considered to be major and significant if both impact magnitude and receptor sensitivity are high or medium. Effects are considered to be moderate and significant if impact magnitude is high and receptor sensitivity is low, or alternatively if receptor sensitivity is high and impact magnitude is low.

9.6.12 Other effects, equating to minor adverse/beneficial and negligible effects, are not considered to be significant.

## Construction effects

9.6.13 Construction effects will be assessed following the general EIA assessment process including:

- establishment of the baseline with definition and collection of relevant data and information as outlined in Section 9.2 (establishment of baseline and definition of survey);
- consultations including those outlined in Section 9.3 (consultation and engagement); and
- assessment of impacts and effects against key aspects of the Proposed Scheme as outlined in Section 9.4 (key aspects of the Proposed Scheme for the topic), covering the scope outlined in Section 9.5 (scope of assessment) and using the significance criteria outlined in this section.

## Operational effects

9.6.14 The same process will be used for the assessment of operational effects as outlined for construction effects above.

## Cumulative effects

9.6.15 The community assessment will report three types of cumulative effects as outlined in Section 4.4 (cumulative effects) of this SMR:

- inter-project effects – the EIA will consider the interaction between the Proposed Scheme, Phase One, Phase 2a and other existing and/or approved projects in the vicinity of the Proposed Scheme which are under construction or have been consented which may give rise to significant cumulative effects;
- intra-project (in-combination) effects – where two or more residual significant effects from other EIA topics (air quality, noise and vibration, HGV traffic or visual impact) coincide on a community resource/receptors (as outlined in paragraph 9.4.1); and
- ‘community-wide effects’ - these occur where a combination of effects on individual resources have a wider impact on a community, such that they change the experience of a large proportion of people within that community in terms of their day to day functions (live, work, leisure, travel).

## 9.7 Assumptions

- 9.7.1 For assessment purposes it will be necessary to assume that the baseline characteristics established during the EIA process will remain largely unchanged. However, where it is possible to predict change, or to identify planned community facilities, these will be incorporated into the future baseline.



## 10 Ecology and biodiversity

### 10.1 Introduction

**Table 21 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraph 10.2.7	Establishment of baseline and definition of survey	Updated to be relevant to the Proposed Scheme being the Phase 2b Western Leg.
Paragraph 10.2.10	Establishment of baseline and definition of survey	Update to historic baseline dates.
Paragraph 10.3.1	Consultation and engagement	Updated to include Scottish consultees.
Paragraph 10.5.1 and 10.5.2	Scope of assessment - Temporal scope	Update to temporal scope of the assessment.
Paragraph 10.5.5	Scope of assessment - Spatial scope	Updated to include Scotland.
Paragraph 10.5.8 and 10.5.13	Scope of assessment - Technical scope	Updated guidance and policy.
Paragraph 10.6.2 and 10.6.3	Assessment methodology - Guidance	Updated to include Scottish guidance.

- 10.1.1 This section of the SMR covers ecology which includes the environmental topic areas of habitats, species and sites recognised or designated for nature conservation and biodiversity.
- 10.1.2 It describes the methodologies that will be used to identify the potential for impacts and effects upon species and habitats, including sites recognised or designated for their significance for nature conservation that are found along the route of the Proposed Scheme.

### 10.2 Establishment of baseline and definition of survey

- 10.2.1 The baseline conditions for the ES will be established through a combination of desk study, field survey and consultation.

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- 10.2.2 Existing biological data for the route of the Proposed Scheme will be obtained from relevant Biological Records Centres and from national and local specialist data sources, such as bat groups. These data to be collated will include:
- statutory designated sites within 10km of the route<sup>114</sup>;
  - non-statutory designated sites and ancient woodlands within 5km of the route of the Proposed Scheme;
  - records of protected, priority or otherwise notable species within 5km of the route of the Proposed Scheme (in some locations and for some species including bats, the corridor of search will be extended up to 10km from the route to ensure that a complete baseline for the assessment is gathered); and
  - priority, or otherwise notable habitats, or features within 500m of the route of the Proposed Scheme.
- 10.2.3 Other relevant sources of ecological data such as local biodiversity action plans, priority habitats and species lists, existing Phase 1 habitat surveys and Habitat Biodiversity Audits, Ancient Woodland Inventories, Biodiversity Opportunity Mapping and Green Infrastructure studies will be consulted.
- 10.2.4 In addition, existing ecological data available from other sources, such as ESs associated with other relevant developments or nature reserve monitoring records, will be consulted where available. A desk study will also be undertaken to identify any additional woodlands within the land required for construction of the Proposed Scheme and a 500m radius around it that have the potential to be ancient woodland. This will be based on a review of historical mapping, and may merit inclusion on the Ancient Woodland Inventory, subject to consultation with Natural England and further ecological survey and assessment.
- 10.2.5 The width of the survey corridor will be defined by the potential area of ecological impact. This will vary depending on a number of factors, including the engineering of the route, the topography and ecological connectivity of the landscape, and the ecological receptor. In rural sections, the survey corridor for some species, such as great crested newt, could extend up to 500m either side of the land required for construction; in urban sections, the survey corridor will, in general, be much narrower as the zone of impact will be more restricted.
- 10.2.6 Phase 1 habitat surveys will be carried out and will include the identification of ancient and veteran trees. On the basis of the habitats present, and on the basis of professional judgement by an ecologist as to the potential for the presence of protected or otherwise notable species, further detailed specialist surveys will be undertaken where relevant.
- 10.2.7 Specialist surveys will include:
- detailed botanical surveys (including Phase 1, National Vegetation Classification and woodland condition);

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<sup>114</sup> Desk study searches encompass corridors either side of the centreline of the route of the Proposed Scheme.

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- river and watercourse surveys (including River Habitat and River Macrophyte Surveys);
- hedgerow surveys;
- ancient and veteran tree survey;
- pond surveys;
- Great Crested Newt Habitat Suitability Index (HSI) surveys of water bodies and eDNA surveys;
- amphibian surveys;
- reptile surveys;
- breeding bird surveys;
- wintering and passage bird surveys;
- badger surveys;
- bat surveys of suitable features and bat emergence and activity surveys;
- otter surveys;
- water vole surveys;
- terrestrial invertebrate surveys;
- aquatic macro-invertebrate surveys including white-clawed crayfish surveys; and
- fish surveys.

10.2.8 Further details on the survey methodologies will be set out in the Technical Note: Field Surveys Methods and Standards (FSMS) (provided in Annex E). The methods set out in this SMR follow recognised methodologies (deviating only where considered appropriate); and have been determined in consultation with Natural England<sup>115</sup>.

10.2.9 The desk study and field surveys, aided by consultation, will support the identification of sites and features of value. In addition, the assessment will identify landscape-scale ecological features, such as linear features (e.g. hedgerows, watercourses, and disused railway lines) that have additional value in providing habitat connectivity and potential migration corridors. This will include identification of landscape scale initiatives such as green infrastructure strategies and living landscape initiatives.

10.2.10 As a general rule, desk study records will be considered as historic if they are more than 15 years old and therefore unlikely to provide relevant information to inform the baseline for the assessment. Different cut-off dates will be applied for the following receptors:

- habitats and higher/lower plant records - all records prior to 2000 considered as historic (a longer period than the standard due to their less mobile nature); and
- white-clawed crayfish - all records prior to 2010 considered as historic (a shorter period than the standard due to the on-going rapid decline in numbers resulting from the spread of non-native crayfish).

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<sup>115</sup> The methodologies set out in the FSMS are relevant for surveys in both England and Scotland.

- 10.2.11 Data from prior to the above dates will only be included as historic data in the ES where no more recent survey data are available, or where these data are of contextual value in relation to considering evidence of longer term species declines/advances and/or to identifying potential targets for habitat creation or species re-introductions.
- 10.2.12 The methodologies and proposed extents for ecological surveys likely to be required on a widespread basis across the route are provided in the Technical Note: FSMS.
- 10.2.13 The Technical Note: FSMS is not intended to cover all survey methodologies utilised. Additional survey methods or deviations from the methodologies identified in the FSMS will be reported in the relevant community area reports within the ES, if they are required at specific locations.

## **10.3 Consultation and engagement**

### **Engagement as part of the EIA process**

- 10.3.1 During the EIA, the above organisations will remain key consultees for ecology and other national bodies will be consulted as appropriate.
- 10.3.2 A number of organisations will be consulted and engaged with as part of the EIA process, including:
- Natural England;
  - Environment Agency;
  - Woodland Trust;
  - Forestry Commission;
  - Royal Society for the Protection of Birds;
  - The Wildlife Trusts;
  - National Trust;
  - NatureScot;
  - Scottish Environmental Protection Agency;
  - Scottish Forestry; and
  - local authorities.
- 10.3.3 In addition, at a local level, other organisations and individuals will be consulted as appropriate to provide existing data and contribute context to the assessment. These may include local authorities, landowners and local species interest groups (for example, bat, bird and reptile).

## 10.4 Key aspects of the Proposed Scheme for the topic

- 10.4.1 Adverse effects on nature conservation could arise most obviously through direct land-take, resulting in habitat loss, fragmentation and creation of barriers, and affecting the ability of habitats and populations of species to maintain favourable conservation status or to achieve favourable conservation status where condition is currently unfavourable. This may result in the loss or degradation of ecological corridors and networks and a decline in connectivity between habitats. At least in the short to medium-term, temporary land-take may give rise to similar effects to those arising from permanent land-take, due to the slow recovery of species, populations and habitats. Some habitats, such as ancient woodland, are recognised as being irreplaceable and where such habitats are unavoidably affected, loss should be reduced as far as is reasonably possible.
- 10.4.2 Disturbance as a result of sound, noise, vibration, movement and/or light during site clearance, construction and operation could give rise to indirect effects on some species. Ecological effects can also result from edge effects, air and water pollution, arising once again during site clearance and construction, and from changes in water levels or flows.
- 10.4.3 In addition, there is the potential for the Proposed Scheme to have beneficial effects, for example as a consequence of habitat creation designed to extend and link fragments of semi-natural habitat.
- 10.4.4 Key potential ecological impacts are listed in Section 10.6 (Assessment methodology).

## 10.5 Scope of assessment

### Temporal scope

- 10.5.1 The main construction works for the Proposed Scheme are anticipated to take place between 2025 and 2038 (including commissioning). The assessment of construction effects will relate to the construction programme set out in the ES. Effects arising from the operation of the Proposed Scheme will be assessed taking account of the services that are expected when HS2 reaches maximum capacity. The assessment will include the period of time required for the establishment of created habitats.
- 10.5.2 The baseline for the assessment will be taken as conditions at the time of the 2017-2021 surveys. Where the baseline is considered likely to change between the date of the surveys and the future scenarios this will be made clear in the ES<sup>116</sup>. The predicted ecology baseline(s) in the relevant year(s) will be based on projection methods described in Section 8 (Climate change).

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<sup>116</sup> There will be a need for a programme of repeating and updating ecological surveys to continue beyond the deposit of the hybrid Bill, up to the point of site clearance, with monitoring beyond that time.

## Spatial scope

- 10.5.3 The spatial scope of the ecological assessment will be defined by the potential area of ecological impact. More details are provided in Section 10.2 (Establishment of baseline and definition of survey). In summary, the area of search for existing information will extend up to 10km from the route of the Proposed Scheme. The extent of field surveys will vary according to the species and/ or habitat under study and the potential area of impact as explained above.
- 10.5.4 The spatial scope will include not only the physical extent of the works, including land-take associated with construction sites, road improvements and off-site works, but also indirect or secondary effects such as temporary and permanent changes in road traffic.
- 10.5.5 Due to the large scale of the Proposed Scheme and the large volumes of information to be collected in support of the assessment, the ES will report on only those resources/receptors identified as potentially relevant to the assessment. For Natura 2000 sites this is identified through Habitats Regulations Assessment to determine the potential for likely significant effects. For other receptors, it has been defined as follows:
- all statutory designated sites within Natural England's Site of Special Scientific Interest (SSSI) Impact Risk Zones, NatureScot SiteLink SSSI portal and any others considered potentially subject to significant effects;
  - non-statutory designated sites (and ancient woodlands) located within a 500m radius of the land required for the construction of the Proposed Scheme, and any others considered potentially subject to significant effects; and
  - protected and/or priority habitats and species<sup>117</sup> within or adjacent to land required for the construction of the Proposed Scheme, and any others considered potentially subject to significant effects.

## Technical scope

- 10.5.6 The assessment will consider all ecological receptors with the potential to be directly or indirectly affected by the Proposed Scheme, including sites designated for their nature conservation value, legally protected or otherwise, notable species / habitats, all species and habitats of nature conservation importance i.e. not only those listed in Section 10.2, plus any other relevant information gathered. As well as assessing effects on individual sites or receptors, the cumulative effects of the works on the ecology along the length of the Proposed Scheme will also be assessed, see Section 10.6 (Assessment methodology). It will also consider the effects on landscape-scale ecological features and habitat connectivity.
- 10.5.7 In order to ensure that all likely significant effects of the Proposed Scheme will be identified, where baseline information is incomplete a precautionary approach of assuming a reasonable worst-case evaluation is to be adopted. This approach will be utilised to assign

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<sup>117</sup> *Natural Environment and Rural Communities Act 2006*. London, The Stationery Office.

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precautionary values to both known receptors and potential receptors based on the best available information. Further details are provided in the Technical Note: Ecological assessment methodology (provided in Annex E)

- 10.5.8 In keeping with The Government's 25 Year Environment Plan<sup>118</sup> mitigation will be developed at both a strategic and local level.
- 10.5.9 The potential impacts and effects of climate change on ecological receptors, alongside the effects of the Proposed Scheme on the ability of habitats and species in the wider landscape to respond to climate change, will be considered as part of the route-wide assessments for ecology and climate in the ES. The climate change assessment is set out in Section 8 (Climate change) of this SMR.
- 10.5.10 Impacts on relevant European designated sites will be described within the ES, against the requirements of both the EIA and the Habitats Regulations. Supporting technical studies may be presented in a separate, standalone document(s).
- 10.5.11 A separate assessment will be made of the implications of the relevant aspects of the proposals covered by the Water Framework Directive<sup>119</sup> (WFD). This is discussed in Section 21, Water resources and flood risk. The WFD assessment will inform the assessment of effects related to water quantity and quality, as well as hydromorphology. The respective biological effects will be reported in the ecology section of the ES.
- 10.5.12 In addition to the overlap with the water resources assessment in regard to the WFD, there are overlaps between the ecology assessment and a number of other assessments being undertaken as part of the EIA. Section 7 should be referred to regarding the air quality assessment; Section 13 should be referred to regarding the historic environment aspects of veteran trees affected by the Proposed Scheme; Section 15 should be referred to with regard to the landscape and visual impacts and effects from loss of habitat; Section 18 with regard to the sound, noise and vibration assessment and Section 21 with regard to the water resources and flood risk assessment.
- 10.5.13 The Government and HS2 Ltd are also seeking to achieve no net loss of biodiversity for the Proposed Scheme. The outputs from the no net loss calculation will be reported separately to the ES at [www.gov.uk](http://www.gov.uk).

## 10.6 Assessment methodology

- 10.6.1 The assessment is to be guided by the methodology advocated by the Chartered Institute of Ecology and Environmental Management (CIEEM) as published in the Second Edition in

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<sup>118</sup> HM Government (2018). *A Green Future: 25 Year Plan to Improve the Environment*, OGL.

<sup>119</sup> European Commission (EC) (2000), *Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy*. Official Journal of the European Communities. 327, p 1-72.



January 2016<sup>120</sup>. Full details of the assessment methodology are provided in the Technical Note: Ecological assessment methodology (provided in Annex E).

## Legislation

10.6.2 The assessment will take into account relevant national and international legislation including:

- The Wildlife and Countryside Act 1981 (as amended)<sup>121</sup>;
- The Conservation of Habitats and Species Regulations 2017 (as amended)<sup>122</sup>;
- Protection of Badgers Act 1992<sup>123</sup>;
- The Hedgerows Regulations 1997<sup>124</sup>;
- Countryside and Rights of Way Act 2000<sup>125</sup>;
- Natural Environment and Rural Communities Act 2006<sup>126</sup>;
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003<sup>127</sup>; and
- Salmon and Freshwater Fisheries Act, 1975 (as amended).

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<sup>120</sup> Chartered Institute of Ecology and Environmental Management (2016), *Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal*. CIEEM.

<sup>121</sup> *The Wildlife and Countryside Act 1981 (as amended)*. London, The Stationery Office.

<sup>122</sup> *The Conservation of Habitats and Species Regulations 2017 (SI 2017 No. 1012)*. Amended 2018 and 2019. London, Her Majesty's Stationery Office.

<sup>123</sup> *The Protection of Badgers Act 1992*. London, The Stationery Office.

<sup>124</sup> *The Hedgerows Regulations 1997 (SI 1997 No. 1160)*. London, The Stationery Office.

<sup>125</sup> *Countryside and Rights of Way Act 2000*. London, The Stationery Office.

<sup>126</sup> *Natural Environment and Rural Communities Act 2006*. London, The Stationery Office.

<sup>127</sup> *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 2003 No. 3242)*. London, Her Majesty's Stationery Office.

## Guidance

- 10.6.3 The assessment also takes into account relevant guidance set out in national, regional and local planning policy and other guidance, including, but not limited to:
- NPPF (2019)<sup>128</sup>;
  - Government Circular: Biodiversity and geological conservation – statutory obligations and their impact within the planning system<sup>129</sup>;
  - Natural Environment White Paper - The Natural Choice: securing the value of nature (2011)<sup>130</sup>;
  - Making Space for Nature: A Review of England’s Wildlife Sites and Ecological Network (2010; the ‘Lawton Report’)<sup>131</sup>;
  - Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (2015)<sup>132</sup>;
  - Natural England and Forestry Commission Standing Advice: Ancient woodland, ancient trees and veteran trees: protecting them from development (2018)<sup>133</sup>;
  - Natural England Standing Advice for Protected Species (2020)<sup>134</sup>;
  - NatureScot standing advice for planning consultations<sup>135</sup>; and
  - Highways England, Design Manual for Roads and Bridges, Sustainability and Environmental Appraisal, LA 108 Biodiversity (2020)<sup>136</sup>.
- 10.6.4 As well as taking account of nature conservation policies in Local Development Frameworks, the assessment will consider other relevant local plans for biodiversity protection and

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<sup>128</sup> Department for Communities and Local Government (2012 revised 2019), *National Planning Policy Framework*. DCLG. Bressenden Place, London.

<sup>129</sup> Office of the Deputy Prime Minister (ODPM) and Department for Environment, Food and Rural Affairs (2005), *ODPM Circular 06/2005 and Defra Circular 01/05, Government Circular: Biodiversity and geological conservation – statutory obligations and their impact within the planning system*, ODPM.

<sup>130</sup> Department for Environment, Food and Rural Affairs (Defra) (2011), *The Natural Environment White Paper, The natural choice: securing the value of nature*. London: The Stationery Office.

<sup>131</sup> Department for Environment, Food and Rural Affairs (2010), *Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network*, Defra.

<sup>132</sup> Department for Environment, Food and Rural Affairs (2015), *Biodiversity 2020: A strategy for England's wildlife and ecosystem services*, Defra.

<sup>133</sup> Natural England and Forestry Commission (2018), *Standing advice on Ancient Woodland, ancient trees and veteran trees: protecting them from development*. Available online at:

<https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences>.

<sup>134</sup> Natural England and Department for Environment, Food and Rural Affairs (2020), *Protected Species and development: advice for local planning authorities*. Available online at:

<https://www.gov.uk/guidance/protected-species-and-sites-how-to-review-planning-proposals>.

<sup>135</sup> NatureScot (2020), *standing advice for local planning authorities*. Available online at:

<https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-standing-advice-and-guidance-documents>.

<sup>136</sup> Highways England (2020), *Design Manual for Roads and Bridges, Sustainability and Environmental Appraisal, LA 108 Biodiversity*.

enhancement such as local biodiversity action plans, green infrastructure plans and Nature Improvement Areas.

## **Significance criteria**

- 10.6.5 Further details of the significance criteria used for the assessment are provided within the Technical Note: Ecological assessment methodology (provided in Annex E).
- 10.6.6 Each potential ecological receptor will be evaluated against the following geographical frames of reference: international; national; regional; county/metropolitan; district/borough; local/parish; and negligible. The standard geographical frames of reference of 'site' and 'within zone of influence' will not be used as they are not considered appropriate for a linear scheme of this scale. Surveys will enable an assessment to be made against the relevant county criteria for identifying local wildlife sites.
- 10.6.7 It is important that there is a consistent approach to the definition of significance across the different environmental topics reported in the ES. Significant ecological effects on receptors at different geographical scales will therefore be related to the overall significance categories used by other environmental topic areas. This process will also ensure that the overall assessment focuses on the key significant ecological issues.

## **Construction effects**

- 10.6.8 Potential impacts resulting from construction activities include:
- temporary and permanent land required;
  - severance of ecological corridors and networks;
  - fragmentation of habitats and sites;
  - barrier effects (to movement of fauna);
  - noise and visual disturbance;
  - disturbance from lighting;
  - dust deposition;
  - air pollutants emitted from construction vehicles and plant;
  - risk of water quality changes from surface water runoff;
  - hydrological effects, from changes in water levels and/or flows;
  - effects on groundwater and any habitats reliant on them;
  - changes in management, resulting in habitat degradation; and
  - introduction and spread of invasive non-native species.
- 10.6.9 The Proposed Scheme also offers opportunities for creation and enhancement of habitats. There are opportunities to restore, reconnect and to 're-naturalise' terrestrial and aquatic habitat, the value of which is limited by existing modification. Both the landscape and drainage designs of the Proposed Scheme will be influenced by ecological opportunities, for example, through creation of more natural watercourses.

## **Operational effects**

10.6.10 Potential operational activities that could give rise to ecological effects include:

- barrier effects (to movement of fauna);
- mortality of wildlife due to passing trains;
- noise and visual disturbance;
- disturbance from lighting;
- accidental pollution; and
- introduction and spread of invasive non-native species.

## **Cumulative effects**

10.6.11 Cumulative effects are those that result from a combination of a number of individual effects. In the context of the ecological assessment of the Proposed Scheme, these will include:

- the combined ecological effect on a single receptor of a number of individual environmental impacts, e.g. area of land required and noise and airborne dust, arising from the Proposed Scheme;
- the cumulative effects of localised ecological impacts along the length of the railway, for example the potential of cumulative loss of certain habitat types; and
- interaction between ecological effects arising from the Proposed Scheme and those from other relevant projects (including Phase 2a) and plans (both on single receptors and along the length of the route of the Proposed Scheme).

## **Significance of effects and monitoring**

10.6.12 Details of the process for determining significance of effects are provided within the Technical Note: Ecological assessment methodology (provided in Annex E).

10.6.13 In the event that any significant residual impacts remain, procedures for monitoring those significant effects will be developed, as appropriate, as part of the overall monitoring approach.

## **10.7 Assumptions**

10.7.1 The ecology and biodiversity section of the ES will include a section to explain any assumptions made in undertaking the ecological assessment.

# 11 Electromagnetic interference

## 11.1 Introduction

**Table 22 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 11	Throughout	Updated references to legislation, guidance and standards.
Paragraph 11.1.5	Introduction	Addition of reference to HS2 Phase 2a Electromagnetic Interference assessment.
Paragraph 11.1.9	Introduction	Updated to reflect acceptable levels of EMI.
Section 11.3	Consultation and engagement	Updated to reflect consultees for the Phase 2b Western Leg.
Paragraph 11.6.3	Assessment methodology	Updated to clarify limits for public and occupational exposure for assessing health risk.
Paragraph 11.7.1	Assumptions	Updated to clarify the modelling to be used in the assessment.

- 11.1.1 This section of the SMR covers electromagnetic interference which includes the environmental topic areas of Electromagnetic Fields (EMF), Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC). EMF is produced whenever electricity is present.
- 11.1.2 EMI is disturbance that affects an electrical system due to magnetic and electric fields, electromagnetic induction, conduction or electromagnetic radiation emitted from an external source.
- 11.1.3 EMC is the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbance to other equipment in that environment.
- 11.1.4 The principal source of EMF from the Proposed Scheme that may have an effect on third parties will be the traction power supply system. Emissions from the signalling and communication systems, electrical and mechanical systems, generally only affect the internal railway operating system. In addition, equipment located within the infrastructure maintenance depot do not produce levels of EMF that will have an effect outside the operational railway. The Electromagnetic Compatibility Regulations 2016 ensures that equipment shall be so designed and manufactured to ensure that the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment can operate as intended.

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- 11.1.5 The Proposed Scheme (and particularly its nature as an electrified railway) is not unique, hence, there exists data from HS1, HS2 Phase One<sup>137</sup> and HS2 Phase 2a<sup>138</sup>, for example, that can be used to illustrate the minimal effects of EMI to the environment.
- 11.1.6 EMI is an issue that can normally be mitigated through the application of EMC industry accepted practice during design and installation.
- 11.1.7 EMF exposure to workers and the general public will be addressed as part of this assessment.
- 11.1.8 EMF limits for workers are specified in the EU Directive 2013/35/EU, published in 2013, and enforced in the UK by the Control of Electromagnetic Fields at Work Regulations 2016 (CEMFAW 2016). An industry guidance note has been produced by the RSSB GLGN1620: Guidance on the Application of the Control of Electromagnetic Fields at Work Regulations, to support the CEMFAW Regulations.
- 11.1.9 EMF limits for the general public are specified in EC Recommendation 1999/519/EC and based on guidance produced by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).
- 11.1.10 Many of the effects caused by EMI will be eliminated or reduced to levels defined by standards during the design and installation period of the Proposed Scheme. Designs for the Proposed Scheme are covered by British and European Standards and industry accepted practice.

## 11.2 Establishment of baseline and definition of survey

- 11.2.1 In constructing and operating the Proposed Scheme, there will be key interface issues that require evaluation and management. A definitive list of interfaces will be established as part of the initial survey scope. The new infrastructure will have an impact on, and be impacted upon, by its surroundings, which will differ throughout the length of the route of the Proposed Scheme.
- 11.2.2 Where the Proposed Scheme includes or is adjacent to an existing railway corridor, there will be a significant interface with the existing railway networks. Although the existing infrastructure may have systems and procedures to mitigate the effects of EMI, it is possible that the introduction of the Proposed Scheme's infrastructure may have an adverse effect on

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<sup>137</sup> High Speed Two Ltd (2013), *High Speed Rail (London – West Midlands) Environmental Statement, Volume 5: Technical Appendices, EMI supporting information (EM-002-000)*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/259623/Route-Wide\\_HS2\\_EMC\\_Management\\_Plan\\_EM-002-000.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/259623/Route-Wide_HS2_EMC_Management_Plan_EM-002-000.pdf).

<sup>138</sup> High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe), Environmental Statement, Volume 5: Technical Appendices, Electromagnetic Interference - Affected receptors within 50m of railway and associated risks and mitigation (EM-001-000)*. Available online at: <https://www.gov.uk/government/publications/hs2-phase-2a-environmental-statement-volume-5-electromagnetic-interference>.

the existing railway infrastructure. Similarly, the existing railway infrastructure may have an effect on the Proposed Scheme (both infrastructure and rolling stock).

- 11.2.3 British and European Standards exist to mitigate the effects of EMI on neighbouring railways. These standards will be adopted through design, installation, operation and maintenance best practice. HS2 Ltd will consult with other infrastructure owners during the design period.
- 11.2.4 For areas that do not include or are not adjacent to an existing railway, the Proposed Scheme's infrastructure is likely to have a greater impact on its surroundings. It is therefore important to identify any key areas along the route where EMI could be an issue for the sensitive receptors identified.
- 11.2.5 A desk top assessment will be undertaken to identify potential receptors at risk which are external to the operational railway. Examples of potentially sensitive sites that may be at risk and are to be considered are:
- universities;
  - schools;
  - hospitals;
  - military establishments;
  - airports;
  - radio telescope operators;
  - emergency and commercial radio stations;
  - residential properties; and
  - industrial properties.
- 11.2.6 The above sites have been chosen in relation to their potential to host/operate electrical equipment and the likely sensitivity of this equipment, as described in BS EN61000-6-1:2019, BS EN61000-6-2:2019, Ministry of Defence Standard 59-411:2007, BS EN60601-1-2:2015+A1:2021 and BS EN50121 series.

## **11.3 Consultation and engagement**

### **Engagement as part of the EIA process**

- 11.3.1 During the preparation of the ES, consultation will be undertaken as appropriate, with the following organisations:
- Network Rail;
  - Manchester Metrolink;
  - electricity supply authorities;
  - electricity distribution companies;
  - data and telecommunication companies;
  - local authorities;



- hospitals;
- radio telescope operators; and
- airports.

## **11.4 Key aspects of the Proposed Scheme for the topic**

11.4.1 The following are potential sources of EMI:

- temporary sources: direct effects could be caused by construction from significant activities such as tunnelling, as a result of the use of electrical machinery, such as pumps, generators and compressors. Tunnel boring machines utilise high voltage electricity supplies. These activities will be supported from local work compounds close to the structure/tunnel being constructed, local worksites, or larger construction compounds where equipment may be used; and
- permanent sources: direct effects could be caused by the operational railway and its supporting systems (e.g. overhead line equipment (OLE) and traction distribution, infrastructure maintenance depot, ventilation shafts and other line side equipment, traction sub stations, rolling stock depots and rolling stock, both existing and proposed). Radio frequency systems such as GSM-R communication systems may also be a source of EMI.

11.4.2 The main source of EMF will be the traction power system, as electromagnetic emissions are caused by the current flowing in an electrical system.

11.4.3 The higher currents found in high voltage power lines have the potential to create larger EMF, the strength of which diminish rapidly with distance from the source.

## **11.5 Scope of assessment**

11.5.1 A desk study will be undertaken to assess the risk of EMI as a result of the Proposed Scheme, considering the main sources of EMF. The desk-based study will also identify establishments where people are potentially at risk from the EMF produced by the Proposed Scheme's 25 kilovolts (kV) electrification traction power. Both the construction and operational phases of the Proposed Scheme will be considered.

11.5.2 The study will identify potentially sensitive receptor sites within a 50m corridor either side of the centreline of the nearest track within the Proposed Scheme, or from proposed power equipment (e.g. OLE and traction substations).

11.5.3 Once each receptor site has been identified, a risk assessment will be undertaken to categorise the perceived level of risk and to identify the potential mitigation for each receptor site.

- 11.5.4 A risk assessment will be undertaken to assess the impact of EMF effects on nearby equipment, installations and people.
- 11.5.5 The assessment will use data from the preliminary traction power modelling completed by HS2 Ltd, in undertaking the evaluation.

## 11.6 Assessment methodology

### Legislation and guidance

11.6.1 The following standards are relevant:

- EU Directive 2014/30/EU The Electromagnetic Compatibility Directive;
- EU Directive 2013/35/EU Electromagnetic Fields (EMF) limits;
- EU Directive 2013/53/EU European Radio Equipment Directive;
- EU Directive 2006/42/EC on machinery;
- SI 2016/1091 – The Electromagnetic Compatibility Regulations;
- SI 2016/588 – The Control of Electromagnetic Fields at Work Regulations;
- ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz): 1998;
- ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (1Hz to 100kHz): 2010;
- EC Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300GHz);
- BS EN 61000-6-1:2019. Electromagnetic compatibility Part 6.1: Generic standards - immunity for residential, commercial and light industrial environments;
- BS EN 61000-6-2:2019. Electromagnetic compatibility Part 6.2: Generic standards- immunity for industrial environments;
- BS EN 61000-6-3:2007+A1:2011. Electromagnetic Compatibility Part 6.3: Generic standards - Emissions for residential, commercial and light-industrial environments;
- BS EN 61000-6-4:2019. Electromagnetic Compatibility Part 6-4: Generic standards - Emissions for industrial environments;
- BS EN 50499:2019. Procedure for the assessment of the exposure of workers to electromagnetic fields;
- BS EN 50121 series of standards, Railway Applications, Electromagnetic Compatibility, which contains the following parts:
  - BS EN 50121-1:2017 Part 1: General;
  - BS EN 50121-2:2017 Part 2: Emissions of the whole railway system to the outside world;
  - BS EN 50121-3-1:2017+A1:2019 Part 3-1: Rolling stock - train and complete vehicle;
  - BS EN 50121-3-2:2016+A1:2019 Part 3-2: Rolling stock – apparatus;

- BS EN 50121-4:2016+A1:2019 Part 4: Emissions and immunity of the signalling and telecommunications apparatus; and
- BS EN 50121-5:2017+A1:2019 Part 5: Emissions and immunity of fixed power supply installations and apparatus.
- BS EN 50122 series of standards, Railway Applications - Fixed installations - Electrical safety, earthing and the return circuit, which consists of:
  - BS EN 50122-1:2011+A4:2017 Part 1: Protective provisions against electric shock;
  - BS EN 50122-2:2010 Part 2: Provisions against the effects of stray currents caused by d.c. traction systems; and
- BS EN 50122-3:2010 Part 3: Mutual Interaction of a.c. and d.c. traction system; and
- The Railways (Interoperability) Regulations 2011.

## Significance criteria

### EMC zones

- 11.6.2 Using the estimated levels of generated EMF from the preliminary traction power modelling results, the levels of predicted EMF will be assessed against the maximum levels mandated by British and European Standards.
- 11.6.3 For the effects of EMF on human health, the limit recommended by ICNIRP for short term effects of EMF exposure to the general public is 100 microTesla ( $\mu\text{T}$ ), for occupational exposure the recommended limit is 1000 $\mu\text{T}$ .
- 11.6.4 For the effects of EMI on susceptible electrical or electronic equipment, where the level exceeds 3 Amperes per metre (A/m) for residential and 30A/m for industrial equipment, this will be regarded as significant. These levels are the current limits identified in BS EN 61000-6-1:2019 and BS EN 61000-6-2:2019 respectively.
- 11.6.5 EM Zone 1: For equipment less than 10m from the centreline of the nearest track rails or from non-traction power equipment (i.e. cables transformers or switchgear). BS EN 50121-4:2016 (Signalling and Telecommunication Apparatus) and BS EN 50121-5:2017 (Fixed Power Supply Installations) will be applied in this zone. The emission and immunity levels are provided in BS EN 50121-4:2016 (Signalling and Telecommunication Apparatus) which applies to any safety critical equipment located in this zone.
- 11.6.6 EM Zone 2: For equipment greater than 10m, but less than 20m from the centreline of the nearest track rails or from non-traction power equipment (i.e. cables, transformers or switchgear). BS EN 61000-6-2:2019 (Generic standards - Immunity for industrial environments), and BS EN 61000-6-4:2019 (Generic standard - Emissions for Industrial Environments) will be applied in this zone. The emission and immunity levels are given in the BSs. Any safety critical equipment located in this zone would also adhere to these BSs.
- 11.6.7 EM Zone 3: For equipment greater than 20m from the centreline of the nearest track rails or non-traction power equipment (i.e. cables transformers or switchgear). BS EN 61000-6-

1:2019 (Generic standard - Immunity for residential, commercial and light industrial environments) and BS EN 61000-6-3:2007 (Generic standards - Emissions for residential, commercial and light industrial environments), will be applied in this zone. The emission and immunity levels are given in these BSs.

- 11.6.8 Where risk is identified, proposals for mitigation will be identified.
- 11.6.9 In creating the hazard log, the impact and risk levels will be established thereby identifying key areas for assessment. At some point before energisation, baseline measurements will be taken to confirm the EMI background levels of the existing environment.

## **Construction effects**

- 11.6.10 The effects of construction will be evaluated, and appropriate mitigation measures will be recommended to address any potentially significant adverse effects identified. Ongoing measurements and monitoring will be considered during construction, where significant adverse effects are identified.

## **Operational effects**

- 11.6.11 The effects of operation will be evaluated, and appropriate mitigation measures will be recommended to address any potentially significant adverse effects.

## **Cumulative effects**

- 11.6.12 Any cumulative effect due to the Proposed Scheme running close to an existing electrified railway, for example, will be included in the assessment.
- 11.6.13 The risk assessment will be based on the preliminary traction power modelling, which considers the worst case traction loads for the proposed timetable. Any effects of EMF and EMI will therefore be considered using the worst case loads.

## **11.7 Assumptions**

- 11.7.1 The following assumptions are made:
- no site visits will be conducted, rather a desk-based study will be undertaken;
  - the preliminary traction power modelling conducted by HS2 Ltd will be used as the basis of assessment;
  - no additional EMI modelling or detailed calculations will be undertaken;
  - where information is not available, professional judgement will be used to reach a conclusion. It may be possible, subject to review, to use information from other recent and similar railway construction projects;
  - the compilation of information from which to assess the baseline measurements will be dependent on the availability of recorded information; and

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- in accordance with good safety management principles, it is assumed that risks due to EMI will be reduced using the 'as low as reasonably practicable' (ALARP) principle.

## 12 Health

### 12.1 Introduction

**Table 23 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraph 12.6.17	Health inequalities and vulnerable groups	Minor update to the description of 'vulnerable groups'.

- 12.1.1 This section of the SMR covers health which includes the environmental topic areas of health assessment, community profiling, stakeholder engagement, and assessment.
- 12.1.2 When considering the health effects of development projects, health is viewed in a broad sense, encompassing both physical and mental wellbeing, as influenced by a wide range of environmental, social and economic determinants. This broader understanding of health is captured in the World Health Organization (WHO) definition: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"<sup>139</sup>. Health effects will be assessed at the population level, through the consideration of exposure to the environmental and socio-economic impacts of the Proposed Scheme and evaluation of the potential for these impacts to affect health. In addition, the assessment will highlight potential impacts on specific groups of receptors such as users of facilities that may be impacted by the Proposed Scheme, or vulnerable groups within the community.
- 12.1.3 Health assessment is a multi-disciplinary activity that cuts across the boundaries of health, public health, social sciences and environmental sciences. The potential health effects of the Proposed Scheme will be assessed alongside environmental effects through an integrated process. The impacts and effects on human health and populations directly arising from the Proposed Scheme in the event of it being affected by a major accident or disaster are considered in Section 16 (Major accidents and disasters).
- 12.1.4 The objectives of the assessment are to:
- describe how the Proposed Scheme has the potential to impact (directly and indirectly) on the factors that influence health and wellbeing (termed 'health determinants')<sup>140</sup>;
  - identify the likely extent and intensity of exposure to impacts on health determinants;

<sup>139</sup> World Health Organization (1948), *Constitution of the World Health Organization Basic Documents*, 45th edition supplement. Available online at: [www.who.int/governance/eb/who\\_constitution\\_en.pdf](http://www.who.int/governance/eb/who_constitution_en.pdf).

<sup>140</sup> The health of an individual is determined primarily by gender, genetics and lifestyle. For a population, a significant contribution to its health status is governed by external factors such as socio-economics and the physical environment. These factors are referred to as health determinants and the assessment of health relies on the fact that impacts on these determinants will have corresponding health effects, based on the evidence from scientific literature.

- qualitatively or quantitatively assess the potential health effects arising from these impacts;
- identify those sections of the population likely to be most affected, either positively or negatively, by impacts on health determinants; and
- identify measures to enhance the positive and mitigate the negative effects on community health and wellbeing.

## 12.2 Establishment of baseline

### Baseline data and community profiling

- 12.2.1 Baseline data will be collected from a variety of sources and will be used to construct a community health profile, providing an overview of the prevailing socio-economic status of the existing population and giving an indication of levels of health and wellbeing. The analysis of these data will focus on identifying vulnerable sub-groups that may be particularly sensitive to health and wellbeing effects. Reference will also be made to environmental baseline information collated by other topics, including environmental characteristics (e.g. noise, air quality and landscape character), and the presence of key features and resources used by the community.
- 12.2.2 The process of gathering baseline data will be undertaken in collaboration with related assessment topics including community and socio-economics. The principal sources of these data will include:
- national datasets such as those from the Office of National Statistics, local authorities, Public Health Observatories, Public Health England (PHE), Sport England (Active People Survey), Joint Strategic Needs Assessment, and other sources;
  - local public health reports;
  - information from local strategies and policies relating to health and wellbeing;
  - data obtained through consultation with public health authorities, including PHE and local authority public health teams;
  - feedback received through joint public consultations; and
  - outputs from the EIA baseline assessment (e.g. sound, noise and vibration, air quality and landscape and visual baselines).
- 12.2.3 Over the timescale of the Proposed Scheme's delivery, the profile and situation of affected communities will change, influenced by wider economic and policy change as well as demographic trends. Where these data and forecasts are available, the likely future community profile will be considered.



## **12.3 Consultation and engagement**

### **Stakeholder engagement**

- 12.3.1 Stakeholder feedback will be sought in order to further understand the specific characteristics, concerns and perceptions of local communities that may not be picked up through a review of publicly available data. This will enable the susceptibility of communities to health and wellbeing effects to be more fully understood.

### **Engagement as part of the EIA process**

- 12.3.2 The integrated approach to health and environmental assessment includes an emphasis on integrated stakeholder engagement. Information obtained through stakeholder engagement will help to inform the health assessment. Engagement on health issues will form part of the wider EIA consultation process and health considerations will be a key element of community engagement activities.
- 12.3.3 In conjunction with the wider consultation process, further engagement with relevant organisations and communities will be carried out. This will be undertaken on a community specific, and route-wide, basis.
- 12.3.4 Key health sector stakeholders will include PHE, Public Health Directors and representatives of mental health trusts and local authority health and wellbeing boards.
- 12.3.5 Local and regional health stakeholders will be identified through contact with parish councils and local authorities. Relevant organisations and special interest groups may be identified via national, regional and local databases, websites and other sources. Engagement will focus on groups that are well-positioned to provide information relating to the affected communities and identified information gaps.
- 12.3.6 Vulnerable groups in the population will be identified through consultation with local stakeholders and community representatives.
- 12.3.7 In line with HS2 Equality, Diversity and Inclusion (EDI) Policy, consultation and engagement will be accessible and inclusive in its approach. This will involve planning and implementing measures to reduce and remove both spatial and non-physical barriers to involvement in the consultation and engagement processes.

## **12.4 Key aspects of the Proposed Scheme for the topic**

- 12.4.1 The assessment of health effects will consider impacts on health determinants during the construction and operation of the Proposed Scheme. The following aspects are likely to be particularly relevant to the health assessment:

- provision of new public transport infrastructure and public realm;
- land required temporarily or permanently, including loss of residential and commercial property, public open space, PRoW, land or property used for sport/leisure, community, healthcare and cultural and faith uses;
- impacts on residential properties;
- impacts on educational facilities;
- impacts on access to healthcare and medical services;
- construction activities, including:
  - site clearance and demolition;
  - earthworks and site preparation;
  - location and management of construction compounds;
  - construction traffic, including HGVs;
  - mitigation, including air, noise and vibration control measures, visual screening and traffic management;
  - employment generation; and
  - accommodation and welfare for construction staff<sup>141</sup>.
- permanent aspects:
  - passing trains (causing noise and visual effects);
  - presence of physical structures (affecting local views and/or causing severance);
  - electromagnetic interference;
  - severance or re-routing of local roads and PRoW;
  - direct and indirect employment and regeneration effects; and
  - direct and indirect impacts on community facilities and resources.

## 12.5 Scope of assessment

### Spatial scope

- 12.5.1 The health and wellbeing effects of the Proposed Scheme will be considered for populations at the local and route-wide level.
- 12.5.2 The community level assessment of health and wellbeing effects will be aligned with the study areas for related environmental topics, where relevant. The study areas for each environmental topic will be defined according to the individual assessment methodologies and protocols. However, as far as possible, the study areas will be consistent to enable an assessment of the combined effects of different environmental and social impacts on communities.

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<sup>141</sup> Occupational health and safety assessments for the workforce are separate to HIA which is for the community, but where there are overlaps, they will be included in the HIA.

## Temporal scope

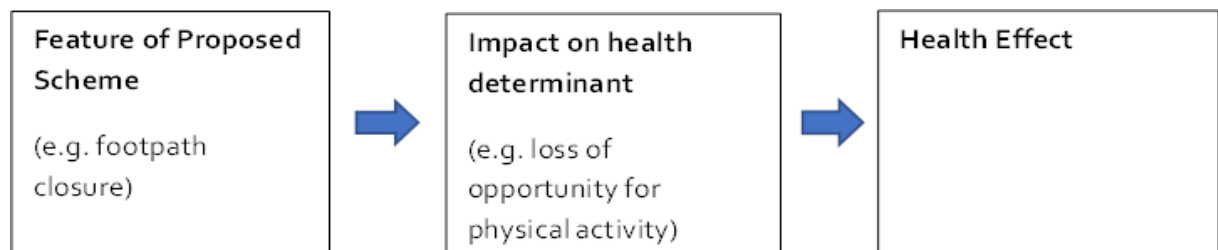
- 12.5.3 The temporal scope is outlined in Section 4.2 (Scope of the assessment) of this SMR. Health effects during the pre-construction period, the construction and commissioning period and operational period will be considered.

## Technical scope

### Health pathways and potential effects

- 12.5.4 Health effects may arise when a proposed development impacts upon factors known as 'health determinants', which have an influence on health and wellbeing. A 'health pathway' (Figure 7) is the series of links or stages between an aspect of a proposed development, its ability to change or influence a health determinant, a community's exposure to change(s) in a health determinant(s) and the generation of a health effect.

**Figure 7 - Health pathways**



- 12.5.5 Health effects may be defined as changes in the levels of the following public health outcomes:

- communicable diseases;
- non-communicable diseases;
- nutritional disorders;
- injuries;
- physical wellbeing; and
- mental health and wellbeing.

### Scope of health assessment

- 12.5.6 The population considered in the assessment will be primarily that which is affected by the construction and operation of the Proposed Scheme along its route. Issues arising during the planning, construction and operation of the Proposed Scheme with the potential to affect health and wellbeing may include, (but are not limited to):

- changes in employment and income opportunities during construction and operation – both positive and negative;

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- displacement of occupants from residential and commercial properties, with impacts on housing, jobs and social capital;
- impacts on green space, affecting opportunities for physical activity and contact with nature;
- impacts on, or loss of, community facilities;
- impacts of exposure to noise and air emissions during construction and operation;
- visual impacts resulting in changes to the character of the local environment;
- temporary or permanent severance and/or diversion of public transport routes, and active travel routes such as footpaths and cycleways;
- changes to traffic flows and vehicle types on local roads during construction;
- presence of a large construction workforce (particularly important in less populated rural areas); and
- concerns and uncertainty about the Proposed Scheme and impacts on local property markets.

12.5.7 Based on the health pathways described above, the following health determinants have been identified for inclusion in the assessment:

- education;
- employment and income;
- transport – including traveller stress and road safety;
- housing;
- social capital;
- noise and vibration;
- air quality;
- neighbourhood quality – including greenspace and contact with nature, landscape and visual, crime and safety;
- opportunities for physical activity; and
- access to services, health and social care.

## In combination effects

12.5.8 The combined effects of the Proposed Scheme on community receptors will be considered. Such effects may arise where a number of impacts on different health determinants are experienced together, either at a common location or by a particular population group. The combined impacts will be qualitatively assessed, in conjunction with the community assessment, drawing on the conclusions from other assessment topics in order to identify potential wellbeing effects at community level.

## 12.6 Assessment methodology

### Legislation

- 12.6.1 The health assessment methodology has been developed in accordance with the EIA Regulations 2017 regarding the assessment of the effects of certain public and private projects on the environment. This requires that EIA should 'identify, describe and assess' the effects of a project on 'population and human health'.

### Guidance

- 12.6.2 There is no definitive guidance or methodology for assessing the health effects of projects. Furthermore, at the time of writing this methodology, no guidance exists on how to incorporate health into EIA as required by the EIA Regulations 2017. There are, however, numerous well established 'toolkits' and guides available, such as:
- Institute of Environmental Management and Assessment, 2017: Health in Environmental Assessment, a primer for a proportionate approach;
  - NHS London Healthy Urban Development Unit (HUDU), 2015. Healthy Urban Planning Checklist and Rapid Health Impact Assessment Tool;
  - Wales Health Impact Assessment Unit, 2012: HIA a practical guide;
  - National Mental Wellbeing Impact Assessment Development Unit 2011: Mental Wellbeing Impact Assessment Toolkit;
  - Health Scotland *et al*, 2007: Health Impact Assessment for Transport: A Guide;
  - London Health Observatory, 2006: A Guide to Reviewing Published Evidence for use in Health Impact Assessment; and
  - Institute of Public Health in Ireland, 2005: Health Impacts of Transport.
- 12.6.3 The proposed scope and methodology as set out in this SMR takes account of the above guidance documents, as well as recent good practice and feedback from the Phase 2a assessment. The assessment will be undertaken as an iterative process whereby information from the initial assessment and consultation is fed back to the design and wider EIA process.

### Construction effects

- 12.6.4 Construction effects will be assessed following the health assessment process described below.

### Operational effects

- 12.6.5 Operational effects will be assessed following the health assessment process described below.

## Evidence base

- 12.6.6 The literature review undertaken for the Phase 2a EIA<sup>142</sup> will be updated to take account of more recent information, where it exists. Evidence of health effects from other major infrastructure projects will be sought through consultation with local health authorities and other project proponents. However, previous investigations indicate that there has been no widespread monitoring of health effects associated with major infrastructure projects. International case studies from high speed rail projects will also be sought.
- 12.6.7 The literature review for Phase One and Phase 2a identified evidence for links between health determinants and potential health outcomes. Evidence was drawn from published research, literature reviews and policy documents. The extent of available evidence varies between the different health determinants considered in the assessment. This ranges from concentration-response functions based on large bodies of research for which scientific consensus is established, to less well-defined linkages drawn from a smaller number of studies where there is no clear consensus on the exact causal relationships between the health determinant and health outcomes.
- 12.6.8 The evidence obtained through the literature review will support the assessment of health effects. It should be noted that the strength of evidence is not proportional to the importance of a determinant and its potential effect on health and wellbeing.

## Qualitative assessment

- 12.6.9 The assessment of health effects will be based on evidence from published research. Where there is sufficient information available, and it is judged to be appropriate to do so, the health effects of the Proposed Scheme will be quantitatively assessed. However, many potential health effects cannot be quantified because there are currently no robust or scientifically widely agreed upon methods for quantifying them, or because the types of data required cannot realistically be obtained. Therefore, it is anticipated that the assessment will be largely qualitative.
- 12.6.10 The assessment of health effects will be based on a set of criteria informed by available, up to date guidance, and developed using professional judgement and precedent from other large-scale health assessments. There is no recognised guidance or framework for evaluating the significance of health effects. In the absence of such guidance, the assessment will provide a commentary on the importance of any health effects identified. A large part of this will depend on the magnitude and severity of the impacts on health determinants, which can be identified and described with greater certainty than the consequent health effects.

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<sup>142</sup> High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe), Environmental Statement, Volume 5: Technical appendices, Health Route-wide commentary on health evidence base (HE-003-000)*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627083/E58\\_HE-003-000\\_WEB.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627083/E58_HE-003-000_WEB.pdf).

12.6.11 The assessment will utilise the following when forming a judgement on the importance of impacts:

- description of change;
- exposure;
- strength of evidence; and
- health inequalities and vulnerable groups.

## **Description of change**

12.6.12 The change to the health determinant is described, including commentary on the following factors:

- the aspect of the Proposed Scheme causing the change;
- how the impact on a health determinant may change, including the direction of this change (beneficial or adverse); and
- the duration and frequency of change (operational effects are assumed to be permanent in most cases; construction effects may be short term if under six months, medium term if six months to two years, or long-term if more than two years in duration).

## **Exposure**

12.6.13 The degree of exposure of a population to changes in health determinants is assessed in terms of the 'extent' of exposure and 'intensity' of exposure, described as follows:

- the extent of exposure is judged to be low, medium or high depending on the number of people in the affected population likely to be exposed to the change in a health determinant;
- the intensity of exposure is judged to be low, medium or high. Factors such as the severity and duration of impact and/or the value of the affected resource will be taken into account when considering intensity, as will the frequency of the exposure for intermittent impacts; and
- the extent and intensity of exposure are described where it is practical to do so. In some cases, such as impacts that could potentially affect an unknown number of individuals along the route as a whole, exposure may not be defined using the terms low/medium/high.

## **Strength of evidence**

12.6.14 The evidence on which the link (or 'association') between a change in health determinant and a health effect is based will be described in the assessment as:

- anecdotal: based on the opinions or experiences of members of the public and other stakeholders consulted during the assessment process;



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- weak: a few peer-reviewed research studies to suggest an association; or the studies show conflicting findings;
- moderate: a range of international (but not necessarily national) peer-reviewed research studies showing similar associations and strength of associations; the association is widely accepted by the public health community; and there may be debate about the specific causal factors, the mechanism of effect and/or the strength of association; and
- strong: a wide range of national and international peer-reviewed research studies showing similar associations and strengths of association. The association is widely accepted by the public health community and there is consensus on the specific causal factors, the mechanism of effect and the strength of association.

12.6.15 It should be noted that a lack of research studies or lack of consensus among the public health community does not necessarily mean that a link does not exist, but that there is currently uncertainty in the likelihood of an effect.

## Health inequalities and vulnerable groups

- 12.6.16 The assessment will consider the potential for an impact to exacerbate existing health inequalities across a population. The sensitivity of the population exposed to the change in health determinant will be considered in the assessment. This will be done qualitatively, based on the community profiling exercise and evidence base compiled for the health assessment, which will provide an indication of which groups are likely to be most affected, and their presence within the communities along the route. The community profiles will use, amongst other sources, Office for National Statistics (ONS) data on the socio-economic circumstances of populations at ward level and the public health profiles produced by PHE.
- 12.6.17 The term 'vulnerable groups' refers to groups of individuals who are made vulnerable by the situations and environments they are exposed to (as opposed to any inherent weakness or lack of capacity). This includes groups of people who may be more likely to be exposed to a change in a health determinant, or to experience health effects as a result of exposure. Consideration of vulnerable groups will take into account:
- how an impact on a health determinant is shown (in scientific literature) to affect a particular section of the community;
  - whether the affected community is already facing existing deprivation (social, economic or environmental) that could make them more vulnerable; and
  - characteristics such as age, health conditions, or other physical or mental characteristics that make people more vulnerable to impacts on one or more determinants, recognising that there could be multiple impacts on some vulnerable parts of the population.
- 12.6.18 The health assessment will also evaluate potential inequalities in health impacts based on population characteristics, including for example, age, health status, gender, disability, ethnicity, income and place (disadvantaged locations). The assessment will refer to the separate EQIA, as appropriate, to evaluate potential inequalities in health impact. In addition

the health assessment will explore the potential impacts on groups that are not covered by the protected characteristics under the Equalities Act 2010.

## Quantitative assessment

- 12.6.19 Where a quantitative assessment of health effects is undertaken, for example, for health and wellbeing effects associated with noise and air quality, this will be based on established assessment methodologies for these health determinants.
- 12.6.20 The likely extent and intensity of exposure to noise and air emissions will be reviewed at an early stage in the EIA process in order to determine whether quantitative health assessment is required. Professional judgement will be used to determine whether quantitative assessment methods are justified, based on the size of the exposed population and the level of exposure.
- 12.6.21 The proposed approaches for these two topics are outlined below.

## Quantifying the effects of noise and vibration on health and wellbeing

- 12.6.22 In line with Government noise policy, Phase One and Phase 2a, the scope and methodology for sound, noise and vibration (Section 18) will identify significant effects on health and quality of life. For completeness the following paragraphs reiterate the principle health related components of the assessment.
- 12.6.23 The following potential health effects may be included in the quantitative assessment of sound, noise and vibration: annoyance, sleep disturbance, cardiovascular impacts and cognitive effects on school children.
- 12.6.24 Evidence suggests that chronic exposure to noise or vibration over a long period of time is an important factor influencing health and wellbeing. Therefore, quantitative assessment of health effects will focus on operational railway noise. The effects of construction activities will be qualitatively assessed.
- 12.6.25 The spatial scope of the study area will be defined using the Lowest Observed Adverse Effect Levels<sup>143</sup> for noise from high speed railway lines, during the day and night. Account will also be taken of any unique features of the Proposed Scheme's sound or impacts in the area being considered. Exposure response relationships will then be used to quantify the number of people exposed to different levels of noise or vibration from the Proposed Scheme. To provide context, the number of people exposed to different levels of noise or vibration from other sources of exposure to transport noise within the study area will be described.

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<sup>143</sup> In line with the Noise Policy Statement for England - Department for the Environment, Food and Rural Affairs (Defra) (2015), *Noise Policy Statement for England*, Defra.

Significant Observed Adverse Effect Levels (SOAEL) will also be established where relevant in line with Government noise policy.

- 12.6.26 This information will be used to estimate the potential risk or scale of each health effect for each of the different sources of noise and to ensure that the mitigation strategy, within the context of Government policy on sustainable development, meets the aims of the Government's noise policy, namely to: "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."

## **Quantifying the effects of air quality on health and wellbeing**

- 12.6.27 It is now well understood that long term exposure to PM2.5 and NO2 is associated with health effects, including premature mortality. Methods are available that would allow a change in concentrations within an exposed population to be expressed in terms of specific health effects such as premature mortality and hospital admissions. In circumstances where any air quality changes are obviously very small and/or the exposed population is also small, then such quantification would lead to a conclusion that the health effects are inconsequential. The findings from the air quality assessment will be reviewed to determine whether quantitative assessment of health effects is merited, on the basis that the change in exposure would be sufficiently large to cause a consequential change in health outcomes, such as mortality rate.
- 12.6.28 The techniques for quantifying these health effects have been applied at the national level by the Committee on the Medical Effects of Air Pollutants (COMEAP) and also at local authority level by PHE, for example. These approaches can be adapted to quantify the effect that a change in NO2 or PM2.5 resulting from a development proposal is likely to have on health outcomes. This requires:
- knowledge of a reliable concentration response function (as recommended by the WHO, for example);
  - knowledge of the baseline rates of certain health outcomes in the population, e.g. mortality;
  - air quality dispersion modelling output, defining the change in exposure of PM2.5, PM10 or NO2 at all locations; and
  - the population numbers within the affected area.

## **Cumulative effects**

- 12.6.29 As outlined in Section 4.4 (Cumulative effects) of this SMR, the assessment will consider the interaction between the Proposed Scheme, Phase 2a and other existing and/or approved projects in the vicinity of the Proposed Scheme which are under construction or have been consented which may give rise to significant cumulative effects.

- 12.6.30 The health effects identified in the assessment will be considered in the context of the potential effects of future climate change. The potential for the combined impacts of the Proposed Scheme and climate change to increase the intensity of health effects will be considered.
- 12.6.31 Interactive effects between the different environmental topics will also be assessed.

## 12.7 Mitigation

- 12.7.1 During the assessment process, recommendations to address the negative effects and maximise the positive effects on health will be fed back to other EIA topics and the design team.
- 12.7.2 It is anticipated that the majority of potential design based interventions for health improvement will be incorporated through the scheme design and wider EIA process, for example, route design to avoid (where reasonably practicable) residential properties and other sensitive receptors, vertical alignment, incorporation of bunds and other measures to minimise the noise and visual effects of the alignment. This embedded mitigation will form part of the Proposed Scheme assessed in the EIA. Other, non-design related mitigation measures may be made in relation to the construction process and ongoing management and delivery of the Proposed Scheme. These will be incorporated into the CoCP and other HS2 strategies and policies as appropriate.
- 12.7.3 Local and central Government strategies, programmes and frameworks aimed at enhancing health and wellbeing will be reviewed and opportunities for the Proposed Scheme to align with these programmes will be identified, where practicable. Initiatives which HS2 Ltd is already pursuing, for example, in relation to community outreach, education and training will also be reviewed in relation to the scope of the health assessment and the potential for positive health outcomes.
- 12.7.4 The proposed means of incorporating health recommendations into the Proposed Scheme will be described. This may comprise the inclusion of specific measures within documents such as the CoCP or EMRs.

## 12.8 Assumptions

- 12.8.1 For assessment purposes it will be necessary to assume that the baseline characteristics established during the health assessment process will remain largely unchanged, as mentioned in Section 12.2 of this SMR. However, where it is possible to predict change this will be incorporated into the future baseline.
- 12.8.2 The community profiles will be limited by the extent of publicly available data and data obtained through consultation and engagement with communities.
- 12.8.3 The assessment will be supported by a review of published research, using the most up to date and credible sources. The strength of evidence is in some cases is well supported by

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research evidence and in other cases is weak or non-existent. Consequently, professional judgement will be necessary concerning the likely way in which potential health effects may occur.

## 13 Historic environment

### 13.1 Introduction

**Table 24 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 13	Throughout	Inclusion of references to equivalent stakeholders, policy/ guidance and terminology in Scotland.
Section 13.3	Consultation and engagement	Update to include engagement relevant to the Phase 2b Western Leg.
Section 13.6	Assessment methodology	Clarifications to factors considered in assessing the significance/value of heritage assets and in assessing impact magnitude.
Paragraph 13.6.2	Assessment methodology	Inclusion of updated guidance.

- 13.1.1 This section describes the methodology to be used in the assessment of the likely significant effects upon heritage assets and the historic environment affected by the construction and operation of the Proposed Scheme.
- 13.1.2 Heritage assets are defined by the Government in the NPPF Annex 2 Glossary as: ‘A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions. Heritage assets include designated heritage assets and assets identified by the local planning authority (including local listing)<sup>144</sup> Historic Environment Policy for Scotland<sup>145</sup> (HEPS) defines an asset (‘historic asset’ or ‘heritage asset’) as ‘a physical element of the historic environment – a building, monument, site, place, area or landscape identified as having cultural significance’. The significance of a heritage asset is referred to throughout the ES as the asset’s ‘heritage value’.
- 13.1.3 Heritage assets include those that are designated under legislation (refer to the NPPF Annex 2 Glossary ‘Designated heritage assets’) as well as those that are non-designated. Non-designated assets include heritage assets identified as such by local authorities through their inclusion within the local Historic Environment Record (HER) and those that are identified from other sources during the course of research and survey. Non-designated heritage assets of archaeological interest that are of ‘demonstrably equivalent significance’ to scheduled monuments, are considered subject to the policies for designated heritage assets<sup>146</sup>.

<sup>144</sup> Department for Communities and Local Government (2012), *National Planning Policy Framework*, Annex 2: Glossary p52.

<sup>145</sup> Historic Environment Scotland (2019). *Historic Environment Policy for Scotland*.

<sup>146</sup> Department for Culture, Media and Sport (2013). *Scheduled Monuments and nationally important but non-scheduled monuments*. sites under the Ancient Monuments and Archaeological Areas Act 1979.

- 13.1.4 The NPPF Annex 2 Glossary defines the historic environment as: 'All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora'.
- 13.1.5 Historic environment is generally and most easily divided into three key areas as follows:
- archaeological and paleoenvironmental remains including geological deposits that may contain evidence of the human past;
  - historic landscapes; and
  - built heritage comprising historic buildings and the historic built environment.

## 13.2 Establishment of baseline

- 13.2.1 The baseline to be assessed is that which is current at the time of the commencement of the ES, or at subsequent refresh points up to the date of publication.
- 13.2.2 Work will be undertaken in accordance with the appropriate legislation, together with standards guidance and good practice advice provided by Historic England, Historic Environment Scotland, and the Chartered Institute for Archaeologists (CIfA).
- 13.2.3 While the Proposed Scheme passes through a largely rural environment of variable historical characteristics, it terminates at a station in an urban environment. In the process of data gathering it is recognised that there are interfaces with other disciplines, for example ecology, water resources and flood risk, sound, noise and vibration, landscape and visual and community. These interfaces will be actively addressed as part of the EIA process to ensure that an integrated assessment is undertaken.
- 13.2.4 Data in respect of heritage assets will be collected for the following designated and non-designated assets:

### **Designated assets:**

- World Heritage Sites;
- listed buildings (Grade I, II\* and Grade II in England and Category A, B and C in Scotland);
- scheduled monuments;
- registered parks and gardens in England, inventory gardens and designed landscapes in Scotland;
- conservation areas; and
- registered historic battlefields in England, inventory battlefields in Scotland.

## **Non-designated assets:**

- non-designated historic buildings, structures and built monuments including:
  - locally listed buildings;
  - buildings, structures and monuments included in the HER; and
  - buildings identified from desk-based research or fieldwork.
- non-designated archaeological or historic landscape sites including:
  - archaeological sites recorded in the HER and/or the Historic England Archives or Historic Environment Scotland dataset;
  - archaeological and other heritage assets predicted or known from desk-based research or fieldwork;
  - paleoenvironmental remains and geological deposits predicted or known to contain evidence for the human past;
  - known historic settlements including those identified as being of archaeological interest;
  - non-designated historic parks, gardens and battlefields; and
  - non-designated assets determined to be of national importance by the Secretary of State.

### 13.2.5 Baseline data sources will include:

- details of designated sites held by Historic England and Historic Environment Scotland;
- local authority conservation area appraisal and management documents and their mapping;
- records of ancient woodland maintained by Natural England, Defra and the Forestry Commission;
- historic landscape characterisation (HLC) mapping undertaken by local planning authorities;
- national historic landscape characterisation (NHLC) mapping and data held by the Archaeology Data Service (ADS);
- Historic Land-use Map and Historic Land-use Assessment data in Scotland;
- HER data, held by local planning authorities;
- National Record of the Historic Environment held by Historic England;
- Canmore National Record of the Historic Environment held by Historic Environment Scotland;
- aerial photographs and satellite images held by Historic England, Historic Environment Scotland, local authorities, and other appropriate repositories;
- historic geological mapping and borehole information as held by the British Geological Survey;



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- documentary, cartographic and other resources as deposited within local studies libraries, county and national records libraries and archives, including historic Ordnance Survey maps, tithe, estate and other maps, and other relevant primary sources;
- readily available published and unpublished sources, building surveys and gazetteers;
- data sets held by other bodies, such as Canal & River Trust and the National Trust who have specific data on the assets for which they have a responsibility;
- local authority or ecclesiastic sources such as faculties, historic maps and documentary sources for burial grounds; and
- urban characterisation reports, extensive urban surveys (EUS) and urban archaeological databases (UADs) held by Historic England and local planning authorities.

13.2.6 As a minimum, data collected during the EIA process will include:

- data from preliminary works such as boreholes or test pits;
- data from a programme of non-intrusive survey;
- data from high resolution satellite imagery, multi and hyperspectral and light detection and ranging (LiDAR) aerial survey;
- data from previous intrusive studies, for example coring, trial trenching and building survey;
- data in respect of the zone of theoretical visibility (ZTV) as identified by the landscape and visual assessment, where this is available (see Section 10 Landscape and visual); and
- data obtained through field visits (site visit and walkover surveys), from PRoW, or from private land where access has been previously arranged and approved.

13.2.7 The scope of non-intrusive, and potentially intrusive survey (subject to land access) is to be developed and agreed in consultation with Historic England, Historic Environment Scotland, and other appropriate bodies including Local Authority Archaeological and Conservation Officers. HS2 Ltd has prepared Technical Note: Historic environment - Risk based approach to prioritising archaeological surveys (provided in Annex H of this SMR) setting out a risk based methodology required to prioritise areas of the Proposed Scheme for additional archaeological survey beyond field visits for the ES. In addition to this approach to archaeological survey, a pragmatic approach to surveys, where land access is forthcoming, will be considered. This will be outlined in the ES.

13.2.8 A technical note that outlines the historic landscape assessment methodology is provided in Annex H of this SMR, to reflect an updated position in relation to the availability of NHLC data, since completion of Phase One and Phase 2a ESs. Both the landscape and visual and historic environment assessments will reference NHLC data, as this is a common resource to both methodologies.

## Study area

13.2.9 The Proposed Scheme study area for data gathering to identify impacts upon non-designated assets will encompass the entire land requirement of the Proposed Scheme plus

500m either side in rural areas and 250m in urban areas. The study area for data gathering to identify impacts upon designated heritage assets, and to understand the historic landscape, will be 2km either side of the land required in rural areas and urban areas. Professional judgement will be used to determine the extent to which assets within the 2km study area require a detailed assessment of effects. The assessment of effects arising from changes within the setting of heritage assets will start by identifying those assets within the 2km study area likely to be affected by the Proposed Scheme. The setting of designated assets within the study area will be cross-referenced to the ZTV, although it is recognised that setting effects may also arise outside of the ZTV.

- 13.2.10 The study area for designated and non-designated assets in the vicinity of bored or mined tunnels will be 100m either side of the extent of tunnelling to allow assessment of the impact of ground movements/settlement on heritage assets.

## **13.3 Consultation and engagement**

### **Engagement as part of the EIA process**

- 13.3.1 Consultation and engagement will be undertaken with Historic England, Historic Environment Scotland as well as the Local Authority Archaeological Officers and Conservation Officers or their equivalents for Cheshire East, Cheshire West and Chester, Warrington, Greater Manchester, Manchester City, Trafford, and Dumfries and Galloway.
- 13.3.2 The National Trust, the Canal & River Trust and the Gardens Trust will also be consulted and engaged with, particularly in relation to Dunham Massey and Tatton Park in Cheshire. Engagement will take place with these organisations and other relevant parties that make representations to HS2 Ltd with reference to the Proposed Scheme during the EIA process.

## **13.4 Key aspects of the Proposed Scheme for the topic**

- 13.4.1 Key aspects of the Proposed Scheme for this topic include:
- construction works which require the physical excavation of, demolition or removal of, or alteration to heritage assets;
  - settlement of heritage assets resulting from tunnelling, deep excavations or construction of retaining walls;
  - protection of heritage assets during construction activities;
  - temporary setting effects on heritage assets during construction;
  - permanent setting effects on heritage assets arising from construction or operation;
  - ground disturbance caused by the implementation of ecological and other mitigation measures;
  - vibration effects upon heritage assets during both construction and operation;

- increased noise effects upon heritage assets where a particular level of noise forms a part of the assets setting during both construction and operation;
- damage to waterlogged deposits through changes to groundwater regimes following construction;
- impacts on the long-term viability of heritage assets as a result of changes in access and/or use;
- beneficial impacts on heritage assets through the removal or alteration of negative aspects of elements of the assets setting; and
- beneficial impacts where conservation and reinstatement of heritage assets is undertaken.

## 13.5 Scope of assessment

- 13.5.1 Effects to be assessed are direct and indirect, temporary, permanent and cumulative. Each of these is examined below in the context of the historic environment assessment to be presented in the ES. Effects can be both adverse and beneficial.
- 13.5.2 A direct effect is one that will occur to the physical fabric or land of an asset and its curtilage, and any effect upon the setting of that asset arising directly from the Proposed Scheme.
- 13.5.3 An indirect effect is one that might arise as a consequence of the construction or operation of the Proposed Scheme by, for example, adversely affecting viability of land leading to dereliction of buildings, or beneficial effects through changes in the management or land use of archaeological or historic landscape features.
- 13.5.4 A permanent effect will occur, for example, as a result of the construction and operation of the Proposed Scheme including the permanent works for the railway. A permanent effect is not reversible and may (by definition) result in the permanent loss of, or harm to, a heritage asset including loss of or change to its setting. Alternately it may have a beneficial effect through change in land management and associated agricultural practices, or through the removal of negative aspects of the assets' setting.
- 13.5.5 Temporary activities such as soil storage, contractors' site compounds and access routes, as well as the activities associated with the erection of other facilities and structures, where the site will be returned to its former condition, may have temporary effects (for example on setting) or permanent effects (for example where sub surface deposits are affected).
- 13.5.6 A cumulative effect may result from either a combination of effects arising from the Proposed Scheme (intra-project effects), for example where changes to noise levels and views affect a heritage asset; or from an interaction between the effects of the Proposed Scheme with the effects of other developments (inter-project effects), for example where two project footprints affect the same heritage asset.

## **Spatial scope**

- 13.5.7 As noted in the Study area section (see above), the impact of the Proposed Scheme will be assessed on all heritage assets within 500m of the land required for the Proposed Scheme in rural areas, 250m in urban areas (which applies for cut and cover tunnels), and 100m either side of bored and mined tunnels.
- 13.5.8 The impact of the Proposed Scheme will be assessed on historic landscape character and designated heritage assets within an area of up to 2km either side of the land required. Professional judgement and the ZTV will be used to determine those assets within the 2km study area that are likely to be affected by the Proposed Scheme.

## **Temporal scope**

- 13.5.9 In addition to considering the effects of construction resulting from the Proposed Scheme, the historic environment assessment will consider effects relating to the operational phase. Construction works for the Proposed Scheme are anticipated to take place between 2025 and 2038 (including commissioning). Effects arising from the operation of the Proposed Scheme will be assessed taking into account the services to be expected when HS2 reaches maximum capacity.
- 13.5.10 The temporal scope of the assessment assumes a baseline with current conditions as of 2021.

## **Technical scope**

- 13.5.11 All heritage assets with the potential to be directly or indirectly affected by the Proposed Scheme will be considered. The heritage value of all heritage assets within the study area will also be considered. Where the Proposed Scheme is predicted to have an impact upon an asset, such that its heritage value would be affected, the magnitude of this impact will be assessed in line with the methodology below. Similarly, the resulting significance of effect will be assessed in line with the methodology below.
- 13.5.12 Ecological significance of veteran trees, historic hedgerows and ancient woodland along with the wider landscape is addressed in Section 10 (Ecology and biodiversity) and Section 15 (Landscape and visual). Ancient woodland and historic hedgerows also have historic environment interest and are included within the assessment of baseline conditions and effects on the historic landscape character.

## 13.6 Assessment methodology

### Legislation and guidance

- 13.6.1 Policy in respect of heritage assets in England is set out in the NPPF (Section 16: Conserving and enhancing the historic environment)<sup>147</sup>. These policies form the basis for the policies set out in the historic environment section of the National Policy Statement (NPS) for National Networks, paras 5.120 - 5.142 (Department for Transport, 2014)<sup>148</sup>. In Scotland relevant policies are set out in Scottish Planning Policy, 2014 'Valuing the Historic Environment' (paragraphs 135-151)<sup>149</sup>. HEPS is a policy statement directing decision-making that affects the historic environment in Scotland.
- 13.6.2 The practical application of these policy documents is presented following the approach in the International Council on Monuments and Sites (ICOMOS)<sup>150</sup> guidance on Heritage Impact Assessments for Cultural World Heritage Properties (see below) and Conservation Principles, Policies and Guidance published by English Heritage (now Historic England) in 2008 (see below). The resulting methodology is, therefore, informed by national planning policy and guidance in England and Scotland, and professional judgement.
- 13.6.3 In January 2011, ICOMOS issued guidance on Heritage Impact Assessments for Cultural World Heritage Properties. Although specifically addressing World Heritage Sites and development impacts on their Outstanding Universal Value, the document provides an approach to assessment and evaluation of impact.
- 13.6.4 Conservation Principles, Policies and Guidance was published by English Heritage (now Historic England) in 2008, with an update issued for consultation in 2017. The guidance sets out the key principles behind sustainable management of the historic environment, as well as establishing the key aspects of the value of heritage assets<sup>151</sup>.
- 13.6.5 Historic England Good Practice Advice Note 2<sup>152</sup>, (Managing Significance in Decision-Taking in the Historic Environment) discusses how national planning policy should be implemented in

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<sup>147</sup> Department for Communities and Local Government (DCLG) (2019), *National Planning Policy Framework*. DCLG, Bressenden Place, London.

<sup>148</sup> Department for Transport (2014), *National Policy Statement for National Networks*. Available online at: [www.gov.uk/government/publications](http://www.gov.uk/government/publications).

<sup>149</sup> The Scottish Government (2014), *Scottish Planning Policy*. Available online at: [www.gov.scot/publications/scottish-planning-policy/](http://www.gov.scot/publications/scottish-planning-policy/).

<sup>150</sup> ICOMOS (2011), *Heritage Impact Assessments for Cultural World Heritage Properties*. ICOMOS, 49-51 rue de la Fédération 75015 Paris, France.

<sup>151</sup> Historic England (2008), *Conservation Principles – Policies and Guidance for the Sustainable Management of the Historic Environment*. English Heritage, Waterhouse, London, (a consultation draft for an update of this guidance was issued in November 2017).

<sup>152</sup> Historic England (2015), *Historic Environment Good Practice Advice Note 2: Managing Significance in decision-taking in the historic environment*. English Heritage, Waterhouse, London.

development projects. Good Practice Advice Note 3, 2nd edition<sup>153</sup> (The Setting of Heritage Assets) sets out an approach to the analysis and assessment of setting and its relationship to the heritage significance of an asset. Equivalent guidance for Scotland is provided in Managing Change in the Historic Environment: Setting (Historic Environment Scotland 2020)<sup>154</sup>.

- 13.6.6 In addition, in February 2018, Historic England provided an advice note on Listed Buildings and Curtilage<sup>155</sup>, which details advice regarding the assessment of the extent of the curtilage of a listed building and buildings and other structures that predate July 1948 that fall within this curtilage.
- 13.6.7 The NPPG contains a section on Conserving and enhancing the historic environment<sup>156</sup> and further guidance is provided in Scotland in Planning Advice Note 2/2011: Planning and Archaeology<sup>157</sup>.

## Field visits

- 13.6.8 Field visits within the study area will comprise field inspections to identify heritage assets and their setting and to examine the character and form of the historic landscape. The purpose of the survey will be to verify the baseline research, assess the setting, nature and condition of known heritage assets and identify previously unidentified assets which may be affected by the Proposed Scheme. These activities will provide an understanding of the characteristics of the landscape and the assets that are contained within it and their contribution to the overall historic landscape within the study area. The field visits will be undertaken in accordance with the methodology set out in Good Practice Advice Note 3, referred to above and incorporated into Technical Note: Assessment of settings of heritage assets (provided in Annex H of this SMR).

## Approach

- 13.6.9 The methodology set out in the above legislation and guidance is summarised as follows:
- identify the baseline heritage assets (defined as all data collected from a range of desk-based sources and, as appropriate, surveys) and their setting;
  - assess the heritage value of the baseline assets and the contribution of their settings to this heritage value;

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<sup>153</sup> Historic England (2017), *Historic Environment Good Practice Advice Note 3, 2<sup>nd</sup> Edition: The Setting of Heritage Assets*. English Heritage, Waterhouse, London.

<sup>154</sup> Historic Environment Scotland (2020). *Managing Change in the Historic Environment: Setting*, Edinburgh.

<sup>155</sup> Historic England (2018), *Listed Buildings and Curtilage*, Historic England Advice Note 10.

<sup>156</sup> Department for Communities and Local Government (2016), Planning Practice Guidance. Available online at: <http://planningguidance.communities.gov.uk/>.

<sup>157</sup> The Scottish Government (2011), *Planning Advice Note 2/2011: Planning and Archaeology*.

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- identify and define the magnitude of impact and the significance of the effects;
  - if reasonably practicable, identify mitigation required and its methodology in terms of spatial extent and techniques to be employed; and
  - assess the Proposed Scheme's impact and its effect on the heritage value of the asset, including on the contribution to value made by its setting, taking into consideration any mitigation proposed.
- 13.6.10 Assets may be described as a group, where grouping can add value, clarity and proportionality to the historic environment reporting. Grouping in this context relates to the collective baseline consideration of a group of individual heritage assets that have overlapping designations, form a group of contemporaneous or contiguous assets, or are otherwise clearly interrelated. Identification of an asset group will not result in the creation of a new asset, or omission from the gazetteer of the individual assets within the group.
- 13.6.11 The risk of unviability of heritage assets will be assessed using professional judgement, taking account of impacts identified from other disciplines (e.g. community, agriculture and socio-economics). This will refer to existing national policy and guidance including the NPPF, NPPG, HEPS and Historic England's Conservation Principles.
- 13.6.12 Specific guidance on the assessment of setting is set out by Historic England and Historic Environment Scotland, as set out above. Setting is not simply a visual consideration and could be affected by changes to, for example, noise levels. Where relevant, the contribution of the existing sound environment to the heritage value of the asset will be identified and the potential change to this will be considered as part of the impact assessment process.

## Significance criteria

- 13.6.13 The heritage value of a heritage asset is defined as 'the value of a heritage asset to this and future generations because of its heritage interest. Heritage interest can be defined as archaeological, architectural, artistic or historic, or a combination of these. The heritage value of an asset derives not only from its physical presence, but also from its setting (after NPPF Annex 2, Glossary). Historic England defines 'significance' and 'heritage values' as being a collective term for the sum of all the heritage interests attached to a place, be it a building, an archaeological site, or a larger historic area such as a whole village or landscape<sup>158</sup>. In assessing the value of an asset, Historic England has outlined heritage interests; comprising evidential, historical, aesthetic and communal values. Equivalent definitions of 'cultural significance' are provided in HEPS.
- 13.6.14 Designated assets comprise any World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden or Inventory Garden and Designed Landscape, Registered or Inventory Battlefield, or Conservation Area designated under the relevant legislation. It should be noted that non-designated heritage assets may exhibit

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<sup>158</sup> Historic England (2008), *Conservation Principles – Policies and Guidance for the Sustainable Management of the Historic Environment*. English Heritage. Holborn, London.



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equivalent heritage value to those which have been granted statutory protection. Heritage assets with archaeological interest that are demonstrably of equivalent heritage value to scheduled monuments will be considered subject to the policies for assets that have been granted statutory protection.

- 13.6.15 The setting of a heritage asset is defined as: 'The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral' (NPPF Annex 2, Glossary).
- 13.6.16 Taking these criteria into account, each identified heritage asset will be assigned a level of heritage value in accordance with a four-point scale as shown in Table 25. This table provides guidance as to heritage value, but professional judgment will be applied in all cases regarding the appropriate category for individual heritage assets. Where it is assessed that an asset is of greater or lower heritage value than noted in the guidance table, justification will be provided within the ES.
- 13.6.17 The nature and character of conservation areas varies greatly from urban areas to houses set in country parks. The special character of these areas comes not only from the quality of their buildings but also from elements that provide value and character to the wider landscape. In consideration of this, conservation areas are included in both the high and moderate value categories and professional judgement will need to be applied in order to determine to which asset category a conservation area belongs. Grade II and Category C listed buildings are of national importance, having met national criteria for designation. However, similarly, the nature and character of these listed buildings varies. Policy and guidance both acknowledge that listed buildings have relative heritage value depending on grade (NPPF paragraph 132, Scotland's Listed Buildings<sup>159</sup> and the Principles of Selection for Listed Buildings<sup>160</sup>). Grade II and Category C listed buildings have therefore also been included in both the high and moderate value significance categories and professional judgement will be applied in order to determine which category to apply.

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<sup>159</sup> Historic Environment Scotland (2019). *Scotland's Listed Buildings*.

<sup>160</sup> Department of Digital, Culture, Media, and Sport (2010), *Principles of Selection for Listed Buildings*.



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**Table 25 - Factors for assessing the value of heritage assets**

Value	Asset categories
High	World Heritage Sites Grade I and Grade II* Listed Buildings, Category A and B Listed Buildings Grade II and Category C listed buildings (as appropriate) Grade I and Grade II* registered parks and gardens (and inventory gardens and designed landscapes, as appropriate) Scheduled monuments Registered/ inventory battlefields Conservation areas (as appropriate) Non-designated heritage assets (archaeological sites, buildings, monuments, parks, gardens or landscapes) that can be shown to have demonstrable national or international heritage value Burial grounds and cemeteries Well preserved historic landscape character areas, exhibiting considerable coherence, time-depth or other critical factor(s)
Moderate	Grade II and Category C listed buildings (as appropriate) Conservation areas (as appropriate) Grade II registered parks and gardens and inventory gardens and designed landscapes Non-designated heritage assets (archaeological sites, buildings, monuments, parks, gardens or landscapes) that can be shown to be of regional importance (value) Historic townscapes with historic integrity in that the assets that constitute their make-up are clearly legible Averagely well-preserved historic landscape character areas with reasonable coherence, time-depth or other critical factor(s)
Low	Non-designated heritage assets (archaeological sites, buildings, monuments, parks, gardens or landscapes) that can be shown to be of limited or of local interest only (value) Locally listed buildings as recorded on a local authority list Assets whose heritage value are compromised by poor preservation or survival or of contextual associations to justify inclusion into a higher grade Historic landscape character areas whose value is limited by poor preservation and/or poor survival of contextual associations
Not significant	Assets identified as being of no historic, evidential, aesthetic or communal interest Assets whose heritage values are compromised by poor preservation or survival or of contextual associations to justify inclusion into a higher grade Landscape with no or little significant historical interest

## Magnitude of impact

- 13.6.18 Impacts can be direct or indirect, and can be characterised in terms of timing, scale, duration, reversibility and the likelihood of the impact occurring. Impacts can be permanent or temporary and can be beneficial, neutral or adverse.
- 13.6.19 The magnitude of an impact can vary from 'high' to 'no change' as set out in Table 26, and can be beneficial or adverse.

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**Table 26 - Factors influencing the assessment of magnitude of impacts**

Impact rating	Description of impact
High	Change such that the value of the asset is totally altered or destroyed. Comprehensive change to elements of setting that make a positive contribution to the value of the asset, which result in harm to the value of the asset and the ability to understand and appreciate the asset 's value
Medium	Change such that the value of the asset is significantly altered or modified. Changes such that the setting of the asset is noticeably different, affecting value resulting in changes in our ability to understand and appreciate the value of the asset
Low	Change such that the value of the asset is slightly affected Changes to the setting that have a slight impact on value resulting in changes in our ability to understand and appreciate the value of the asset
Minimal	Changes to the asset that hardly affect value. Changes to the setting of an asset that have little effect on value and no real change in our ability to understand and appreciate the value of the asset
No change	The Proposed Scheme does not affect the value of the asset. Changes to the setting that do not affect the value of the asset or our appreciation of the value of the asset

## Significance of effects

- 13.6.20 Assessment of the significance of effects will take into consideration embedded mitigation associated with the Proposed Scheme, for example design changes, landscape planting, ecological compensation and noise barriers. It is recognised that some mitigation measures can themselves be a source of impact on heritage assets.
- 13.6.21 The assessment of the level of overall significance of the effect, taking into consideration embedded mitigation, is determined by cross referencing the heritage value of the asset (Table 25) and the magnitude of impact (Table 26) as shown in Table 27.

**Table 27 - Matrix for establishing overall significance of effect**

Value	Magnitude of impact				
	High	Medium	Low	Minimal	No change
High	Major	Major	Moderate	Minor	Neutral
Moderate	Major	Moderate	Minor	Minor	Neutral
Low	Moderate	Minor	Minor/Negligible	Negligible	Neutral
Not significant	Negligible	Negligible	Negligible	Negligible	Neutral

- 13.6.22 Major and moderate impacts are considered to be significant effects. The assessment of overall effect can be either adverse, neutral or beneficial.

## Construction effects

- 13.6.23 Construction effects will be assessed by establishing baseline conditions and assessing the impacts and effects of the relevant key aspects of the Proposed Scheme (outlined above) using the heritage value criteria described above. The assessment of impacts will include consideration of effects identified, or mitigation proposed, by other EIA topics; for example,

water resources and flood risk, sound, noise and vibration, landscape and visual, and ecology and biodiversity.

- 13.6.24 Effects on the heritage value of assets (such as those due to a change in their setting) that first occur during the construction phase, but continue to apply during operation, will be described with relevant reference to the temporal scope of the effect.

## **Operational effects**

- 13.6.25 The same process will be used for the assessment of operational effects as outlined for construction effects above.

## **Cumulative effects**

- 13.6.26 Cumulative effects may result from either a combination of effects arising from the Proposed Scheme (intra-project effects), for example, where changes to noise levels and views affect a heritage asset; or from an interaction between the effects of the Proposed Scheme with the effects of other developments (inter-project effects), for example where two project footprints affect the same heritage asset.
- 13.6.27 The intra-project effects will be considered as part of the assessment of indirect and direct effects during the construction and operational phases of the Proposed Scheme, described above.
- 13.6.28 The construction of the Proposed Scheme, combined with the developments that are already taking place or anticipated along the route of the Proposed Scheme, could result in increased pressure on heritage assets where areas of contiguous or contemporaneous archaeology or historic landscape assets are affected by the footprint of more than one development, or where different development proposals have a combined effect arising from the change in the setting of a heritage asset, for example, resulting in increased urbanisation. The criteria for the selection of developments included in the cumulative impact assessment are provided in Section 4.4 (Cumulative effects) of this SMR.

## **13.7 Assumptions**

- 13.7.1 Key assumptions for this topic are that relevant data will be available from the various archive and record holding bodies consulted (i.e. HERs, Historic England, Historic Environment Scotland, the National Record of the Historic Environment and Canmore National Record of the Historic Environment), records of designated sites (including the National Heritage list for England); and that collections of historic maps and other sources held by external record offices (such as local studies libraries, county and national archives) will be available.
- 13.7.2 It is assumed that all heritage assets within the land required for the construction of the Proposed Scheme will be removed unless expressly excluded within the ES.

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- 13.7.3 It is recognised that, within certain areas, access for heritage surveys will be restricted (e.g. to PRow) or will be denied. Surveys will, therefore, necessarily be constrained to those areas where landowner access is granted.
- 13.7.4 The assessment set out in this section of the SMR considers heritage assets from the perspective of the historic environment. The value of heritage assets from the perspective of other disciplines is covered in discipline specific sections. This could include assessing the value of heritage assets from a social, recreational, ecological and landscape points of view in Section 9 (Community), Section 10 (Ecology and biodiversity) and Section 15 (Landscape and visual) of this SMR, respectively. Baseline data common to more than one topic, for example, HLC data, may be referred to in more than one environmental topic assessment, but in the context of different methodologies and in relation to different receptors.

## 14 Land quality

### 14.1 Introduction

**Table 28 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraph 14.1.3	Land contamination	Section updated to include potential surface water contamination.
Paragraph 14.2.5	Establishment of baseline and definition of survey	“conceptual site model approach” updated to “conceptual model approach”.
Paragraph 14.2.6	Establishment of baseline and definition of survey	Updated to reflect revised guidance and model terminology.
Section 14.6	Assessment methodology	Updated significance criteria for receptors and mineral resources. Updated to reflect revised guidance.
Section 14.6	Table 20 Assessment methodology	Update to high sensitivity receptors, to include areas of future mineral extraction, where a licence is in place.

14.1.1 This section of the SMR covers land quality which includes the environmental topic areas of land contamination, mineral resources and sites of geological interest. These were considered within the Sustainability Statement and its updates within the wider topic of ‘Land use resources’.

14.1.2 In this context, ‘land contamination’ includes soil, gas and water contamination, i.e. releases to groundwater and surface water bodies. Wider issues of groundwater and surface water resources are contained within Section 21 (Water resources and flood risk) of this SMR.

### Land contamination

14.1.3 Land, surface water and groundwater along the route of the Proposed Scheme may have become contaminated through previous industrial or agricultural practices. Such land, surface water or groundwater could adversely affect people and the wider environment; including effects on groundwater quality, surface water quality and ecology.

14.1.4 Contamination may be present in topsoils, subsoil, made ground, deeper geology, groundwater or as ground gases/vapours. Construction of the Proposed Scheme will require excavation of the ground, cuttings and embankments, cut and cover and bored tunnelling, deep foundations, borings, temporary and permanent dewatering and other construction activities. Where the route crosses or lies close to existing sources of contamination, these activities could result in the mobilisation of the contamination, which would need to be assessed and mitigated.

14.1.5 The land quality section of the ES will present a baseline assessment of potentially contaminative current and historical land use. This will be based on available maps,

consultation and other information obtained along the Proposed Scheme. An assessment of temporary and permanent effects will then be made, including a screening and ranking of risk. Where appropriate, a range of measures will be proposed in order to mitigate the potential effects of contamination.

- 14.1.6 Contaminated land or groundwater currently present may already be causing environmental impairment. The purpose of the land quality assessment is to inform the EIA by assessing the possible impacts and significant effects arising from interaction with contamination. Construction and operation of the Proposed Scheme should manage existing contamination pre-dating the project and should not introduce new sources or pathways by which contamination can spread. Where there is a significant risk of this happening, the land quality assessment will consider mitigation measures to avoid this.
- 14.1.7 The land quality section will interact with the agriculture, forestry and soils (Section 6), health (Section 12), major accidents and disasters (Section 16), waste and material resources and water resources and flood risk (Section 21) of this SMR.

## **Geological and mineral features**

- 14.1.8 Along the route of the Proposed Scheme there may also be areas of land that have special geological significance, either from a scientific, or mineral resources point of view, such as:
- geological or geomorphological SSSI or Local Geological Sites (LGS);
  - currently permitted and proposed future mineral and resource extraction areas which may be compromised or sterilised by the construction and operation of the Proposed Scheme. These include;
    - designated mineral resources for example: Mineral Preferred Areas (MPA) and Mineral Safeguarding Areas (MSA);
    - designated shale gas and Coal Bed Methane exploration areas and areas subject to Petroleum exploration and production licences;
    - existing or proposed shallow, deep and opencast coal mining; and
    - existing or proposed brine extraction.

## **14.2 Establishment of baseline and definition of survey**

- 14.2.1 The method for determining the baseline conditions will involve access to a combination of the following:
- data collected for the Sustainability Statement;
  - analysis of the results of previous investigations, if readily available, carried out in the immediate area of the Proposed Scheme;
  - historical Ordnance Survey mapping;

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- published geological and hydrogeological mapping/information;
- data made available by local authorities, including the adopted Minerals Plans;
- Coal Authority environmental records, including environmental monitoring data;
- route-wide inspections of key sites, including depot areas, where access is available;
- Foot and Mouth Disease (FMD) and Anthrax burials data; and
- other relevant publicly available environmental data.

14.2.2 Documentary data are available from a number of governmental and non-governmental organisations including:

- Environment Agency;
- water companies;
- British Geological Survey;
- the Coal Authority;
- Network Rail;
- the Ministry of Defence (MoD);
- the Crown Estate;
- Public Health England (PHE);
- Animal and Plant Health Agency (APHA);
- Natural England;
- local geological trusts;
- mining and quarrying companies; and
- local authorities (including unitary authorities, county and district councils).

14.2.3 Much of the data is also held on commercial environmental databases. Site inspections at key sites will be used to supplement the documentary study data obtained.

14.2.4 Generally, a zone extending to 250m either side of the boundary of the land required for the construction of the Proposed Scheme including land required for construction of stations, depots, construction/storage sites and other land required for the works, will be reviewed. The extent of this zone has been developed using professional judgement on the basis that contamination migration beyond this distance is likely to be minimal or could be mitigated. This principle has been applied in assessing previous railway projects such as Crossrail and was used in the Phase One and Phase 2a assessments. The 250m zone may be widened where evidence suggests that it is required. The assessment of groundwater as a receptor will extend to 1km from the boundary of the land required for the construction of the Proposed Scheme.

14.2.5 A risk based approach in accordance with Defra and the Environment Agency guidance will be taken in assessing contamination which may have a significant effect upon the construction and operation of the Proposed Scheme, or upon the wider environment as a consequence of the Proposed Scheme. This will use the well-established conceptual model (CM) approach.

- 14.2.6 Intrusive investigations would be carried out after the completion of the ES and review of the desk study data, the Sustainability Statement and site inspections, therein: where the identified past uses of land indicate a high risk of previous significant contamination and potential risk to receptors. Such investigations would be undertaken in conjunction with geotechnical investigations in order to provide additional data upon which risks and impacts can be assessed and would be based upon the “Framework for Land Contamination Risk Management”<sup>161</sup>, BS10175: 2011<sup>162</sup>, BS 5930:2015<sup>163</sup>, BS 8576:2013<sup>164</sup> and the developed CM.
- 14.2.7 With regards to sites of geological interest, information will be obtained from Natural England, the British Geological Survey, The Coal Authority, local geological trusts and from local authorities (usually county councils) who may hold information on such sites.

## 14.3 Consultation and engagement

### Engagement as part of the EIA process

- 14.3.1 During the preparation of the ES, wider and more comprehensive consultation on land quality will be undertaken as appropriate, with the following organisations:
- Environment Agency;
  - Canal & River Trust;
  - Natural England (if ‘geological SSSI’ are affected);
  - Geoconservation UK and local geological trusts;
  - British Geological Survey;
  - Network Rail;
  - landfill and mineral abstraction companies;
  - the Coal Authority;
  - APHA;
  - Health and Safety Executive;
  - mining and quarrying companies;
  - local authorities (primarily Environmental Health Officers, Petroleum Officers/Fire Brigade and Contaminated Land Officers);
  - county councils; and
  - water companies.

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<sup>161</sup> Environment Agency (2020) *Framework for Land Contamination Risk Management which replaced Environment Agency and DEFRA (2004) “Model Procedures for the Management of Contaminated Land” (now withdrawn)*.

<sup>162</sup> British Standards Institute (BSi) (2011), *BS10175:2011 Investigation of potentially contaminated sites. Code of practice (+A2:2017)*, BSi.

<sup>163</sup> British Standards Institute (BSi) (2015), *BS5930:2015 Code of practice for ground investigations (+A1:2020)*, BSi.

<sup>164</sup> British Standard (2013), *BS8576:2013 Guidance on Investigations for Ground Gas*, BSi.



## **14.4 Key aspects of the Proposed Scheme for the topic**

- 14.4.1 There is the potential for contaminants to already be present on land that will be required for the Proposed Scheme. Contaminants could be disturbed during site clearance, movement of construction vehicles, and construction activities during the construction phase (e.g. ground disturbance, cuttings, removal of existing structures, construction of portals, tunnels or ventilation shafts). Soil and groundwater contamination may be present as a result of historical potentially contaminative activities at a particular location or as a result of current contaminative land uses.
- 14.4.2 Contaminated sites may exist in both urban and rural areas and may include localised industries, old and existing landfill sites, chemical works, sewage farms, mine sites, spoil heaps, and other land uses that will need to be assessed with respect to contaminative effects. Adverse effects can occur due to the presence of contaminant linkages, potentially resulting in an impact and/or harm to a sensitive receptor, for example, excavation into a landfill might allow leachate to impact a drinking water abstraction unless mitigation is undertaken.
- 14.4.3 The impairment or destruction of identified geological or geomorphological SSSI or LGS would be considered an adverse impact.
- 14.4.4 The sterilisation of identified mineral resources by the Proposed Scheme would be considered an adverse impact for which mitigation measures will be proposed, where reasonably practicable.

## **14.5 Scope of assessment**

- 14.5.1 The ES will assess the likelihood of existing contamination being encountered during the construction process, such that it could cause significant environmental harm or adverse health effects if not addressed adequately at the construction and/or operational stages.
- 14.5.2 The scope of the land quality assessment in the ES does not include assessment of ground instability and subsidence. These are considered as part of the design of the Proposed Scheme. Information on the approach to design of the Proposed Scheme will be set out in the ES. Measures to reduce subsidence will form part of the EMRs, as will survey and monitoring requirements for ground stability and settlement.
- 14.5.3 The construction of the Proposed Scheme will entail bringing materials onto site (such as fuel) which if spilt or leaked could result in new land or groundwater contamination. It is also possible that imported materials (such as sand, gravel and clay) could result in land or groundwater contamination if not properly sampled, tested, characterised and assessed for use at the site.
- 14.5.4 Impairment and sterilisation of geological and mineral resources will also be considered.

- 14.5.5 Although the maintenance of the Proposed Scheme, once it is operational, will be required to be in compliance with appropriate environmental legislation, the major operational sources of contamination will be reviewed and appropriate mitigation measures proposed in order to prevent future land, surface water or groundwater contamination. In addition, during the operational period, monitoring works (such as for groundwater, gas/vapours and leachate) may continue in order to demonstrate the effectiveness of any remedial works, or as part of a strategy of any agreed monitoring programmes, at specific sites.

## 14.6 Assessment methodology

### Legislation

- 14.6.1 Part 2A of the Environmental Protection Act 1990 (as amended)<sup>165</sup> provides a statutory definition of contaminated land: “contaminated land is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that – (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused”.

### Guidance

- 14.6.2 In the guidance that accompanies the Environmental Protection Act 1990, there is advice on what constitutes significant harm and what constitutes a significant possibility. The following reports provide further guidance on the risk assessment process, and introduce the Contaminated Land Exposure Assessment (CLEA) model:
- Land Contamination Risk Management (Environment Agency);
  - Guidance on the legal definition of contaminated land<sup>166</sup>;
  - Human Health Toxicological Assessment of Contaminants in Soil<sup>167</sup>;
  - Updated Technical Background to the CLEA Model<sup>168</sup>; and
  - Guiding Principles on Land Contamination<sup>169</sup>.
- 14.6.3 The impacts associated with contaminated land are generally assessed by means of a source/contaminant-pathway-receptor methodology in accordance with the framework for

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<sup>165</sup> *Environmental Protection Act 1990*. London, The Stationery Office.

<sup>166</sup> Department of Environment, Food and Rural Affairs (Defra) (2008), *Guidance on the legal definition of contaminated land*.

<sup>167</sup> Environment Agency (2008), *Science Report – SC050021/SR2 - Human Health Toxicological Assessment of Contaminants in Soil*, Environment Agency.

<sup>168</sup> Environment Agency (2008), *Science Report – SC050021/SR3 - Updated Technical Background to the CLEA Model*, Environment Agency.

<sup>169</sup> Environment Agency (2010), *Guiding Principles on Land Contamination*, Environment Agency.

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Land Contamination Risk Management which has replaced CLR11<sup>170</sup>, and as detailed in BS10175: 2011. CLR11 introduced the concept of a conceptual site model to identify and assess contaminant linkages and this was further updated by the revised Part 2a Contaminated Land Statutory Guidance (2012)<sup>171</sup>. The following definitions apply:

- contaminant: contamination that has the potential to cause unacceptable adverse impacts to a receptor. It may comprise chemical, biological or physical agents.
- receptor: a target that may be affected by contamination; examples include human occupants or users of the site, water resources or structures; and
- pathway: a route whereby a contaminant may come into contact with the receptor; examples include ingestion of contaminated soil and leaching of contaminants from soil into water resources.

## Significance criteria

14.6.4 The previously described approach forms the basis of the methodology to be used in the assessment of land quality. For contamination to present a significant potential effect, a contaminant linkage must first be established using the CM approach. The likelihood must be demonstrated that there is an identifiable source of contamination (be it an onsite or off site source), receptors and a viable pathway through which the former may affect the latter.

14.6.5 The sensitivity of potential receptors to contamination and geological/mineral resources can be described qualitatively according to the categories shown in Table 29 and Table 30 below.

**Table 29 - Criteria for assessing contamination receptor sensitivity**

Receptor sensitivity	Receptor
High	Residential areas, schools and playing fields Surface water bodies of high quality <sup>172</sup> and/or Principal aquifers <sup>173</sup> Nationally designated areas e.g. SSSI
Moderate	Retail and business parks (public and work places) Allotments and market gardens Surface water bodies of moderate quality, and/or Secondary A Aquifers Regionally designated areas e.g. local nature reserves or LGS
Low	Commercial or industrial development

<sup>170</sup> Environment Agency and DEFRA (2004), "Model Procedures for the Management of Contaminated Land", withdrawn in October 2020 and replaced with Environment Agency "Framework for Land Contamination Risk Management".

<sup>171</sup> Department for Environment, Food and Rural Affairs (2012), *Environmental protection Act 1990: Part 2A. Contaminated Land Statutory guidance.*

<sup>172</sup> As defined in the Water Framework Directive (WFD) and Water resources section.

<sup>173</sup> As environmental receptors themselves and to human health via abstracted public water supplies.

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Receptor sensitivity	Receptor
	Surface water bodies of low quality <sup>174</sup> , Secondary B and undifferentiated aquifers

**Table 30 - Criteria for assessing resource sensitivity**

Value of Resource	Resource <sup>175</sup>
Very high	Mineral resource of national importance (strategic) currently being worked (where a licence to extract is in place, if applicable) or where planning permission or consent has been granted for future extraction Geological or geomorphological SSSI of international importance
High	Non-strategic mineral resource currently being worked, or Specific Sites/Preferred Area for mineral works within a Mineral Planning Authority's (MPA) Local Plan Geological or geomorphological SSSI
Medium	Mineral Safeguarding Areas within a MPA Local Plan LGS (Local Geological Sites)
Low	Mineral Consultation Areas <sup>176</sup> within a MPA Local Plan, or other areas of mineral with no MPA Local Plan designation Other local geological conservation resource

- 14.6.6 Construction and/or maintenance workers are not included in the list of receptors, as it will be a fundamental requirement that any construction/maintenance workers on the project are adequately protected from the effects of any contamination by the measures in the CoCP via project specific health and safety plans and procedures which will be put in place prior to the construction phase. This will include construction workers' temporary accommodation sites. Railway users are considered to be protected from any residual land quality impact by ensuring the design of the Proposed Scheme provides suitable protection measures built into structures and public areas.
- 14.6.7 Furthermore, new utilities built within the boundary of existing highway construction and within road sub-base materials or natural ground below are also scoped out of the assessment as they present a very low risk of interacting with contaminated sites nearby and causing an impact on sensitive receptors such as housing or aquifers.
- 14.6.8 The magnitude of the effects of land contamination are assessed by comparing the difference in risk of each contaminant linkage at baseline to those at construction and at post construction stages. This provides a way of assessing both the adverse and beneficial

<sup>174</sup>Drains and unproductive strata are designated as having negligible sensitivity and value in the context of this assessment.

<sup>175</sup> Resource applies to both minerals and geological sites and is defined as a "mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licence (PEDLs), Shale Prospective Areas (SPAs) and sites of local geological interest".

<sup>176</sup> Although classified as low risk, MCAs should be excluded from the land quality assessment, owing to the significant geographical areas which they cover.

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effects during construction and the post construction period. An example of this is given in Table 31.

**Table 31 - Summary of temporary (construction) effects<sup>177</sup>**

Name and area ref	Receptor	Main baseline risk	Main construction risk	Temporary effect
Tank within farmyard at Upper Hanyards Farm 2-56	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Moderate/low to moderate	N/A (exposure pathways removed)	Moderate beneficial (significant)
	Human health (direct contact, ingestion and inhalation of vapours from contaminated water offsite)	Moderate	N/A (exposure pathways removed)	Moderate beneficial (significant)
	Controlled waters - groundwater	High	Moderate/low	Moderate beneficial (significant)
	Property (direct contact with contaminated soil and water)	Moderate/low	Very low	Moderate beneficial (significant)

14.6.9 The magnitude of potential Proposed Scheme impacts regarding land quality issues will be assessed using a four-point scale as shown in Table 32.

**Table 32 - Impact magnitude criteria<sup>178</sup>**

Impact magnitude	Criteria	Examples
High	Results in loss of attribute and/or likely to cause exceedance of statutory objectives and/or breach of legislation	Likely significant human health impact <sup>179</sup> , contamination of a Principal aquifer, or loss or isolation of strategic mineral resource
Moderate	Results in impact on integrity of attribute/or loss of part of attribute, and/or possibly cause exceedance of statutory objectives and/or breach of legislation	Reduction in the value of a feature, moderate human health impact, loss or isolation of regional/local mineral resource
Low	Results in minor impacts on attribute	Measurable change in attribute, but of limited size/proportion

<sup>177</sup> Taken from High Speed Two Ltd (2016), *High Speed Rail (West Midlands – Crewe) Working Draft Environmental Impact Assessment Report: Volume 2: Community Area 2 Report (Colwich to Yarlet)*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/552374/C8\\_web\\_tagged\\_07-09-16.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/552374/C8_web_tagged_07-09-16.pdf).

<sup>178</sup> Based on the Highways Agency (2008), *Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 2 Environmental Impact Assessment, Part 5 Assessment and Management of Environmental Effects*. Now replaced by DMRB (2019) *LA109 Geology and Soils*.

<sup>179</sup> Defined in *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Section 4.1)*. Her Majesty's Stationery Office, London.

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Impact magnitude	Criteria	Examples
Negligible	Results in no change or impact on attribute	No significant loss in quality of feature/attribute

- 14.6.10 The assessment of significance is based on the magnitude of the impact and the importance or sensitivity of the receptors/resources. The significance of the potential effects is identified, as well as those of the residual effects for geological and mineral impacts. Appropriate mitigation measures will be recommended in order to reduce/control any significant adverse effects on sensitive receptors. Once remediated, there should be no residual effects with respect to land contamination issues.
- 14.6.11 Effects have the potential to be adverse, beneficial or neutral. For example, in terms of beneficial effects, the Proposed Scheme may remove a source of contamination or it may break a pathway that currently links a source to a receptor.
- 14.6.12 The significance of the effect will be affected by:
- the value of the resource;
  - the sensitivity of the receptor;
  - the strength and length of the pathway; and
  - the size of the area affected.
- 14.6.13 Adverse and beneficial effects are further classified as being minor, moderate or major. Only moderate and major effects are considered significant and will be reported in the ES.
- 14.6.14 Table 33 summarises the criteria for assessing effect significance.

**Table 33 - Significance of effects criteria<sup>180</sup>**

Significance	Description
Major adverse	Considerable detrimental effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability/legislation/policy standards
Moderate adverse	Limited detrimental effect (by extent, duration or magnitude) that may be considered significant
Minor adverse	Slight, very short or highly localised detrimental effect
Neutral	No appreciable effect
Minor beneficial	Minor reduction in risk (slight, short or highly localised effect)
Moderate beneficial	Moderate reduction in risk
Major beneficial	Major reduction in risk <sup>181</sup>

<sup>180</sup> Generally based on the Highways Agency (2008), *Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 2 Environmental Impact Assessment, Part 5 Assessment and Management of Environmental Effects*, The Stationery Office.

<sup>181</sup> Defined in Technical Note: Detailed Methodology for Contaminated land Assessment (Annex I of this SMR).

## **Construction effects**

- 14.6.15 The impact of existing land contamination will predominantly occur during the construction phase. A fundamental requirement of the project will be to carry out sufficient mitigation or remediation of contamination such that, following construction, there are no continuing significant adverse effects from the contamination during the operational phase of the Proposed Scheme.
- 14.6.16 Remediation of contaminated land, and other construction activities, can lead to a number of secondary effects such as potential issues of dust migration and surface water impairment during the remediation and construction processes. Any such effects would be controlled through measures set out in the CoCP.
- 14.6.17 Where remediation of soil and groundwater is carried out for the Proposed Scheme, this would be regarded as a beneficial effect, as future risks to human health and the wider environment from the pre-existing contamination would have been reduced by the remedial works.

## **Operational effects**

- 14.6.18 The major operational sources of contamination will be reviewed, and appropriate mitigation measures proposed. In addition, during the operational period, monitoring works (such as for groundwater, gas/vapours and leachate) may continue in order to demonstrate the effectiveness of any remedial works at specific sites.

## **Cumulative effects**

- 14.6.19 The assessment of cumulative effects would be limited to those areas/sites at which contamination remediation is likely to be required and at which construction of the Proposed Scheme would be undertaken at the same time as nearby construction work being undertaken by others (i.e. not related to the Proposed Scheme) within an area of contaminated land.
- 14.6.20 Cumulative effects would also need to be taken into account, for example, when assessing the Proposed Scheme impact on mineral resources; effects at a local scale on a number of mineral resources may have a cumulative effect at a regional scale.
- 14.6.21 HS2 Phase 2a has the potential to materially alter the land quality baseline conditions. Where relevant, these effects will be considered in-combination with the Proposed Scheme and reported under the assessment of cumulative effects during construction.

## **14.7 Assumptions**

- 14.7.1 The semi quantitative assessment within this topic area considers land quality from the perspective of land contamination. It excludes soils quality from an agricultural or forestry

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perspective. Such an assessment will be found in Section 6 (Agriculture, forestry and soils) of this SMR.

- 14.7.2 Land contamination has the potential to affect groundwater resources. There will be significant interaction between the land quality and water resources assessments in order to determine the potential effects on the quality of groundwater from contaminated land. Wider issues of groundwater and surface water resources are contained within Section 21 (Water resources and flood risk) of this SMR.
- 14.7.3 Land contamination has the potential to affect ecological resources<sup>182</sup>. Other ecological issues are addressed in Section 10 (Ecology and biodiversity) of this SMR.
- 14.7.4 Remediation of contamination can lead to a requirement for treatment and/or disposal of contaminated materials. Issues of onsite treatment and re-use of contaminated materials will be dealt with in the land quality assessment whereas issues of the disposal of contaminated soils off site are dealt with in Section 20 (Waste and material resources) of this SMR.

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<sup>182</sup> *Environmental Protection Act 1990*: Part 2A Contaminated Land Statutory Guidance (Section 4.3). Her Majesty's Stationery Office, London.



## 15 Landscape and visual

### 15.1 Introduction

**Table 34 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 15.1	Landscape and visual - Introduction	Updated to include latest topic guidance.
Section 15.2	Establishment of baseline and definition of survey	Updated with route information.
Paragraph 15.4.5	Spatial scope	Update to spatial scope in relation to ZTV in urban areas.
Paragraph 15.5.6	Determining landscape character susceptibility to change	Revision of criteria used to determine landscape susceptibility.
Paragraph 15.5.14	Table 36 Landscape magnitude of change	Inclusion of a negligible magnitude of change.

- 15.1.1 This section of the SMR covers landscape and visual which includes the environmental topic areas of changes to landscape character and views. The definition of landscape is ‘an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors’ (European Landscape Convention (ELC) – Council of Europe 2000)<sup>183</sup>. Changes in views may result in a change in visual amenity experienced by people (visual receptors).
- 15.1.2 The ELC gives an inclusive definition of landscape with the need to take into account all landscapes, recognising that it is not just the special or designated places that have value but also ‘ordinary’ landscapes. For this assessment, the term ‘landscape’ encompasses rural, urban and peri-urban landscapes, all types and forms of open space and development in the countryside, villages, towns and cities, in line with the ELC.
- 15.1.3 The topic specific methodology presented in this section builds upon the general assessment methodology summarised in Section 4 (EIA methodology) of this SMR. This has been developed to take account of the range of likely significant environmental effects on the landscape and visual receptors arising from the construction, existence and operation of the Proposed Scheme. The methodology has also been designed to be consistent with the approach set out in the Guidelines for Landscape and Visual Assessment, 3rd Edition (‘GLVIA3’)<sup>184</sup>. Where relevant account has also been taken of the Design Manual for Roads

<sup>183</sup> Council of Europe, 20/10/2000 Florence, European Landscape Convention CETS No.: 176.

<sup>184</sup> Landscape Institute and Institute of Environmental Management and Assessment (2013), *Guidelines for Landscape and Visual Impact Assessment*. 3<sup>rd</sup> Edition. Routledge. New York.

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and Bridges (DMRB) LA 107 Sustainability and Environmental Appraisal<sup>185</sup>, Townscape Character Assessment, Technical Information Note, 05/2017<sup>186</sup>, An Approach to Landscape Sensitivity Assessment, Natural England<sup>187</sup> and LI TGN 06/19 Visual Representation of Development Proposals<sup>188</sup>.

- 15.1.4 The process for the landscape and visual assessment is illustrated in Figure 8 below. Each stage of the assessment process is then described in more detail through the following sections. A key principle is for the landscape baseline and the visual baseline to first be identified and understood before assessment takes place. The assessment of significant effects is a judgement based on a combination of receptor sensitivity and magnitude of change.

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<sup>185</sup> Highways England (2019), *Design Manual for Roads and Bridges: LA 107, Sustainability & Environmental Appraisal*. London: The Stationery Office.

<sup>186</sup> Landscape Institute (2017), *Townscape Character Assessment, Technical Information Note, 05/2017*. Landscape Institute. London.

<sup>187</sup> Natural England (2019), *An Approach to Landscape Sensitivity Assessment – to inform spatial planning and land management*. NE724.

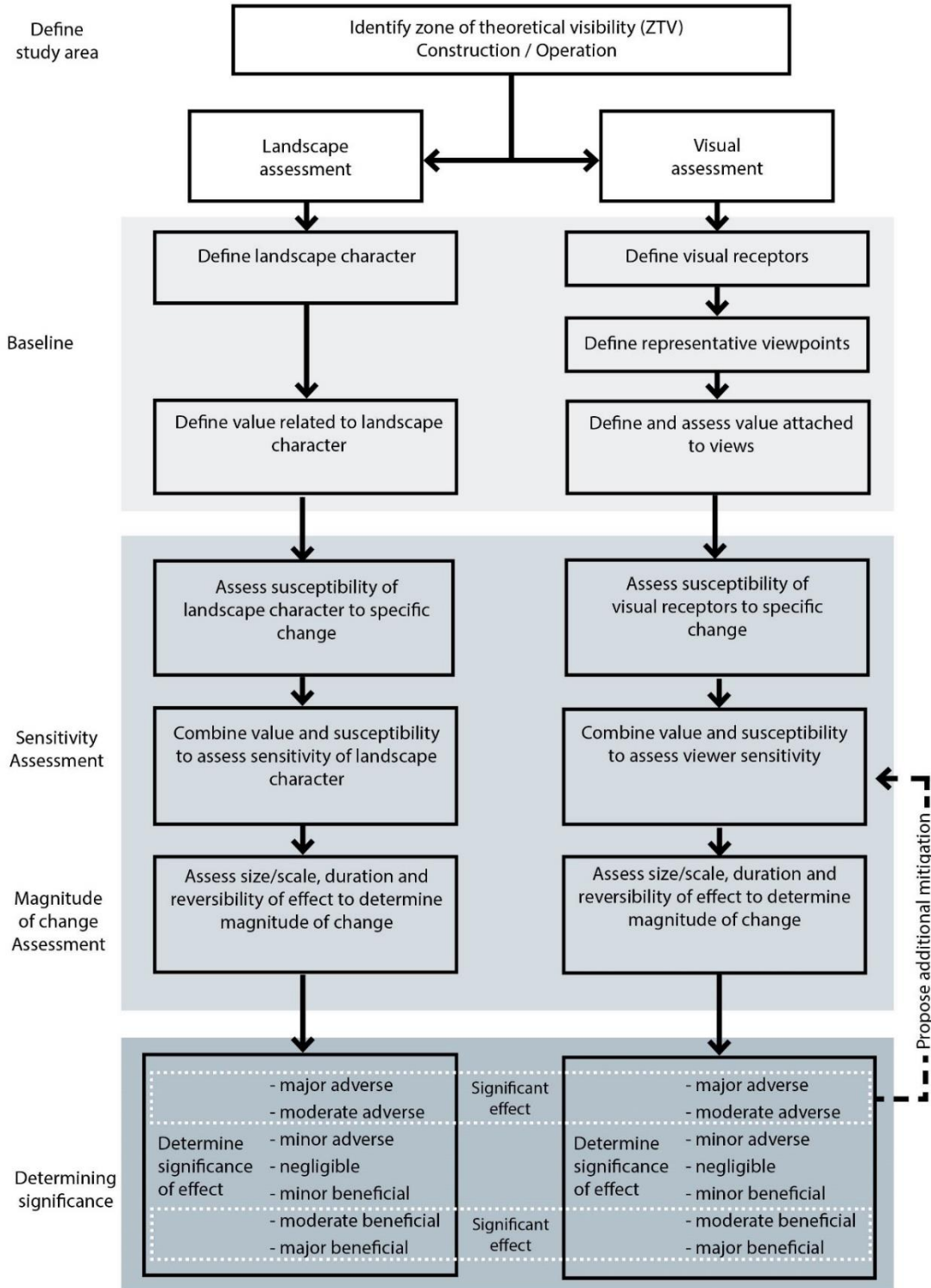
<sup>188</sup> Landscape Institute (2019), *Visual Representation of Development Proposals, Technical Guidance Note 06/19*, Landscape Institute, London.

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**Figure 8 - Assessment process for the landscape and visual assessment**



## 15.2 Establishment of baseline and definition of survey

- 15.2.1 The Proposed Scheme will pass through a wide range of different landscape character areas between the rural and agricultural landscapes of Cheshire and Lancashire, as well as the city of Manchester. The overall character of the study area from south to north is as follows:
- the 19th century landscape of Crewe and the area around Crewe Station;
  - the rural landscapes of East Cheshire and West Cheshire between Sandbach and Winsford;
  - the rural woods and farmland surrounding Arley and Ashley in Cheshire East;
  - the Manchester Ship Canal; and
  - Manchester city centre through which the route will run to terminate in a new station alongside Manchester Piccadilly Station, with a spur crossing the M62 west of Manchester to join the conventional rail network.
- 15.2.2 The landscape character of the study area and the nature of existing views will be established through desk-based research, field survey and reviews of consultation responses, including those on the Sustainability Statement and its updates.
- 15.2.3 The landscape and visual surveys will be carried out by Chartered Landscape Architects experienced in EIA. Surveys and Assessments made will be verified by at least two other Chartered Landscape Architects experienced in EIA. Survey work will be carried out in both winter and summer, in order for seasonal change to be considered in the assessment. The survey work will be undertaken in a methodical order as follows:
- verification of the zone of theoretical visibility (ZTV) to inform the study area (see Section 15.4 Scope of assessment - Spatial Scope);
  - definition and verification of the landscape character (in consultation with relevant disciplines such as historic environment and ecology and reviewing and adapting information in existing landscape character assessments);
  - assessment of the value of the landscape;
  - assessment of the susceptibility of the landscape character to the specific changes arising from the scheme;
  - assessment of the sensitivity of the landscape character based on value and susceptibility;
  - definition of groups of visual receptors (people who may be affected by the Proposed Scheme) and definition of representative, specific and illustrative viewpoints within the ZTV;
  - definition of the type and nature of the view from each viewpoint;
  - determination of the value of each of the viewpoints (where published information is available);

- assessment of the viewer's susceptibility to change in the view at each of the viewpoints;
- assessment of the sensitivity of the viewer based on value and susceptibility; and
- consideration of size/scale, geographical extent, duration and reversibility to determine the magnitude of change for landscape character and views.

15.2.4 The field study will include a comprehensive photographic record carried out in both the summer and winter, to illustrate the landscape character and viewpoints.

## **Landscape baseline**

15.2.5 The landscape baseline will include an overview of the elements that form the baseline within the study area, using text and plans to describe:

- topography, drainage, water bodies and geology;
- cover, distribution and type of land use (past and present) and open space;
- statutory and non-statutory designations relevant to the landscape and visual assessment, with consideration of appropriate special qualities for which they are designated and setting issues;
- development patterns and scale, including age, relationship to historic patterns, massing and density of buildings, levels of enclosure, skyline characteristics, building materials and landmark features;
- vegetation patterns and extents derived from aerial photography and site visits, plus use of Integrated Habitat Survey/Phase 1 Ecological Survey;
- access and connectivity, including PRoW, National Trails public access land, and other routes to include roads, railways, cycleways, bridleways, footpaths, historic green lanes and drovers roads and waterways;
- historic landscape and heritage assets and areas, including conservation areas, listed buildings, registered parks and gardens and the use of historic landscape characterisation (HLC); and
- existing landscape character assessments, designated landscape management plans (where appropriate), local landscape designations, local green infrastructure strategies or plans prepared by authorities, National Character Areas and Profiles from Natural England.

## **Landscape character assessment and ascribing landscape value**

15.2.6 The landscape baseline elements will be used to prepare a character area assessment covering the full extent of the study areas. Landscape character areas are defined as areas with broadly homogenous characteristics<sup>189</sup>. The identification of character areas will be

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<sup>189</sup> The approach used for this is consistent with that set out in Natural England (2014), *An Approach to Landscape Character Assessment*.

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influenced by published character assessments, including those prepared at national, county and district scales, plus the work undertaken by other assessment topics, such as Historic environment (Section 13). If these are sub-divided to create units of character appropriate to the scale of the Proposed Scheme, this will be clearly set out in the ES. This landscape characterisation work will be informed by a review of Historic Landscape Character Areas (HLCA) that will be identified under the historic environment topic and will in turn be informed by HLC studies. It will also be informed by targeted field survey. The character area boundaries generally represent zones of transition although they may be aligned with specific natural or built landscape features (particularly in urban areas) and will rarely coincide with political or administrative boundaries.

- 15.2.7 The character of each landscape character area will be described with reference to the following six criteria, which also inform the discussion on landscape value:
- geology, landform, hydrology and soils;
  - land cover, fauna and flora;
  - cultural, social and historic;
  - associations and memories;
  - aesthetic qualities; and
  - perceptual and experiential qualities.
- 15.2.8 For each criterion, the value will be determined using a five point scale (low/medium-low/medium/medium-high/high) using professional judgement with reference to site visits and existing documentation including local authority character assessments, historic landscape character assessments and conservation area character appraisals where available.
- 15.2.9 An overall level of value for each landscape character area will be determined by comparing the judgements made for each criterion described above and by bringing out the elements contributing most strongly to value, through use of professional judgement.
- 15.2.10 Further detail on the attributes that influence the value judgements for each criterion will be described in Technical Note: Approach to landscape susceptibility, value and sensitivity (provided in Annex J of this SMR). This will be developed through engagement with relevant environmental stakeholders.

## Visual baseline

### Identification of visual receptors and selection of viewpoints

- 15.2.11 Representative, specific and illustrative viewpoints will be selected to allow an assessment of effects upon visual receptors within the study area. Representative viewpoints will be selected to represent the experience of different types of visual receptor, where large numbers of viewpoints cannot all be included individually and where significant effects are

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unlikely to differ (e.g. for users of particular public footpaths and bridleways). Specific viewpoints will be chosen because they are key, and sometimes promoted, viewpoints within the landscape (e.g. for specific local visitor attractions or viewpoints with particular cultural landscape associations). Illustrative viewpoints will be chosen specifically to demonstrate a particular effect or specific issues (e.g. the restricted visibility at certain locations). Sequential views along PRoW, canals and other transport corridors will be identified in some cases where views of the Proposed Scheme would be progressively revealed.

15.2.12 Visual receptors will be divided into the following six categories:

- protected views;
- residential;
- recreational;
- hotel, healthcare and schools;
- transport; and
- employment.

15.2.13 All viewpoints will be agreed<sup>190</sup> wherever possible with local planning authorities and in consultation with other relevant stakeholders as appropriate, for example Historic England, the National Trust, Natural England, Forestry Commission and the Canal & River Trust.

15.2.14 Photographs taken during both winter and summer periods will be included in the ES for each viewpoint. The composition of the view will be described, including foreground, middle ground and background characteristics, the nature of the view towards the land to be acquired or used for the Proposed Scheme. Elements which obstruct the view (if anything) and whether a view is panoramic, framed, glimpsed or sequential (e.g. promoted long distance routes, canal paths), will also be described.

15.2.15 The view at night will be described in cases where significant effects arising from lighting during construction or operation are likely as described in Technical Note: Approach to night time 'darkness' survey and assessment (provided in Annex J of this SMR).

## Determining view value

15.2.16 For each viewpoint, any particular elevated value will be determined where appropriate using professional judgement and with reference to site visits and existing documentation relating to cultural links and significance, including any references in art and literature. Some views may be specifically recognised, for example in relation to heritage assets, or through planning designations.

15.2.17 The value of a viewpoint will also be determined through a review of consultation responses and through consultation with relevant disciplines, such as historic environment. A view will be identified as valued if it is recorded in a View Management Framework/Conservation Plan/Business Management Plan; or if the view is identified as an important view in a

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<sup>190</sup> Viewpoints cannot provide an exhaustive picture, hence the need for selection.



Conservation Area Appraisal; or a designed view important to the setting of a heritage asset (as recorded in the relevant citations accompanying any designation, and taking appropriate account of Historic England guidance on setting of heritage assets); or if the view is an advertised viewpoint which appears in a guide book, tourist map or interpretive material. In these instances, the information source and reasons for the value and importance of the view will be captured. Consideration of the level of popularity of the viewpoint, which may be reflected in provision of facilities for visitor enjoyment, will also inform the assessment of view value.

## **15.3 Consultation and engagement**

### **Engagement as part of the EIA process**

- 15.3.1 Consultees for this section of the ES will include (but not be limited to) local planning authorities, county councils, Natural England, Historic England, the National Trust, the Forestry Commission, the Canal & River Trust and other groups with appropriate technical knowledge.

### **Key aspects of the Proposed Scheme for the topic**

- 15.3.2 The main features of relevance to the landscape and visual assessment during construction include:
- construction sites (including vehicles, construction lighting);
  - construction plant, such as cranes;
  - site compounds and storage areas, including temporary fencing and signage;
  - earthworks (including temporary stockpiles or earth bunds);
  - construction of buildings and structures such as stations, headhouses, depots, tunnels, viaducts, overbridges and electrical apparatus;
  - construction of embankments, cuttings and associated drainage works, plus construction of balancing ponds;
  - demolition of existing buildings and structures and vegetation clearance, for example felling of woodland and trees, loss of hedgerows;
  - construction traffic, including use of existing roads as haul routes and the construction of bespoke routes, movement of excavated materials and movements on public roads; and
  - infrastructure and utility diversions.
- 15.3.3 The main features of relevance to the landscape and visual assessment during operation include:
- the track and track bed;
  - traffic (including trains and maintenance vehicles), and 'arcings' from trains;
  - the OLE, lighting, communication masts and signage;



- tunnel portals and ventilation shafts;
- viaducts and bridges (including both road and pedestrian);
- earthworks including cuttings, embankments, cut and cover 'green tunnels' and earthworks such as earth bunding and regrading works, much of which would assist with screening and integrating the Proposed Scheme;
- planting, for example new woodland, copse, specimen trees, hedgerows;
- balancing ponds and other drainage features plus new ecological ponds;
- noise barriers and visual screens;
- new and redeveloped stations, depot and infrastructure maintenance facilities;
- associated development such as road widening, junction changes and increased traffic, plus new permanent buildings such as tunnel headhouses and auto-transformer stations and auto-transformer feeder stations; and
- associated developments, such as utility and permanent road diversions or upgrading, plus diverted highways and footpaths.

## 15.4 Scope of assessment

- 15.4.1 The methodology for the landscape and visual assessment follows the guidance set out in the GLVIA3<sup>191</sup> and, where appropriate, the Design Manual for Roads and Bridges (DMRB)<sup>192</sup>, Townscape Character Assessment, Technical Information Note, 05/2017<sup>193</sup> and An Approach to Landscape Sensitivity Assessment, Natural England<sup>194</sup>.
- 15.4.2 The assessment will also draw upon other topic assessments where relevant, such as historic environment, ecology, community and health. The methodology in this section is compatible with these other topics to ensure that all data generated can be shared in a logical and transparent way. The methodology in this section describes the assessment process for effects on landscape character, the physical landscape and on visual receptors. Section 13 (Historic environment) of this SMR will consider the effects of the Proposed Scheme on the setting of individual cultural and heritage assets. For example, this may include effects on the setting of scheduled monuments, listed buildings and registered parks and gardens.

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<sup>191</sup> Landscape Institute and Institute of Environmental Management and Assessment (2013), *Guidelines for Landscape and Visual Impact Assessment*, 3rd edition, Routledge, New York.

<sup>192</sup> Highways England (2019), *Design Manual for Roads and Bridges: LA 107: Sustainability & Environmental Appraisal*. London: The Stationery Office.

<sup>193</sup> Landscape Institute (2017), *Townscape Character Assessment, Technical Information Note, 05/2017*. London.

<sup>194</sup> Natural England (2019), *An Approach to Landscape Sensitivity Assessment – to inform spatial planning and land management*, NE724.

## **Spatial scope**

- 15.4.3 The Landscape and visual assessment study area will be determined through the production of ZTV models and will typically extend to 1.5km either side of the Proposed Scheme alignment, for:
- construction – defined as the area over which the proposed construction activity would be visible;
  - operation year 1 – defined as the area over which the components of the Proposed Scheme (including trains) would be visible; and
  - operation year 15 – defined as the area over which the components of the Proposed Scheme (including trains) will be visible taking into account the screening effect new planting established as part of the Proposed Scheme may have in summer after 15 years of growth.
- 15.4.4 In predominantly urban areas landscape and visual receptors within 750m of the centre line of the route of the Proposed Scheme will be assessed as part of the study area. This will reflect the limited ZTV available in these predominantly urban areas.
- 15.4.5 Long distance views of up to 2km will also be considered in certain areas, e.g. at settlement edges. The landscape study area will be defined by the maximum extent of all character areas located partially or entirely within the ZTV. The visual assessment area will be defined by the maximum extents of the ZTV. The extent of the study area may also be informed by any considerations raised through consultation and engagement with stakeholders.
- 15.4.6 The ZTVs will be based on the most recently available and consistent topographic data (digital terrain model or DTM) and digital surface model (DSM) data. GLVIA3 states that ZTV mapping should ‘assume that the observer eye height is some 1.5 to 1.7 metres about ground level, based on the midpoint of average heights for men and women’ (GLVIA 3 p. 103). A datum of 1.6m above ground level will be used for the ZTV mapping to represent the eye level view of an average height person. The ZTV takes account of existing topography, buildings and tree cover, excluding any trees that would be removed as part of the construction of the Proposed Scheme. The validity of the route wide ZTV will be checked on site, using professional judgement, to ensure the output is a fair representation of the theoretical visibility of the Proposed Scheme, in line with guidance provided by the Landscape Institute. This checking process will include consideration of any elevated viewing positions outside the ZTV which should be considered in the assessment (e.g. from a prominent ridge-top or hill).

## Temporal scope

- 15.4.7 The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. The visual assessment will be undertaken for the following years:
- construction - an assessment of effects in winter during peak activity of the construction phase;
  - operation year 1 - an assessment of effects in winter and summer during operation year 1<sup>195</sup>; and
  - operation year 15 - an assessment of effects in summer during operation year 15, to reflect the maturing vegetation planted as part of the Proposed Scheme has matured or where this vegetation has achieved its design intention.
- 15.4.8 Likely significant landscape and visual effects in operation year 30 will be reported in the formal ES to reflect the maturity of tree/shrub planting established as part of the design and mitigation of the Proposed Scheme.

## Climate change

- 15.4.9 Projections of future climate change will be incorporated in the definition of the future baseline for the landscape assessment. The methodology and timeframes for assessing climate change impacts on sensitive receptors and significant effects assessed by the landscape topic are set out in Section 8 (Climate change) of this SMR.

## 15.5 Assessment methodology

- 15.5.1 The HS2 Design Vision sets out three core principles of people, place and time. In order to achieve the HS2 Design Vision<sup>196</sup>, the HS2 Landscape Design Approach (LDA)<sup>197</sup> guides and directs professionals to achieve an integrated and seamless design that is driven by an understanding of the surrounding landscape and sense of place. It results from the manner in which different components of the environment - both natural (the influences of geology, soils, climate, flora and fauna) and cultural (the historical and current effects of land use,

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<sup>195</sup> The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Such scenarios are only considered in the visual assessment in relation to years 1 and 15.

<sup>196</sup> High Speed Two Ltd (2017), *HS2 Design Vision*. Available online at:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/607020/HS2\\_Design\\_Vision\\_Booklet.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/607020/HS2_Design_Vision_Booklet.pdf).

<sup>197</sup> High Speed Two Ltd (2016), *Landscape design approach*. Available online at:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/550791/HS2\\_Landscape\\_Design\\_Approach\\_July\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/550791/HS2_Landscape_Design_Approach_July_2016.pdf).

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settlement, enclosure and other human interventions) - interact together and with people in perceptual and aesthetic terms.

- 15.5.2 The LDA is in accordance with the commitments that are embedded in the HS2 Sustainability Policy and the HS2 Environmental Policy. It is grounded in landscape characterisation and strategy methodologies (specifically the four design strategies to guide scheme design outcomes in their landscape context). It is also based on the concept of a 'green corridor', which refers to HS2 Ltd's aim to deliver a network of 'green infrastructure' (i.e. high quality, multifunctional green space, both urban and rural), which is capable of providing a wide range of environmental and quality of life benefits for local communities. This 'green corridor' approach accommodates sustainability benefits for landscape, ecology and people. It considers not only the land directly around the Proposed Scheme but also any wider opportunities for mitigation beyond the route - a landscape scale response.
- 15.5.3 The landscape and visual impact assessment and design processes are iterative and will involve the identification of landscape and visual sensitivities and measures to avoid or reduce adverse effects of the Proposed Scheme on landscape character and visual receptors. A 'mitigation by design' approach will be adopted, meaning that during the course of the approach to the planning of the site, landscape and visual considerations will be considered from the outset as an integral part of the design process. Potential residual landscape and visual effects likely to be generated after mitigation measures have been incorporated into the development proposals, and the significance of those effects, will be assessed.

## Landscape assessment methodology

- 15.5.4 Physical changes to the landscape may give rise to effects on character. Effects may be direct (whereby landscape components are lost, damaged or altered by the construction or operation of the Proposed Scheme), or indirect (whereby the proposed development alters the setting of surrounding character areas).
- 15.5.5 Landscape character sensitivity is derived from judgements about the susceptibility of landscape character to the type of change arising from the Proposed Scheme; and the value attached to the landscape in the baseline.

## Determining landscape character susceptibility to change

- 15.5.6 The susceptibility of the landscape will be assessed against the following four criteria, which are related to but separate from the value criteria set out above. The focus in the below criteria is on understanding characteristics of the landscape which are vulnerable to change arising from the Proposed Scheme:
- geology, landform hydrology and soils;
  - land cover, fauna and flora;

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- cultural, social and historic; and
- associations and memories.

- 15.5.7 For each criterion, the level of susceptibility will be assessed on a five point scale (low/medium-low/medium/medium-high/high) using professional judgement with reference to site visits and existing documentation, including local authority character assessments, historic landscape character assessments and conservation area character appraisals where available.
- 15.5.8 An overall level of susceptibility for each landscape character area will be assessed by comparing the judgements made for each criterion described above and drawing out the elements most important to character in each case.
- 15.5.9 Further detail on the attributes that influence the susceptibility judgements for each criterion will be described in the Technical Note: Approach to landscape susceptibility, value and sensitivity (provided in Annex J of this SMR).

## Determining landscape character sensitivity

- 15.5.10 The sensitivity of the landscape will be assessed with reference to the overall value and susceptibility of the landscape to change. The assessment of sensitivity requires the application of professional judgement, in line with guidance provided by the Landscape Institute. The presence of any combination of attributes within the criteria described may be considered when assessing the sensitivity of a character area. This allows professional judgement to be used when determining the relative importance of different attributes.
- 15.5.11 The attributes that influence the sensitivity of the landscape character area described in Table 35 and in the Technical Note: Approach to landscape susceptibility, value and sensitivity (provided in Annex J of this SMR).

**Table 35 - Landscape sensitivity**

Sensitivity	Where the character area:
High	<ul style="list-style-type: none"><li>Is mostly unspoilt and of high scenic or landscape quality</li><li>Is intact or mostly intact</li><li>Is highly valued by virtue of its designation or recreational value</li><li>Is predominantly characterised by landscape components that are rare and distinctive and/or listed</li><li>Has a strong sense of tranquillity and remoteness</li><li>Is highly susceptible to specific change arising from the Proposed Scheme</li><li>Has components that are not easily replaced or substituted (e.g. mature trees)</li><li>Has very limited scope for effective mitigation in character with the existing landscape</li><li>Is well maintained and in a good condition</li></ul>
Medium-high	<ul style="list-style-type: none"><li>Is mostly unspoilt and of notable scenic or landscape quality</li><li>Is largely intact</li><li>Is valued by virtue of its designation or recreational value</li><li>Is largely characterised by landscape components that are distinctive, rare and/or listed</li><li>Has a largely strong sense of tranquillity and remoteness</li></ul>

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Sensitivity	Where the character area:
	<p>Has a relatively high degree of susceptibility to specific change arising from the Proposed Scheme</p> <p>Has components that are not easily replaced or substituted (e.g. mature trees)</p> <p>Has relatively limited scope for effective mitigation in character with the existing landscape</p> <p>Is mostly well maintained and in a good condition</p>
Medium	<p>Displays some scenic or landscape qualities albeit with some erosion around infrastructure and settlement edges</p> <p>Has a generally intact landscape with the presence of some uncharacteristic development</p> <p>Is valued locally for its recreational facilities and footpath network</p> <p>Has many components that are rare and distinctive and/or listed</p> <p>Has a moderate sense of tranquillity and remoteness</p> <p>Has a moderate degree of susceptibility to specific change arising from the Proposed Scheme</p> <p>Has components that are relatively easily replaced or substituted</p> <p>Has some scope for effective mitigation in character with the existing landscape</p> <p>Is in a fair condition</p>
Medium-low	<p>Displays few scenic or landscape qualities albeit degraded around infrastructure and settlement edges</p> <p>Has a partially intact landscape with a clear presence of uncharacteristic development</p> <p>Has some elements that are of local or communal value</p> <p>Has some components that are rare and distinctive and/or listed</p> <p>Has localised areas with a sense of tranquillity and remoteness</p> <p>Has a relatively low degree of susceptibility to specific change arising from the Proposed Scheme</p> <p>Has many components that are easily replaced or substituted</p> <p>Has scope for effective mitigation in character with the existing landscape or for the creation of new landscape character</p> <p>Is in a fair, albeit partly degraded condition – land management issues may be evident</p>
Low	<p>Has a landscape affected heavily by uncharacteristic development eroding scenic qualities</p> <p>Very little sense of intactness or with character substantially eroded</p> <p>Has limited landscape value with few recreational facilities or footpath networks</p> <p>Has few or no distinctive components, or components that detract from the overall character of the landscape</p> <p>Has limited sense tranquillity or remoteness by virtue of the dominance of infrastructure and human activity</p> <p>Has limited susceptibility to specific change arising from the Proposed Scheme</p> <p>Has components that are easily replaced or substituted</p> <p>Has considerable scope for effective mitigation in character with the existing landscape, and opportunities for an improvement in character or for creation of new landscape character</p> <p>Is in a poor condition and/or defined by 'uncharacteristic' or unsympathetic land management</p>

## Determining magnitude of landscape change

15.5.12 The magnitude of change on the landscape is influenced by:

- size and scale of the change - for example if there is a complete or partial loss of a particular element of the landscape;

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- geographical extent of the area that will be altered; and
- duration of the change and its reversibility.

15.5.13 A combination of the above factors may influence magnitude of landscape change and this will be considered using professional judgement when carrying out the assessment.

15.5.14 Factors that will be considered in assessing the magnitude of change to landscape character are summarised in Table 36. These criteria are based on guidance provided by the Landscape Institute.

**Table 36 - Landscape magnitude of change**

Impact magnitude	Definition
High	Total loss of or substantial alteration to key characteristics of the character and/or setting of the character area Addition of new uncharacteristic features or components that substantially alter character and/or a large part of the setting of the character area Introduction of irreversible change over a substantial area of an LCA or its setting Introduction of long term or permanent change uncharacteristic of the area
Medium	Noticeable change or alteration to one or more key characteristics of the character and/or setting of the character area Addition of new features or components that form prominent elements of the character and/or setting of the character area, but are largely characteristic of the existing setting Uncharacteristic changes across only a proportion of the character area or its setting Introduction of some irreversible changes in parts of a character area or its setting Introduction of medium to long term uncharacteristic changes and/or permanent changes largely characteristic of the existing setting
Low	Slight loss or alteration to one or more characteristics of the character and/or setting of the character area Addition of new features or components that form largely inconspicuous elements of the existing character and/or setting Introduction of short to medium term uncharacteristic changes and/or long term/permanent changes in a small proportion of a character area or its setting
Negligible	No loss or alteration to one or more characteristics of the character and/or setting of the character area Addition of new features or components that form inconspicuous elements of the existing character and/or setting Introduction of short term uncharacteristic changes in a very small proportion of a character area or its setting

## Assessing significance of landscape effects

15.5.15 Assessment of the significance of an effect requires the application of impartial professional judgement including experience of other major infrastructure schemes to weigh the findings of the sensitivity of the landscape character area and the magnitude of change. This approach is recommended by the Landscape Institute. The presence of any combination of factors may be considered when assessing the level of significance of effect. This allows professional judgement to be used when determining the relative importance of different factors, which varies on a site-specific basis. The assessment will include a written rationale



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to explain how sensitivity and magnitude of change are combined to inform a judgement of the overall significance of effects. Effects may be adverse or beneficial.

- 15.5.16 The broad criteria that influence the level of significance of landscape effects are noted in Table 37. Both the major and moderate categories are considered to comprise a significant effect as these would discernibly alter the character of an area. Any one aspect described may result in a categorisation within that significance level. These criteria are based on guidance provided by the Landscape Institute.

**Table 37 - Significance of effects for landscape assessment**

Significance level	Description The proposed development would result in effects that:
Major beneficial – significant	Would considerably and distinctly improve and enhance the existing character Would restore or enhance valued characteristic features substantially or entirely lost through other land uses
Moderate beneficial – significant	Would markedly improve and enhance the existing character Would restore or enhance valued characteristics substantially lost through other land uses
Minor beneficial	Would slightly enhance the existing character Would restore valued characteristic features partially lost through other land uses
Negligible	Would be compatible with the existing character
Minor adverse	Would be slightly at variance with the existing character Would damage or partially remove some valued characteristic features
Moderate adverse – significant	Would be at variance with the existing character Would detract from, diminish or remove valued characteristic features, elements and/or their setting Would not be wholly compatible with local environmental policies for the protection and enhancement of the landscape
Major adverse – significant	Would be at considerable variance with the existing character, degrading its integrity Would permanently detract from, diminish or remove the integrity of valued characteristic features, characteristic, aesthetic or perceptual qualities, elements and/or their setting, particularly rare or distinctive landscapes Would comprehensively conflict with national, regional or local environmental policies for the protection and enhancement of the landscape

## Visual assessment methodology

- 15.5.17 Visual effects relate to:
- the changes that arise in visual amenity and the composition of available views as a result of changes arising from the Proposed Scheme; and
  - people’s likely responses to changes.
- 15.5.18 The sensitivity of viewers is made up of judgements about susceptibility of the visual receptor to the type of change arising from the Proposed Scheme; and the value attached to certain views that are experienced.



## Determining viewer susceptibility to change

- 15.5.19 Susceptibility to change of visual receptors depends on occupation or activity of people and the extent to which attention is focused on views and visual amenity.
- 15.5.20 The most susceptible visual receptors (people) include:
- residents at home;
  - people engaged in outdoor recreation whose interest is likely to be focused on landscape and views (e.g. users of open access land, long distance routes, PRoW and the canal network);
  - visitors to heritage assets or other attractions where views are important to the experience; and
  - communities where views contributing to landscape setting are enjoyed by residents.
- 15.5.21 Those less likely to be focused on the landscape and views include:
- people engaged in outdoor sport or recreation not involving appreciation of views of the landscape;
  - people at places of work where setting is not important to quality of working life; and
  - users of roads, railways or other transport routes.
- 15.5.22 Users of transport routes may be placed into an intermediate category using professional judgement depending on whether travel involves recognised scenic routes or depending on the nature, character and speed of the route. For instance, users of rural B roads and winding rural lanes will have a higher susceptibility to visual change than will users of motorways or busy A roads due to the relative importance of their visual surroundings to their travel experience.
- 15.5.23 The susceptibility of visual receptor types will be identified by category. A typical hierarchy is shown in Table 38. It should be noted that these can vary according to view value and context. Professional judgment will need to be applied in each case.

**Table 38 - Visual susceptibility**

Level of susceptibility	Category of visual receptor
High	Occupiers of residential properties Recreational users or tourists whose attention is focussed on the landscape (e.g. visitors to the Registered Parks and Gardens, users of the promoted route/long distance path/PRoW and canal network)
Medium-high	Users of local PROW (Note: The medium-high category is likely to include elements from the high and medium sensitivity categories and professional judgement will be used)
Medium	People travelling along rural roads/lanes/scenic routes through the landscape where their attention is likely to be focussed to a degree on their surroundings People staying in hotels and healthcare institutions People walking or cycling through urban areas where their attention is likely to be focussed to a degree on their surroundings

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Level of susceptibility	Category of visual receptor
Medium-low	People travelling along main A and B roads where their attention is proportionately less focussed on their surroundings People at work in outdoor environments/in a setting where their surroundings make a contribution to their experience at work (Note: The medium-low category is likely to include elements from the low and medium sensitivity categories and professional judgement will be used)
Low	People at work and in schools (although users of residential educational institutions will have a higher sensitivity) People engaged in formal sports activities People walking or cycling through urban areas where they are more likely to be preoccupied with getting to their destination than enjoying the views and scenery along their route People travelling on high speed main roads/rail routes through the landscape

### Determining overall viewer sensitivity

- 15.5.24 As set out in Figure 8, the judgements of the susceptibility of visual receptors to the Proposed Scheme and the value attached to particular views will be combined to provide an overall judgement of the sensitivity of the visual receptor.
- 15.5.25 For sites where substantial lighting is anticipated during construction or operation, an assessment of visual effects at night time arising from additional lighting will also be made, in line with the methodology described for the day time assessment below.
- 15.5.26 The construction phase assessment will be undertaken during winter, when construction works are likely to be most visible.
- 15.5.27 The operation year 1 assessment will be undertaken during winter and summer to account for seasonal change in the visibility of the proposed development.
- 15.5.28 The operation year 15 and 30 assessments will be undertaken to account for any vegetation planted as part of the Proposed Scheme that has matured or has achieved its design intention and would be in full leaf. The assessment for these years will be undertaken during summer.

### Determining magnitude of visual change

- 15.5.29 The magnitude of the change to views is made up of judgements about:
- size and scale of the effect - for example if there is complete or partial loss of a particular element in the view;
  - geographical extent of changes in view; and
  - duration of the change and their reversibility.
- 15.5.30 A combination of the above factors may influence magnitude of visual change and this will be considered using professional judgement when carrying out the assessment.

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15.5.31 The factors that will be considered in assessing the magnitude of change on views and on representative viewpoints are summarised in Table 39.

**Table 39 - Visual magnitude of change**

Impact magnitude	Definition
High	Total loss or substantial alteration to key characteristics of the view from a receptor Addition of new features or components that are continuously highly visible across the majority of the view and out of character from a receptor Substantial changes in proximity to the visual receptor, within the direct frame of view Introduction of long term or permanent change uncharacteristic of the view
Medium	Noticeable change or alteration to one or more key characteristics of the view from a receptor Addition of new features or components that may be continuously highly visible across much of the view, but are largely characteristic of the existing view from a receptor Changes a relatively short distance from the receptor, but viewed as one of a series of components in the middle ground of the view Substantial change partially filtered by intervening vegetation and/or built form, or viewed obliquely from the visual receptor Introduction of medium to long term change uncharacteristic of the view and/or permanent changes largely characteristic of the existing view or in a small proportion of the view
Low	Slight loss or alteration to one or more characteristics of the view from a receptor Addition of new features or landscape components that may be continuously or intermittently visible in part of the view, but are largely characteristic of the existing view from a receptor Changes within the background of the view, viewed as one of a series of components in the wider panoramic view from a receptor Change largely filtered by intervening vegetation and/or built form, or viewed obliquely from the visual receptor Introduction of short to medium term change uncharacteristic of the view and/or long term/permanent changes in a small proportion of the view
Negligible	No change to, or barely perceptible loss or alteration of inconspicuous characteristics of the view from a receptor Addition of new features or landscape components that are largely inconspicuous and characteristic of the existing view when viewed from a receptor Changes within the background of the view, viewed as an inconspicuous element within the wider panoramic view from a receptor Change from a visual receptor almost entirely obscured by intervening vegetation and/or built form Short term changes in a small proportion of the view

## Assessing significance of effects

15.5.32 Assessment of the significance of an effect requires the impartial application of professional judgement to weigh the sensitivity of the visual receptor with the magnitude of the change. Effects may be adverse or beneficial. The broad criteria that influence the level of significance of visual effects are set out in Table 40. Both the major and moderate categories are considered to comprise a significant effect as these would markedly alter the existing

view. The significance for visual effects follows the guidance provided by the Landscape Institute.

**Table 40 - Significance of effects for visual assessment**

Significance level	Description The proposed development would result in:
Major beneficial – significant	A prominent improvement in the existing view
Moderate beneficial – significant	A marked improvement in the existing view
Minor beneficial	A discernible improvement in the existing view
Negligible	No perceptible reduction or improvement in the existing view
Minor adverse	A discernible reduction in the existing view
Moderate adverse – significant	A marked reduction in the existing view
Major adverse – significant	A prominent reduction in the existing view

15.5.33 Residual significant effects are reported for those effects that will persist after any mitigation. For construction, residual effects associated with construction activities will be temporary, lasting the duration of the peak construction phase. For operation, residual effects will be reported only for significant effects that persist from year 15 after opening, on the basis that the planting incorporated into the design of the Proposed Scheme will mitigate other effects reported at year 1.

## Verifiable photomontage methodology

15.5.34 In some locations, to be agreed with statutory consultees, the assessment of visual effects will be accompanied by the production of verifiable photomontages, recognising that photomontages can only be an aid to assessment and decision-making. These will be prepared for viewpoints where:

- the receptor is highly sensitive to change and/or the viewpoint is identified in the Local Plans and Supplementary Planning Guidance (SPG), Conservation Area character appraisals or Management Plans for protected landscapes (where relevant); or
- the magnitude of change cannot be easily assessed with reference to plans, sections, elevations and 3D visualisations (e.g. where views may be partially filtered or partially screened by vegetation or built form, or where the precise position of elements has a particular importance in relation to the composition of a view).

15.5.35 Verifiable photomontages would be produced for construction, operation year 1, and operation year 15 as required. The detailed methodology for producing the verifiable photomontages is described in the Technical Note: Approach to verifiable photomontages

(provided in Annex J). The methodology has been informed by Landscape Institute Guidance Note 01/11<sup>198</sup> and GLVIA3.

## **Cumulative effects assessment**

- 15.5.36 Cumulative effects (also known as in-combination effects) arising from the Proposed Scheme in conjunction with other developments within the study area would be described with reference to how the findings of the main assessment would change.
- 15.5.37 The construction phase cumulative assessment would consider the effects of construction of the Proposed Scheme in conjunction with all other major developments likely to be under construction at the same time within the construction phase study area, including HS2 Phase 2a.
- 15.5.38 The operation year 1 cumulative assessment would consider the effects of the operation of the Proposed Scheme in conjunction with all other major developments in operation in year 1 within the operational phase study area.

## **15.6 Assumptions**

- 15.6.1 The assessment is based on professional judgement and takes into account both the adverse and beneficial contribution that new development can have upon the existing landscape character and on the visual resource of surrounding receptors.
- 15.6.2 During the baseline survey there may be some areas which are inaccessible (such as private land, commercial premises and residential buildings). In these instances, professional judgement will be used to approximate the likely views from these locations. Where viewpoints are selected to reflect the visibility of the Proposed Scheme from tall residential properties, a photo will be included from public land close to the property, taken at ground level, and a commentary included as to the likely appearance of the view from a higher elevation. In line with industry accepted guidance, in these instances, no photomontages will be included from an elevated perspective.
- 15.6.3 The ZTVs will be generated using (LiDAR) topographic data (where available) or Ordnance Survey Landform Profile data. It is acknowledged that changes in the assessment area through new development and/or demolition will not necessarily be identified by this model. However, professional judgement will be used to verify the ZTVs on site as far as possible.

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<sup>198</sup> Landscape Institute (2019), *Visual Representation of Development Proposals: Technical Guidance Note 06/19*, Landscape Institute, London.

## 16 Major accidents and disasters

### 16.1 Introduction

**Table 41 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraph 16.1.6	Introduction	Reference added to updated HS2 Development Agreement.
Paragraph 16.3.4	Consultation and engagement - Consultation as part of the EIA process	New text added to outline relevant engagement.
Paragraph 16.5.3	Assessment methodology - Identify risks	Update to text related to level crossings.
Paragraph 16.5.18 (Table 32)	Assessment methodology - Guidance	Updated reference to the International Standards Organization's ISO 31000 Risk Management – principles and guidelines.
Section 16.6	Assumptions	Assumptions updated to reflect Network Rail owned and operated infrastructure.

16.1.1 This section of the SMR covers the potential vulnerability of the Proposed Scheme to a major accident and/or disaster and considers the potential for likely significant environmental effects arising from such an event.

16.1.2 The assessment of the vulnerability of the Proposed Scheme to major accidents and disasters is required following changes to EU and UK legislation. The Regulations 2017 state the need to assess the expected significant adverse effects of the project on the environment arising from the vulnerability of the project to risks of major accidents or disasters that are relevant to the project concerned.

16.1.3 Furthermore, as derived from Schedule 4 Paragraph 8 of the EIA Regulations 2017, a description of the measures envisaged to prevent or mitigate the significant adverse effects of major accidents and/or disasters on the environment and details of the preparedness for and proposed response to such emergencies should be provided.

16.1.4 The full excerpt of Schedule 4 Paragraph 8 states that:

“(8) A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(c) of the European Parliament<sup>199</sup> and of the Council or Council Directive

<sup>199</sup> Directive 2012/18/EU Seveso III on the control of major-accident hazards involving dangerous substances (amending Council Directive 96/82/EU).

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2009/71/Euratom(d)<sup>200</sup> or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies”.

- 16.1.5 The Proposed Scheme will be designed to reduce as far as practicable the risk of major accidents occurring. The Proposed Scheme, as a modern, high-speed railway with stations, will be designed, built and operated in line with best international current practice with embedded climate change resilience. HS2 Ltd has committed to deliver levels of passenger safety performance in line with best current international practice which is as good, or better than, HS1<sup>201</sup>.
- 16.1.6 A guiding principle of safety risk management for the Proposed Scheme, is to manage all risks to be as low as reasonably practicable (ALARP) as set out in HS2’s Development Agreement<sup>202</sup> and accepted by the Office of Road and Rail (the regulator). For example:
- for construction, the HS2 Corporate Health and Safety Strategy ‘Safe at Heart’ is applied to identify and mitigate accident risks; and
  - for operation of the high speed railway, the safety of the railway is considered under application of EU Regulation 402/2013 (as amended)<sup>203</sup> the Common Safety Method for Risk Evaluation and Assessment (CSM-RA)<sup>204</sup>. Under CSM-RA, hazards with the potential to cause a major accident during railway operation are identified, assessed and mitigated.
- 16.1.7 The assessment of major accidents and disasters will identify whether an appropriate risk management structure is in place, for both health and safety and environmental risks. Furthermore, it will report whether the potential for major accidents and/or disasters to impact on human health or the environment has been identified and will be managed to be ALARP by HS2 Ltd and its suppliers. This will be achieved through a review of available documentation and legal and regulatory requirements; the EIA will not involve assessment from ‘first principles’. The assessment will present any identified risks which may require

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<sup>200</sup> Council Directive 2009/71 establishing a country framework for the nuclear safety of nuclear installations.

<sup>201</sup> High Speed Two Ltd and Department for Transport (2014), *Development Agreement: relating to the High Speed Two Project*. Simmons & Simmons, London. Available online at: <https://www.gov.uk/government/publications/hs2-development-agreement-december-2014>.

<sup>202</sup> High Speed Two Ltd and Department for Transport (2018), *Development Agreement: relating to the High Speed Two Project*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/916509/hs2-development-agreement-document.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/916509/hs2-development-agreement-document.pdf).

<sup>203</sup> Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009.

<sup>204</sup> The Rail Safety (Amendment etc.) (EU Exit) Regulations 2019. SI 2015 No. 837. Her Majesty's Stationary Office, London. Available online at: <https://www.legislation.gov.uk/uksi/2019/837/contents/made>.



further precautionary mitigation actions beyond those already integrated into the design and execution of the Proposed Scheme.

- 16.1.8 The methodology presented in this section builds upon the general assessment methodology summarised in Section 4 of this SMR. It sets out how the vulnerability (exposure and resilience) of the Proposed Scheme to major accidents and/or disasters will be assessed, with reference to available relevant information.

## **16.2 Establishment of baseline and definition of assessment process**

- 16.2.1 The assessment will use baseline information collected from other sections of the ES to define the receptors and the Proposed Scheme's risk to a major accident or disaster. In particular, baseline information on climate change, community, ecology and biodiversity, health, socio-economics, traffic and transport and water resources and flood risk is pertinent to the assessment. Close interaction with these disciplines is important to gather this information.
- 16.2.2 In accordance with Schedule 4 Paragraph 8 of the EIA Regulations 2017<sup>205</sup>, safety assessments undertaken for the Proposed Scheme will be used to inform the identification and assessment of likely significant environmental effects. For the purposes of the Proposed Scheme these will include Construction, Design and Management (CDM) risk registers and system safety hazard records current at the time of undertaking the assessment. Application and acceptance of the ALARP principle is within the remit of the regulator (Office of Rail and Road) and the Health and Safety Executive and not part of the EIA. The assessment will be based on a review of available documentation and legal and regulatory requirements.
- 16.2.3 Additional baseline information will be required on features external to the Proposed Scheme which could contribute a potential source of hazard to the Proposed Scheme. This information would be obtained from a desk based study. Such features may include, but are not limited to:
- Presence of COMAH sites;
  - Potentially hazardous ground conditions; and
  - Proximity to other infrastructure (road, rail, aviation, energy).
- 16.2.4 The assessment of significant adverse effects on the environment will be undertaken with reference to the regulatory requirements, legislation and design standards in place for the

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<sup>205</sup> Schedule 4 Paragraph 8 of the Town and Country Planning (Environmental Impact Assessment) 2017 Regulations states "Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(c) of the European Parliament and of the Council or Council Directive 2009/71/Euratom(d) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met." The referenced Directives relate to operating sites which contain large quantities of dangerous substances (for example oil refineries, oil storage depots and nuclear facilities) which are not applicable to the Proposed Scheme.



construction and operation of the Proposed Scheme, including those referred to in paragraph 16.1.5.

- 16.2.5 The assessment will provide a collation and review of existing risk assessments, as defined in paragraph 16.2.2, to identify whether significant effects on the environment have been determined, and whether such risks have been managed and mitigated to be ALARP.

## **16.3 Consultation and engagement**

### **Consultation as part of the EIA process**

- 16.3.1 General consultation on the scope, methodology and outcomes of the EIA, including major accidents and disasters assessment will be undertaken with appropriate bodies.
- 16.3.2 Consultation will be undertaken in an integrated way in conjunction with the consultation proposed for the other environmental topic areas. These topic areas will already be considering routine events (those predicted to happen, or which are likely to happen) and some non-routine events (which 'might' happen) in their assessment of likely significant effects. This topic will not duplicate those assessments; however it will make reference to existing assessments where relevant. Whilst not required specifically to inform the assessment, where relevant the assessment will make reference to engagement undertaken as part of the design development of the Proposed Scheme between HS2 Ltd and regulatory stakeholders, as well as relevant asset owners and operators (e.g. Network Rail, COMAH sites, airports).

## **16.4 Scope of assessment**

### **Terminology**

- 16.4.1 For the purposes of this assessment, vulnerability is defined as the 'exposure and resilience' of the Proposed Scheme to the risk of a major accident and/or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.
- 16.4.2 A risk is defined as the likelihood of an impact occurring, combined with effect or consequence(s) of the impact on a receptor if it does occur.
- 16.4.3 A major accident, in the context of the Proposed Scheme, is defined<sup>206</sup> as an event that threatens immediate or delayed serious damage to human health, welfare and/or the environment and requires the use of resources beyond those of the HS2 Ltd or its contractors. Serious damage includes the loss of life or permanent injury and/or permanent or long-lasting damage to an environmental receptor that cannot be restored through minor

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<sup>206</sup> These definitions are consistent with those used in the HS2 Phase 2a Environmental Statement.

clean-up and restoration efforts. The significance of this effect will take into account the extent, severity and duration of harm, and the sensitivity of the receptor.

- 16.4.4 A disaster, in the context of the Proposed Scheme, is a naturally occurring phenomenon, such as an extreme weather event (e.g. storm, flood, temperature) or ground-related hazard events (e.g. subsidence, landslide, earthquake), with the potential to cause an event or situation that meets the definition of a major accident as defined above.

## Receptors

- 16.4.5 The assessment of significant adverse effects will consider all factors defined in the EIA Regulations 2017, i.e. population and human health, biodiversity, land, soil, water, air and climate and material assets, cultural heritage and the landscape. For the purpose of assessment, an environmental receptor will therefore be considered to be any of these. Relevant receptors for this topic include:
- members of the public and local communities;
  - infrastructure and the built environment;
  - the natural environment, including ecosystems, land and soil quality, air quality, surface and groundwater resources and landscape; and
  - the historic environment, including archaeology and built heritage.
- 16.4.6 Assessments within the ES such as the resilience of the Proposed Scheme to climate change, and the flood risk assessment are relevant to this topic. However, they are not receptors as defined above, but are potential hazards that may lead to risk events and will be considered accordingly.
- 16.4.7 Certain receptors will be excluded from the assessment, for the reasons described in Table 42.

**Table 42 - Receptors to be excluded from assessment of major accidents and/or disasters**

Excluded receptors	Reason for exclusion
Employees of HS2 Ltd and/or its suppliers, whether during construction, operation or maintenance of the Proposed Scheme	HS2 Ltd's commitment and obligations to manage risks to employees are described in other documents.
Train staff and passengers (of the Proposed Scheme)	Comprehensive demonstration to the regulator (the Office of Road and Rail) that the risk of accidents on the Proposed Scheme are being managed as low as reasonably practicable is a fundamental requirement of the licence to operate a railway. This assessment goes through an independent review process, is approved by the regulator, and is not repeated here <sup>207</sup> .

<sup>207</sup> The potential for an accident causing harm to an environmental receptor, as well as train staff and passengers, is considered in other regulatory processes (refer to Table 43).

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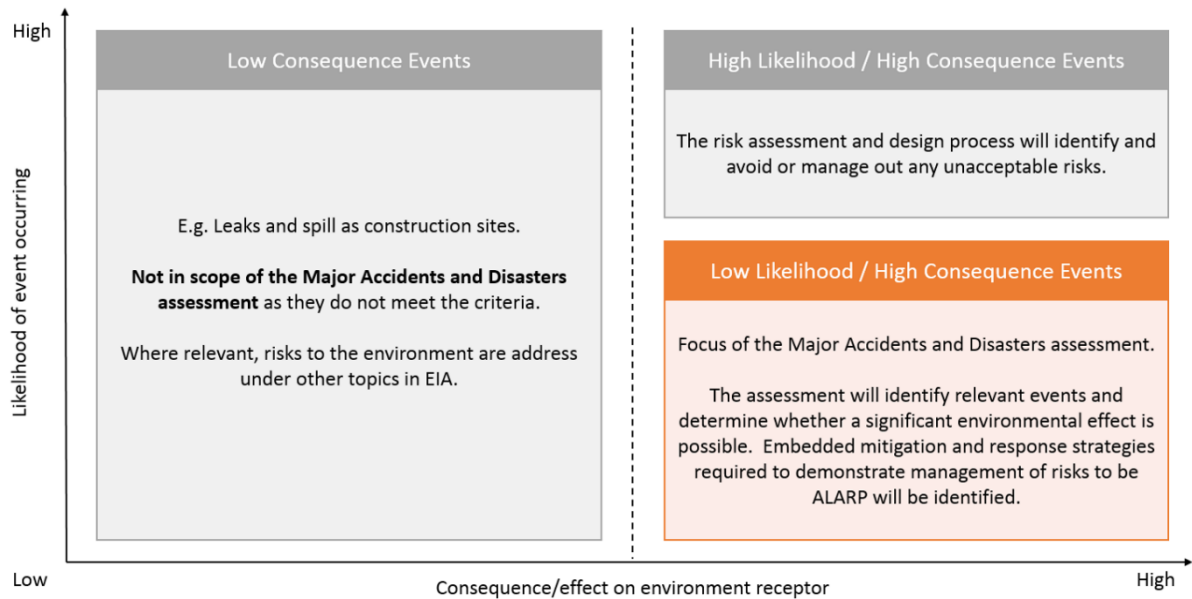
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Excluded receptors	Reason for exclusion
Members of the public who are wilfully trespassing	The safety and security of the Proposed Scheme from trespassers is mandated within a number of documents including the Development Agreement, the Supply Chain health and safety standard, and the Code of Construction Practice. There are measures described to educate the local communities including school children on the risks associated with the Proposed Scheme. On the basis that these measures are required to be in place to demonstrate compliance with these standards, it is assumed that any members of public who are wilfully accessing unauthorised areas are not a valid receptor in the context of this assessment.
HS2 Ltd as an organisation, i.e. programme or cost of the Proposed Scheme, or HS2 Ltd's reputation.	These will be managed in accordance with the Development Agreement between HS2 Ltd and the DfT.

## Risk identification

- 16.4.8 The major accidents and disasters considered in the assessment are rare events.
- 16.4.9 All low consequence events, whatever their likelihood, do not meet the definition of major accidents and/or disasters set out above. For example minor spills which may occur during construction but would be limited in area and volume and temporary in nature do not meet the definition of a major accident. Such minor events would be dealt with under the contractors' Environmental Management System (EMS) and do not fall within the scope of this assessment.
- 16.4.10 It is envisaged that this assessment will focus on low likelihood but potentially high consequence events (see Figure 9).
- 16.4.11 Low likelihood is defined for the purposes of this assessment, as:  
 'May occur during the lifetime of the Proposed Scheme, so no more than once in 10 years for the construction phase, and no more than once in 120 years for the operational phase.'
- 16.4.12 This is an upper boundary for low likelihood. Very low likelihood events will also be included in the assessment, which may only occur at most once in every 1,000 years. Mitigation measures will reflect what is reasonable for such rare events, considering their potential consequence, within the guiding principle of risks being ALARP.
- 16.4.13 High consequence events are considered to lead to a significant adverse effect which will typically align with definitions given for each environmental topic.

**Figure 9 - Summary of risk events considered in the scope of the assessment for major accidents and/or disasters**



## Spatial scope

- 16.4.14 The assessment will be undertaken at a route-wide level but will, where relevant, reflect any locations, including stations, considered more vulnerable to a major accident and disaster and/or sensitive to significant adverse effects.

## 16.5 Assessment methodology

- 16.5.1 The potential for identified relevant major accident and/or disaster events to result in a significant adverse environmental effect will be evaluated using a risk based approach. The approach will consider the environmental consequences of a risk scenario, the likelihood of these consequences occurring, taking into account planned mitigation, and the acceptability of the subsequent risk to the environment. The process followed includes identifying risks, screening these risks, defining the impact, assessing the likelihood, and then assessing the risk.

### Identify risks

- 16.5.2 Risk identification will use existing sources of information wherever possible, as described in Section 16.2, such as risk assessments undertaken for the Proposed Scheme as part of other processes (many of which are required by law) or risk events identified within the UK's current National Risk Register<sup>208</sup>. It is envisaged that no additional risk assessments will be

<sup>208</sup> HM Government (2017), *National Risk Register of Civil Emergencies*, 2017 Edition, Cabinet Office.

undertaken. The risk identification activity will focus on collating and reviewing these existing sources.

16.5.3 In order to identify whether a risk event has the potential to be a major accident and/or disaster, which also has the potential to have a significant adverse effect on an environmental receptor, three components need to be present: a source, a pathway (between source and receptor) and a receptor. As such, and as recommended by Defra (2011)<sup>209</sup>, the assessment will use the following conceptual model:

- the source is the original cause of the hazard, which has the potential to cause harm, for example a moving train with the potential to derail. There are a number of generic risk events related to high speed rail which are not relevant to the Proposed Scheme as the source is not present (e.g. conductor rail);
- the pathway is the route by which the source can reach the receptor, for example via the derailment of a train; and
- the receptor, which is the specific component of the environment that could be adversely affected, if the source reaches it (e.g. an ancient woodland).

16.5.4 Risk events which do not have all three components will be screened out from the assessment.

## **Screen risks for those within scope**

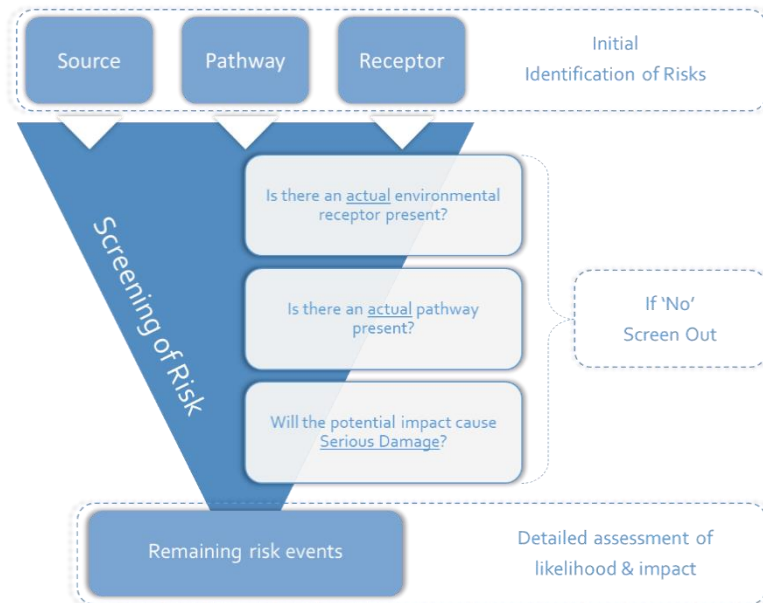
16.5.5 The following screening process will be used to identify those risk events which may require further consideration within the assessment (Figure 10):

- is there a potential source, pathway and receptor as defined in paragraph 16.5.3 above? If not, no further assessment required;
- is there a relevant environmental receptor (paragraph 16.3.2) present in the locations where the risk event could occur, and a pathway whereby the source of harm can reach the receptor? If not, no further assessment required; and
- does the potential impact on the environmental receptor meet the definition of a significant adverse effect given in paragraph 16.4.3? If not, no further assessment required.

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<sup>209</sup> Department for Environment, Food and Rural Affairs (2011), *Guidelines for Environmental Risk Assessment and Management: Green Leaves III*, Cranfield University and Department for Environment, Food and Rural Affairs, November 2011.

Figure 10 - Screening process flow diagram



16.5.6 For those risk events which are not screened out during the three step process, the following assessment methodology will be used. The assessment will form the basis for recommending additional mitigation measures, as appropriate.

## Embedded mitigation

16.5.7 Several mechanisms are in place to reduce the vulnerability of the Proposed Scheme to major accidents and/or disasters, or mitigate significant effects on the environment should they occur. All measures to manage and reduce risk of significant adverse effects occurring as a result of the vulnerability of the Proposed Scheme to major accidents and/or disasters will be considered to be 'embedded' mitigation measures for the purposes of the assessment. This framework and the measures therein of relevance to the assessment will be described in the ES.

## Define impact

16.5.8 A reasonable worst case environmental impact(s) will be identified for each risk event which remains in scope following assessment through a qualitative assessment, supported where necessary by consultation with relevant disciplines for each environmental topic within the ES. This does not have to be an extensive or quantitative assessment but must answer the question 'could this event constitute a major accident or disaster in terms of the definitions provided (see paragraph 16.3.2)?'. Where relevant, specific sensitive receptors along the route of the Proposed Scheme will be considered. The Environmental Risk Record, which sets out the results of the review process undertaken for major accidents and disasters, will be updated reflecting this review, and recording the consultation outcome.

## **Assess embedded mitigation measures**

- 16.5.9 The likelihood of the reasonable worst case environmental effect(s) occurring will be evaluated taking into account:
- the likelihood of the risk event occurring considering the measures already embedded into the design and execution of the Proposed Scheme; and
  - the likelihood that an environmental receptor is affected by the risk event.
- 16.5.10 Likelihood assessments need not be quantitative, but will evaluate whether the effect (for example, loss of life) is a possible outcome of the risk event.
- 16.5.11 This evaluation will refer to existing risk assessments as well as consultation with relevant discipline specialists as defined in paragraph 16.2.1, with reference to the definition of low likelihood in paragraph 16.4.11.

## **Assess risk**

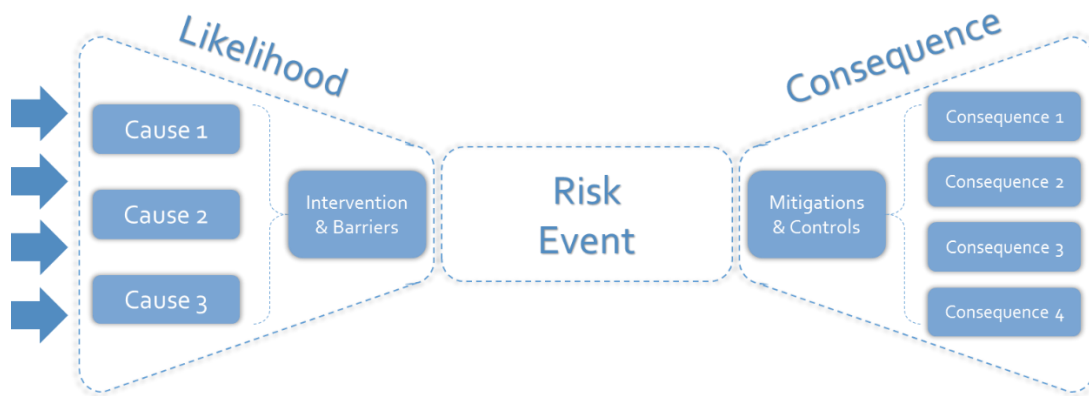
- 16.5.12 The assessment of the risk will be carried out with and the results presented in an Environmental Risk Record. Where likely significant adverse effects are identified, mitigation measures must be in place, commensurate with the likelihood of the event occurring. The assessment will consider, in consultation with relevant disciplines, whether the risk to the environmental receptor is managed to be ALARP with the existing measures. If gaps are identified, where the existing measures do not represent management of risks to an environmental receptor to be ALARP, then additional measures may be required.

## **Appraise risk management options**

- 16.5.13 Risk management options, including embedded mitigation (refer to paragraph 16.5.7), will fall into one of the following categories consistent with the mitigation hierarchy used for the EIA:
- eliminate (or 'avoid') the risk, by adopting alternative processes in order to eliminate the source of the hazard, or remove the receptor;
  - reduce the risk by adapting proposed processes such that either the likelihood or the impact of the risk event can be reduced;
  - isolate the risk, by using physical measures to ensure that should the risk event occur, it can be effectively isolated such that there is no pathway;
  - control the risk, by ensuring that appropriate control measures are in place (e.g. emergency response) so that should a risk event occur, it can be controlled and managed appropriately. The EIA mitigation hierarchy of repair and compensate any significant damage to environmental receptors may then apply following a control measure; and
  - exploit the risk if it presents potential benefits or new opportunities.

16.5.14 Figure 11 shows the principles of managing risk, where measures to prevent a risk event occurring are barriers or intervention measures (for example appropriate site selection), or mitigation measures and controls in place should an event occur (for example, firewater containment measures).

**Figure 11 - The principles of managing risks both pre-and post-event**



16.5.15 As safety risks will be required to be adequately addressed within the regulatory framework for the Proposed Scheme, it is not anticipated that significant residual effects will be identified.

## Legislation

16.5.16 Relevant EIA legal framework surrounding the topic is provided in 16.1. The other legal obligations covering design, construction, operation and maintenance of the Proposed Scheme are as listed in Table 43.

**Table 43 - Legislation of relevance to the assessment of major accidents and disasters**

Legislation	Overview description	Relevance to the EIA
Construction (Design and Management) Regulations 2015 (CDM) <sup>210</sup>	These regulations place legal duties on almost all parties involved in construction work. The regulations place specific duties on clients, designers and contractors, so that health and safety is taken into account throughout the life of a construction project from its inception to its subsequent final demolition and removal. Under CDM regulations, designers have to avoid foreseeable risks so far as is reasonably practicable by eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure, reducing risks from any remaining hazard, and giving collective safety measures priority over individual measures.	Hazards with the potential to cause a major accident during construction, operation and maintenance of the Proposed Scheme are identified, assessed and mitigated. The regulations ensure that mechanisms are in place to continually identify, evaluate and manage safety risks throughout the design and construction phases of the Proposed Scheme. Many of the risks identified and managed out at the design phase also serve to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring during the operational phase.

<sup>210</sup> *The Construction (Design and Management) Regulations 2015 (SI 2015 No. 51)*. London: The Stationery Office.



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Legislation	Overview description	Relevance to the EIA
Health and Safety at Work etc. Act 1974 (HSWA) <sup>211</sup>	<p>The Act provides the framework for the regulation of industrial health and safety in the UK. It places general duties on employers, people in control of premises, manufacturers and employees. The overriding principle is that foreseeable risks to persons will be reduced so far as is reasonably practicable and that adequate evidence will be produced to demonstrate that this has been done.</p> <p>Health and safety regulations made under this Act contain more detailed provisions. For example, the Management of Health and Safety at Work Regulations 1999 (MHSWR) make more explicit what employers are required to do to manage health and safety under the HSWA.</p>	<p>The Act provides a regulatory mechanism for occupational safety hazards and risks to be continually identified, evaluated and managed throughout the design, construction and operational lifetime of the Proposed Scheme. This serves to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring.</p>
Regulation (EU) No 402/2013 on the Common Safety Method on Risk Evaluation and Assessment (CSM-RA) (as amended by Regulation EU 2015/1136)	<p>The CSM-RA was introduced to ensure that levels of safety are maintained or improved when and where necessary and reasonably practicable, in accordance with the Railway Safety Directive (2004/49/EC). The CSM-RA describes a common mandatory European risk management process for the rail industry to assess compliance with safety levels and safety requirements. It applies when any technical, operational or organisation change is proposed to the railway system which has the potential to impact on safety.</p> <p>There is also a CSM-RA independent assessment body (AsBo) which reviews, assesses and reports on the safety assessment. The assessment and the AsBo report both go to the regulator (Office of Rail and Road (ORR)) to get permission for authorisation to place into service and put into use<sup>212</sup>.</p>	<p>Under the CSM-RA, HS2 Ltd is conducting a systematic risk assessment of all aspects of the operational railway. This includes infrastructure, railway systems, rolling stock, operations (including all procedures) and the organisational structure of the operators. This assessment will ensure that all hazards have been identified and the risk reduced ALARP.</p> <p>Furthermore, the CSM-RA establishes a mandatory mechanism for safety hazards and risks to be continually identified, evaluated and managed throughout the design, construction and operational lifetime of the Proposed Scheme. This serves to eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring.</p>
The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS) (as amended) <sup>213</sup>	<p>The ROGS place a duty on Railway Undertakings (RUs) and Infrastructure Managers (IMs) to:</p> <ul style="list-style-type: none"> <li>• develop safety management systems (SMS) that must meet certain requirements;</li> </ul>	<p>The Regulations ensure that mechanisms are in place and implemented for the operation of the Proposed Scheme that will eliminate or reduce the risk of a major accident (and therefore environmental consequence) occurring.</p>

<sup>211</sup> *The Health and Safety at Work etc. Act 1974 (c. 37)*. London: The Stationery Office.

<sup>212</sup> Office of Rail Regulation (2015), *Common safety method for risk evaluation and assessment: Guidance on the application of Commission Regulation (EU) 402/2013*. Open Government License. Kew, London.

<sup>213</sup> *The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (SI 2009 No. 599)* (as amended). London: The Stationery Office.

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Legislation	Overview description	Relevance to the EIA
	<ul style="list-style-type: none"> <li>• have a safety certificate (for RUs) or a safety authorisation (for IMs);</li> <li>• show that they have procedures in place to introduce new or altered vehicles or infrastructure safely;</li> <li>• carry out risk assessments and put in place the safety measures they have identified as necessary to make sure that the transport system is run safely; and</li> <li>• work together to make sure the transport system is run safely (ROGS regulation 22).</li> </ul>	
The Railways (Interoperability) Regulations 2011 (as amended) (RIR) <sup>214</sup>	These regulations implement the EU Railway Interoperability Directive 2008/57/EC <sup>215</sup> , which had the purpose of establishing common operational standards and practices across European railways, including adoption of the CSM-RA.	<p>HS2 Ltd is designing a railway according to the European Technical Specifications for Interoperability (TSIs)</p> <p>Technical Specifications for Interoperability (TSIs) define the technical standards required to satisfy the essential requirements set out in the Directive to achieve interoperability. These requirements include safety, reliability and availability, health, environmental protection and technical compatibility along with others specific to certain subsystems. The development process for TSIs are managed and published by the European Union Agency for Railways (formerly the European Railway Agency).</p>
Civil Contingences Act 2004 <sup>216</sup>	The Civil Contingences Act delivers a single framework for civil protection in the UK. It establishes a coherent framework for emergency planning and response ranging from local to national level.	<p>The Act provides a framework for emergency preparedness and response procedures throughout the design, construction and operational lifetime of the Proposed Scheme. This serves to minimise the effects of an emergency, and therefore environmental consequence. Roles and responsibilities are set out for those involved in emergency preparation and response.</p> <p>Network Rail, and its operating companies, sit as Category 2 responders. The Act requires Category 2 responders to co-operate and share information with Category 1 responders (e.g. emergency services and local authorities) to inform multi-agency planning frameworks.</p>

<sup>214</sup> *The Railways (Interoperability) Regulations 2011*. No 2011.

<sup>215</sup> *Directive of the European Parliament and of the Council on the Interoperability of the Rail System in the Community*, 17 June 2008, 2008/57/EC.

<sup>216</sup> *Civil Contingences Act 2004 (c. 36)*. London: The Stationery Office.

## Guidance

- 16.5.17 There is currently no published guidance for the application of the EIA Regulations 2017 to major accidents and disasters. The scope and methodology presented may therefore be subject to change on the basis of new guidance or professional judgement.
- 16.5.18 However, selected relevant guidance for the risk assessment methodology is available, as presented in Table 44.

**Table 44 - Guidance relevant to the assessment**

Guidance	Description
Defra (2011) 'Green Leaves III' Guidelines for Environmental Risk Assessment and Management <sup>217</sup>	<p>These guidelines provide generic guidance for the assessment and management of environmental risks. A cyclical framework for risk management is provided which identifies four main components of risk assessment:</p> <ul style="list-style-type: none"> <li>• formulating the problem;</li> <li>• carrying out an assessment of the risk;</li> <li>• identifying and appraising the management options available; and</li> <li>• addressing the risk with a risk management strategy.</li> </ul> <p>A source-pathway-receptor model is suggested as a tool to assist in risk screening and an example is provided of applying the following filters to prioritise significant hazards for further investigation:</p> <ul style="list-style-type: none"> <li>• the plausibility of linkages between the source of a hazard and a receptor;</li> <li>• the relative potency of a hazard, availability of a pathway, or vulnerability of a receptor;</li> <li>• the likelihood of an event, on the basis of historic occurrence or of changed circumstances; or</li> <li>• a view on the performance of current risk management measures that, if they were to fail, may increase the potential for future harm.</li> </ul>
Chemical and Downstream Oil Industries Forum, (2013), Guideline – Environmental Risk Tolerability for COMAH Establishments	<p>These guidelines provide a common screening methodology for carrying out an environmental risk assessment under the COMAH Regulations. Amongst other things, the guidance:</p> <ul style="list-style-type: none"> <li>• defines the types of harm that should be considered in an environmental risk assessment, and how the harm should be characterised for the assessment;</li> <li>• defines the risk criteria to be used in assessing tolerability of the environmental risk from an establishment, and where appropriate, individual scenarios; and</li> <li>• explains how risks may be evaluated.</li> </ul> <p>The guidelines present a series of thresholds that can be used to 'screen' the potential for a Major Accident to the Environment (MATTE) to relevant environmental receptors. The thresholds have been developed based on the criteria for reporting a major accident to the European Commission defined in the Seveso III Directive and COMAH Regulations, and to guidance on MATTE issued by the then Department of the Environment, Transport and the Regions in 1999<sup>218</sup>. The thresholds are presented in two dimensions, namely (i) extent and severity and (ii) duration of harm; and thresholds for both dimensions must be exceeded for the scenario to be considered a potential MATTE.</p>

<sup>217</sup> Department for Environment, Food and Rural Affairs (2011), *Guidelines for Environmental Risk Assessment and Management: Green Leaves III*, Cranfield University and Department for Environment, Food and Rural Affairs, November 2011.

<sup>218</sup> Department of the Environment, Transport and the Regions (DETR) (1999), *Guidance on the Interpretation of Major Accident to the Environment for the Purposes of the COMAH Regulations*, Department of the Environment, Transport and the Regions, 1999.

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Guidance	Description
The International Standards Organization's ISO 31000: 2018 Risk Management – principles and guidelines	<p>This guideline identifies a number of principles that need to be satisfied to make risk management effective. If the standards are adopted and applied the management of any risk should help minimise losses, improve resilience, improve controls and improve the identification of opportunities and threats.</p> <p>The ISO standard states that when defining risk criteria the following factors should be considered:</p> <ul style="list-style-type: none"><li>• the nature and types of causes and consequences that can occur and how they will be measured;</li><li>• how likelihood will be defined;</li><li>• the timeframe(s) of the likelihood and/or consequence(s);</li><li>• how the level of risk is to be determined;</li><li>• the views of stakeholders;</li><li>• the level at which risk becomes acceptable or tolerable; and</li><li>• whether combinations of multiple risks should be taken into account and, if so, how and which combinations should be considered.</li></ul>

16.5.19 There may also need to be consideration of Network Rail standards for the formal ES assessment.

### Significance criteria

- 16.5.20 No additional significance criteria are anticipated for this topic. Significance will be considered for each identified receptor in conjunction with the appropriate environmental topics for this EIA.
- 16.5.21 Factors to consider in determining whether potential adverse effects are significant include:
- the geographic extent of the effects. Effects beyond the project boundaries are more likely to be considered significant;
  - the duration of the effects. Effects which are permanent (i.e. irreversible) or long lasting are considered significant;
  - the severity of the effects in terms of number, degree of harm to those affected and the response effort required. Effects which trigger the mobilisation of substantial civil emergency response effort are likely to be considered significant;
  - the sensitivity of the identified receptors; and
  - the effort required to restore the affected environment. Effects requiring substantial clean-up or restoration efforts are likely to be considered significant.
- 16.5.22 For the Proposed Scheme, a significant adverse effect is considered to mean the loss of life or permanent injury, and/or permanent or long-lasting damage to an environmental receptor. The significance of this effect takes into account the extent, severity and duration of harm, and the sensitivity of the receptor.

## 16.6 Assumptions

16.6.1 The scope of the major accidents and disasters assessment includes assessment of HS2 trains using Network Rail owned and operated infrastructure. Key assumptions for the assessment include:

- the route of the Proposed Scheme will not carry hazardous (combustible/explosive) freight. However, it is expected that off-route sections of Network Rail owned and operated infrastructure associated with the Proposed Scheme (such as the WCML) will carry freight, alongside HS2 services. In these instances hazardous freight will be carried on Network Rail owned and operated infrastructure, and as such fall under Network Rail's operating licence and safety plans; and
- there are no level crossings included as part of the Proposed Scheme design. However, it is expected that off route sections of Network Rail owned and operated infrastructure associated with the Proposed Scheme (such as the WCML) will pass level crossings. As these crossing exist on Network Rail owned and operated infrastructure these will continue to be managed under Network Rail's operating licence and safety plans.

16.6.2 In terms of the assessment methodology, the following assumptions are made:

- no site visits will be conducted, the assessment will be desk-based;
- no modelling or detailed calculations will be undertaken;
- the qualitative assessment will take the form of 'sign-posting' to existing risk assessments, and assessment of potential gaps or residual risks which are not considered to be managed using the ALARP principle;
- only those hazard events with a feasible source-pathway-receptor model will be considered;
- risk events identified in Volume 3 and Volume 5 are considered to be ALARP owing to compliance with UK legislation and relevant design standards throughout the design, construction planning, construction, and operation of the Proposed Scheme;
- where information is not available, professional judgement will be used to reach a conclusion. Reference may be made to existing information from both UK railways, and international high speed rail projects; and
- in accordance with good safety management principles, it is assumed that all risks that have the potential to be major accidents or disasters, and could impact a local environmental receptor, will be managed using the ALARP principle.

## 17 Socio-economics

### 17.1 Introduction

**Table 45 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 17.5	Scope of assessment - Temporal scope	Updated temporal scope of the assessment.

17.1.1 This section of the SMR sets out the methodology for the socio-economic assessment, which focuses on identifying significant economic and employment effects during the construction and operational phases of the Proposed Scheme. Future catalytic development associated with the Proposed Scheme is outside the scope of this assessment. The need for a socio-economic assessment results from the potential for the Proposed Scheme to generate impacts on:

- existing businesses and organisations;
- local economies, including employment;
- planned growth and development; and
- wider concentrations of economic activity.

17.1.2 The assessment will draw upon other assessments where relevant, such as agriculture, forestry and soils, sound, noise and vibration, landscape and visual, air quality and traffic and transport. Specifically the socio-economic topic will focus on the implications for employment. A technical note is provided in Annex K which provides further detail on the assessment methodology.

17.1.3 The assessment is distinguished from the wider business case in that it will identify direct and significant impacts on local economies. The wider business case is related to, but differs from, the socio-economic assessment in that it predicts overall benefits to the output of the national economy. Benefits to the national economy arise through the circulation of monies over a wide area, which may not have directly observable or significant consequences in the context of the EIA.

### 17.2 Establishment of baseline and definition of survey

#### Characteristics of communities

17.2.1 The need to minimise negative socio-economic effects and enhance positive socio-economic effects has influenced the design development of the Proposed Scheme.

## **Baseline data and methods**

- 17.2.2 The assessment will rely on two general sources of information, namely technical evidence and stakeholder views. Stakeholder views will inform how best to approach the more qualitative aspects of the assessment.
- 17.2.3 The baseline information will be developed following an integrated approach with health and community. Baseline information will be presented against comparable performance statistics for areas associated with communities where impacts are being assessed, known as benchmark areas. Benchmark areas will include the host district and wider areas or a region where appropriate. The baseline for the benchmark areas will draw upon a number of sources and data covering:
- existing planning, economic and regeneration plans and strategies;
  - population;
  - labour supply;
  - employment and unemployment;
  - enterprises;
  - development potential/capacity; and
  - existing studies on wider economic effects during operation of the Proposed Scheme.
- 17.2.4 Data will be collected by a variety of methods including accessing national data sets, requesting and accessing local information; exchange of information with other environmental topics; and carrying out investigations into the character and nature of businesses in the area.

## **17.3 Consultation and engagement**

### **Engagement as part of the EIA process**

- 17.3.1 Relevant stakeholders will be contacted as part of the EIA process including local authorities along the route of the Proposed Scheme including proposed stations, rolling stock depots, junctions and the infrastructure maintenance depot (and potentially local authorities affected by any secondary effects on other routes).

## **17.4 Key aspects of the Proposed Scheme for the topic**

- 17.4.1 Relevant aspects of the Proposed Scheme include:
- direct and indirect effects of construction and operation;
  - demand for labour, particularly during construction, including labour skills and sources; and
  - relocation of businesses during construction e.g. for development of new infrastructure.



## 17.5 Scope of assessment

### Spatial scope

17.5.1 The spatial scope of the assessment will vary according to the type of resource and receptor as shown in Table 46.

**Table 46 - Socio-economic assessment: resources, receptors and spatial scope**

Resource	Impacts	Effects:		Spatial scope
		On resources	On receptors	
Existing businesses and organisations – land required and in-combination effects of noise, HGV traffic, vibration, air quality and visual impacts on businesses and organisations' operations <sup>219</sup>	Businesses (non-community) lost to land required	Loss or impairment of business activities	Change in employment and skills mix	Direct land required by the Proposed Scheme
	Community activities lost to land required	Loss or impairment of community activities	Change in employment and skills mix	Direct land required by the Proposed Scheme
	In combination effects of noise, HGV traffic, vibration, air quality and visual impacts on businesses and organisations' operations	Character or quality of businesses and organisations' environment changes as a result of noise, HGV traffic, vibration; air quality and visual impacts	Impact on (non-community) businesses	Relevant impact area from the edge of the Proposed Scheme is a minimum 250m in both urban and rural areas unless subsequent analysis from other topic areas suggests a greater or lesser extent at specific locations
	Severance of infrastructure (used for employment purposes) from receptors resulting in an impact on businesses and organisations' operations	Physical e.g. islanding or isolation of resource results in change to business and organisations' environment	Impact on (non-community) businesses	All or part of the catchment area of affected resource where it is subject to severance <sup>220</sup>
Employment associated with construction	Direct employment opportunities associated with the construction phase	Demand for construction sector services	Demand for construction sector jobs and changes in opportunities for local employment	Travel to Work Area of construction sites for daily commute workforce and UK wide for migrant workers

<sup>219</sup> Noise, HGV traffic, vibration, air quality and visual's significant effects will be identified for the in-combination assessment as it is those effects which are most likely to potentially contribute to a change of amenity value of infrastructure (used for employment purposes).

<sup>220</sup> The distance of the diversion and duration are factors in determining whether or not there is an impact.



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Resource	Impacts	Effects:		Spatial scope
	Indirect impacts on the economy of the construction phase	Indirect impacts on other construction sector projects, multiplier impacts on the wider economy	Demand for construction sector jobs and changes in opportunities for local employment	UK
Employment associated with operations	Direct employment opportunities associated with the operational phase	Demand for operational phase services	Demand for operational phase associated jobs and change in opportunities for local employment	Travel to Work Areas associated with stations and depots during the operational phase employment locations
	Indirect impacts on the economy of the operational phase	Indirect impacts on sectors of the economy, multiplier impacts on the wider economy	Change in employment and skills and change in opportunities for local employment	Induced effects are most likely to occur in those areas with stations and depots where the operational workforce is located. Indirect (supplier based) effects are likely to occur within the UK

## Temporal scope

- 17.5.2 The temporal scope is outlined in Section 4 (Scope of assessment) of this SMR. Socio-economic impacts will generally be assessed for the construction period (2025 – 2038, including commissioning) and 2038 for operation (i.e. the first year of operation of the Proposed Scheme).

## 17.6 Assessment methodology

- 17.6.1 The effects of the Proposed Scheme will be considered at varying spatial levels according to the nature of the effect in each case, through comparison of the baseline conditions and those as a result of the Proposed Scheme.

## Legislation and guidance

- 17.6.2 The available guidance on socio-economic assessment sets out the overarching principles, including the assessment of gross and net impacts and recognition of the wider economic impacts of transport schemes. The HCA employment densities guide<sup>221</sup> will be used where

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<sup>221</sup> Homes and Communities Agency (HCA) (2015) *Employment Density Guide*, 3<sup>rd</sup> edition. Homes and Communities Agency, London.

necessary to estimate employment in identified floorspace where it is not practical to undertake a direct survey. Other relevant guidance includes:

- Treasury Green Book: Appraisal and Evaluation in Central Government<sup>222</sup>; and
- Homes and Community Agency (2014) *Additionality Guide*<sup>223</sup>.

17.6.3 The methodology will also take into account good practice from other infrastructure project EIAs, for example, HS2 Phase One, Phase 2a, Crossrail and Thames Tideway Tunnel.

## Significance criteria

17.6.4 Since there is no definitive guidance on significance criteria for socio-economic effects, the assessment will draw on existing industry accepted practice. The significance of a socio-economic effect will be determined by assessing both the:

- magnitude of the impact; and
- sensitivity of receptors.

## Determining magnitude of impacts

17.6.5 The magnitude of an impact represents its severity or scale, and is influenced by:

- spatial extent (localised/isolated versus widespread with potential secondary effects);
- extent (number of employees or businesses affected);
- duration;
- conformity with standards for provision or accessibility (as set out in regional, sub regional or local planning guidance);
- permanence;
- likelihood of occurrence;
- the scope for incorporated environmental design features or mitigation; and
- value of the resource.

17.6.6 Based on the above considerations, guidance criteria will be used to determine the magnitude of the impacts on the basis of professional judgement and existing industry accepted practice (Table 47).

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<sup>222</sup> HM Treasury (2003), *The Green Book: Appraisal and Evaluation in Central Government*. London: The Stationary Office.

<sup>223</sup> Homes and Communities Agency (2014), *Additionality Guide: Fourth Edition 2014*. Homes and Communities Agency, London.

**Table 47 - Socio-economic impact magnitude criteria**

Impact magnitude	Definition
High	An impact that will be very adverse/ beneficial, and very likely to affect large numbers of businesses and/or people (with numbers depending on the local context and nature of impact), and that will usually continue and effectively constitute a permanent, long term impact on the baseline conditions
Moderate	An impact that is likely to affect a moderate number of businesses and/or people (with numbers depending on the local context and nature of the impact)
Low	An impact that is likely or may affect a small number of businesses and/or people (with numbers depending on the local context and nature of the impact) and/or that usually does not extend beyond the life of the project so that the baseline is not affected beyond a short or medium term duration
Negligible	An impact that is temporary in nature and/or is anticipated to have a slight or no effect on the well-being of businesses and/or people

## Determining receptor sensitivity

17.6.7 Guideline criteria have been established using professional judgement and existing industry accepted practice to determine the sensitivity of the receptors as shown in Table 48.

**Table 48 - Socio-economic receptor value/sensitivity criteria**

Receptor value and/ or sensitivity	Definition
High	Businesses, workforces or economies that are at risk and that have little or no capacity to experience the impact without incurring a significant socio economic loss (or gain) of an economic resource, or employment
Moderate	Businesses, workforces or economies that have a limited or average capacity to experience the impact without incurring a significant socio economic loss (or gain) of an economic resource, or employment
Low	Businesses, workforces or economies that generally have adequate capacity to experience impacts without incurring a significant socio-economic loss (or gain) of an economic resource, or employment

## Determining the significance of effects

17.6.8 The significance of a socio-economic effect is a product of the magnitude of the impact and the sensitivity of the receptor and will be assessed on the basis of professional judgement and existing industry accepted practice.

17.6.9 The approach to determining significance is summarised in Table 49.

**Table 49 - Socio-economic - significance of effect criteria**

Significance		Impact magnitude			
		High	Medium	Low	Negligible
Sensitivity of receptor	High	Major adverse/beneficial – significant	Major adverse/beneficial – significant	Moderate adverse/beneficial – significant	Minor adverse/beneficial – not significant
	Moderate	Major adverse/beneficial – significant	Moderate adverse/beneficial – significant	Minor adverse/beneficial – not significant	Negligible – not significant
	Low	Moderate adverse/beneficial – significant	Minor adverse/beneficial – not significant	Negligible – not significant	Negligible – not significant

17.6.10 Effects are considered to be significant if both impact magnitude and receptor sensitivity are high or medium. Additionally, effects are considered to be significant if impact magnitude is high and receptor sensitivity is low, or alternatively, if receptor sensitivity is high and impact magnitude is low. This equates to major and moderate adverse/ beneficial effects.

17.6.11 Other effects equating to minor adverse/beneficial and negligible effects, are not considered to be significant.

## Construction effects

17.6.12 Construction effects will be assessed following the accepted EIA assessment processes including:

- establishment of the baseline with definition and collection of relevant data and information as outlined in Section 17.2 (Establishment of baseline and definition of survey);
- consultation including those outlined in Section 17.3 (Consultation);
- assessment of impacts and effects against key aspects of the Proposed Scheme as outlined in Section 17.4 (Key aspects of the Proposed Scheme for the topic), covering the scope outlined in Section 17.5 (Scope of assessment) and using the significance criteria outlined in Table 49; and
- iterative further assessment of impacts identified through other environmental topics as part of the EIA.

## Operational effects

17.6.13 The same process will be used for assessment of operational effects as outlined for construction effects.

## Cumulative effects

17.6.14 Cumulative effects will be identified on the basis of a high level assessment of other developments individually or cumulatively in the planning pipeline that have the potential to

interact significantly with the Proposed Scheme. Other developments will include major infrastructure projects such as HS2 Phase 2a and large scale urban developments (e.g. urban extensions). The known characteristics of such developments will be converted into an employment effect using employment density assumptions and identified in relation to the Proposed Scheme's own timeline.

## 17.7 Assumptions

17.7.1 Key assumptions include:

- construction labour productivity underpinning the construction labour demand curve remains constant over the life of the Proposed Scheme (e.g. no major changes in technology and method of work that lead to changes in the skills mix); and
- projections of the baseline/counterfactual (without HS2 economic trends) remain constant over the lifespan of the Proposed Scheme (in terms of known major projects, macro-economic conditions etc.).

## 18 Sound, noise and vibration

### 18.1 Introduction

**Table 50 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraph 18.1.12	Government noise policy and environmental impact assessment	Reference updated to the latest guidance.
Table 46 (under paragraph 18.3.39)	Significance criteria - non-residential receptors and land uses	Update to noise screening criteria for noise sensitive non-residential buildings and external amenity spaces.
Paragraph 18.3.40	Significance criteria - non-residential receptors and land uses	Reference updated to the latest guidance.

- 18.1.1 This section of the SMR covers noise and vibration effects. It has been divided into two parts, the first dealing with ground-borne noise and vibration and the second dealing with airborne noise.
- 18.1.2 The terms sound and noise are used in this section. 'Sound' is the neutral term used to describe the fluctuating pressure waves in the air that stimulate the sense of hearing. Noise is often defined as unwanted sound. The term sound is used in this scope and methodology where appropriate because during consultation for HS2 Phase One in 2011, communities along HS2's line of route requested that the 'sound quality' in their local area be taken into consideration when assessing the effects of HS2.
- 18.1.3 The SMR for the Proposed Scheme builds on that from Phase One and Phase 2a.
- 18.1.4 The Phase One and Phase 2a approaches to the assessment and control of noise and vibration effects caused by the construction and operation of the Proposed Scheme anticipated the changes<sup>224</sup> in EIA Regulations that were made into UK law in May 2017<sup>225</sup>.
- 18.1.5 The HS2 scope and method for the assessment of noise or vibration likely significant effects is developed in alignment with Government noise policy. HS2 Phase One was the first major infrastructure project to set out the interaction between Government noise policy<sup>226</sup> and the EIA Regulations.

<sup>224</sup> The two main changes in the EIA regulations with regard to noise and vibration relate to the greater emphasis on firstly monitoring and secondly the assessment of effects on health.

<sup>225</sup> *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017 No. 571)*. London, Her Majesty's Stationery Office.

<sup>226</sup> Department for Environment, Food and Rural Affairs (2015), *Noise Policy Statement for England*. Available online at:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69533/pb13750-noise-policy.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf).

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- 18.1.6 The SMR for Phase One was published in 2012 at a time when the implementation of Government noise policy within planning policy and planning practice guidance was only emerging following the publication of the NPPF in 2012. During the parliamentary examination of the Phase One hybrid Bill, HS2 Ltd's implementation of the above policies and guidance was clarified and the presentation simplified in a number of Information Papers, E20-E23<sup>227,228,229,230</sup>.
- 18.1.7 When the Phase 2a SMR was published in 2016, the Phase One hybrid Bill was still being examined by Select Committee. The Phase 2a SMR took account of any changes in scope and method arising from the examination of the Phase One hybrid Bill but retained the form of presentation used for the Phase One SMR.
- 18.1.8 The Phase One and Phase 2a hybrid Bills were enacted in February 2017 and February 2021 respectively, along with the final version of the Information Papers covering:
- Control of airborne noise (Phase One: E20/Phase 2a: E9);
  - Control of ground-borne noise and vibration from the operation of the temporary and permanent railways (Phase One: E21/Phase 2a: E10);
  - Control of noise from the operation of stationary systems (Phase One: E22/Phase 2a: E11); and
  - Control of construction noise and vibration (Phase One: E23/Phase 2a: E13).
- 18.1.9 The following Phase 2b Western Leg Information Papers for the Proposed Scheme will be published alongside the ES:
- Phase 2b Western Leg Information Paper E9: Control of airborne noise from altered roads and the operational railway;
  - Phase 2b Western Leg Information Paper E10: Control of ground-borne noise and vibration from the operation of temporary and permanent railways;
  - Phase 2b Western Leg Information Paper E11: Control of noise from the operation of stationary systems; and
  - Phase 2b Western Leg Information Paper E13: Control of construction noise and vibration.

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<sup>227</sup> High Speed Two Phase One (2017), Information Paper E20: Control of airborne noise from altered roads and the operational railway.

<sup>228</sup> High Speed Two Phase One (2017), Information Paper E21: Control of ground-borne noise and vibration from the operation of the temporary and permanent railways.

<sup>229</sup> High Speed Two Phase One (2017), Information Paper E22: Control of noise from the operation of stationary systems v1.4.

<sup>230</sup> High Speed Two Phase One (2017), Information Paper E23: Control of construction noise and vibration.

## Key changes since Phase One and Phase 2a

- 18.1.10 The differences in the text of this SMR compared to that of Phases One and 2a are mainly presentational and have been made for the following reasons:
- accessibility: HS2's approach to the assessment and control of noise and vibration caused by the construction and operation of Phase One was subjected to extensive scrutiny during consideration by Parliament of the Phase One hybrid Bill. Whilst the approach was accepted, the Phase One parliamentary process revealed that the language used to describe the approach could be made more accessible. This was particularly with regard to the interaction between Government noise policy<sup>231</sup> and the EIA Regulations; and
  - presentational consistency with Phase One Information Papers: HS2 Phase One Information Papers E20-E23 present HS2's implementation of Government noise policy, planning policy and planning practice guidance drawn from the Phase One SMR. This section of the SMR adopts the clearer language and tables from the Information Papers in place of the Phase One and 2a SMR language and tables.
- 18.1.11 Additionally, this section presents a number of changes to the scope of the assessment where HS2 Phase One, in line with best practice, has shown that mitigation incorporated into the Proposed Scheme can avoid likely significant effects associated with a number of sources of noise and vibration and a number of types of receptor. These are brought forward into this SMR in order to reduce the scale of final EIA reporting.

## Government noise policy and environmental impact assessment

### Legislation and planning policy and guidance

- 18.1.12 The EIA must identify 'likely significant effects' resulting from the Proposed Scheme. The assessment will be carried out in the context of the noise policy, and planning policy and guidance in England. This section sets out the approach taken to the relationship between planning policy and guidance and EIA. The approach is common to the sub-topics of noise and vibration.

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<sup>231</sup> Department for Environment, Food and Rural Affairs (2010), *Noise Policy Statement for England*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69533/pb13750-noise-policy.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf).



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- 18.1.13 Relevant regulation includes the EIA Regulations 2017<sup>232</sup>. Relevant policy and guidance includes the Noise Policy Statement for England 2010<sup>233</sup>, (NPSE), the NPPF, and the Government's planning guidance on noise (PPGN)<sup>234</sup>.
- 18.1.14 The aims of the NPSE are, "Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- 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."
- 18.1.15 The explanatory note to NPSE makes use of the following concept:
- Lowest Observed Adverse Effect Level<sup>235</sup> (LOAEL) - the level above which adverse effects on health and quality of life can be detected;  
and goes on to define:
  - Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.
- 18.1.16 Thresholds for identifying these policy adverse effect levels are not defined numerically in any Government document. For HS2 Phase One and Phase 2a they are defined in the HS2 Information Papers E20-E23 and E9-E11 and E13 respectively included in the register of undertakings and assurances.
- 18.1.17 The EIA Regulations require the identification of 'likely significant effects'. Where, in terms of government noise policy, the predicted noise or vibration indicates a significant adverse effect on health and quality of life (i.e. the level exceeds the relevant SOAEL), then the assessment will identify a likely significant observed adverse effect at each receptor. In accordance with PPGN this is where, for example, noise would disrupt activities indoors.
- 18.1.18 In line with best practice<sup>236</sup> and recent projects<sup>237</sup>, this assessment will also consider situations where the predicted noise or vibration is above LOAEL but below SOAEL based on

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<sup>232</sup> *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017 No. 571)*. London, Her Majesty's Stationery Office.

<sup>233</sup> Department for Environment, Food and Rural Affairs (2010), *Noise Policy Statement for England*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69533/pb13750-noise-policy.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf).

<sup>234</sup> Department for Communities and Local Government (DCLG) (2019), *Planning Practice Guidance – Noise*. Available online at: <https://www.gov.uk/guidance/noise--2>.

<sup>235</sup> World Health Organisation (2009), *Night Noise Guidelines for Europe*, WHO Regional Office for Europe, Denmark.

<sup>236</sup> Institute of Environmental Management and Assessment (IEMA) (2014), *IEMA Guidelines for Environmental Noise Impact Assessment*. Available online at: <https://www.iema.net/event-reports/2016/01/07/Launch-Webinar-IEMA-Guidelines-for-Environmental-Noise-Impact-Assesment-2014/>.

<sup>237</sup> HS2 Phase One, A14 Cambridge to Huntingdon Improvement Scheme and Thames Tideway Tunnel.

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the change in noise or vibration caused by the Proposed Scheme, and other evaluative criteria. This assessment leads to the identification of effects that are likely to be considered significant on a community basis, and consequently inform proposals for mitigation. An example of such 'other evaluative criteria' is the number of dwellings in a community that are subject to the change (see Section 18.2). With regard to PPGN, such likely significant effects relate for example to a change in the perceived 'acoustic character' of an area and may be either adverse, due to a noise increase, or beneficial, due to a noise reduction, caused by the Proposed Scheme.

- 18.1.19 Table 51 summarises how noise and vibration levels in terms of Government noise policy and, for example, change in noise or vibration levels, will be collectively used with other contextual information to identify effects that are likely to be significant at individual dwellings or on a community basis. The table is based on the noise exposure hierarchy presented in PPGN.
- 18.1.20 Policy and regulation that are specific to individual sub-topics of noise and vibration are presented within the appropriate paragraphs of this section. The relevant LOAEL and SOAEL values criteria are presented for each sub-topic.

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**Table 51 - Noise and vibration assessment approach for dwellings**

Noise and vibration assessment approach for dwellings: interaction between Government policy and guidance, and EIA requirements (based on the noise hierarchy table presented in PPGN)							
	Government noise policy and planning practice guidance			EIA	Mitigation		
	Perception	Effect	Action	Assessment <sup>238</sup>	Effect	Source	Receptor
	Not noticeable	No effect	No specific measures required	None	Adverse effect unlikely	Special cases only	None
	Noticeable and not intrusive	No observe and adverse effect	No specific measures required				
	Lowest Observed Adverse Effect Level – LOAEL						
	Noticeable and intrusive	Observed adverse effect [increasingly likely]	Mitigate and reduce to a minimum	Noise level change + contextual significance criteria	Change in noise level may cause adverse effect on acoustic character of an area. This may be considered a likely <i>significant</i> effect in EIA terms on a community basis	Take all reasonable steps to mitigate and reduce to a minimum	None
	Significant Observed Adverse Effect Level – SOAEL						
←Increasing level of noise or vibration	Noticeable and disruptive	Observed Significant 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 <sup>239</sup>
	Noticeable and very disruptive	Unacceptable adverse effect	Prevent	Exceeding this effect level – each receptor is a significant effect			Prevent at source or compensate (e.g. temporarily rehouse during construction)

- 18.1.21 In order to express the range of outcomes typically identified in an EIA, the concept of flow through the table has been added for the identification of effects as noise or vibration increases. Additional words (in square brackets) have been added to the PPGN description to reflect the changing situation as noise and vibration increases, working down the table.

## 18.2 Ground-borne noise and vibration

### Introduction

- 18.2.1 This section presents the proposed approach for assessing ground-borne noise and vibration associated with the construction, operation and maintenance of the Proposed Scheme.
- 18.2.2 Ground-borne vibration created either by construction activities, maintenance or train services propagates through the ground to surrounding buildings where it may result in the vibration of floors, walls and ceilings which could also be heard as a low frequency ‘rumbling’ sound (called ground-borne noise).
- 18.2.3 The assessment will cover all homes, businesses, amenities and facilities referred to as receptors, including, where appropriate, those for which planning permission has been granted before the safeguarding date but are not yet completed, subject to the screening distances discussed within the specific subject areas. Where a receptor has multiple uses, the assessment will be made based on the most sensitive use.

### Establishment of baseline and definition of survey requirements

- 18.2.4 Absolute criteria, rather than change criteria, generally apply for ground-borne noise and vibration for the following reasons:
- there is rarely any appreciable existing ground-borne noise or vibration at a receptor;
  - the character and nature of ground-borne noise and vibration generally differs from other ambient noise heard inside buildings;
  - the body of experience and research available with regard to human response to ground-borne noise and vibration has mostly been based on the assessment of the exposure to the source being assessed;

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<sup>238</sup> Provision is made under HS2 implementation of policy and EIA for Special Cases whereby a receptor specific assessment may be necessary to determine whether an adverse or significantly adverse effect is likely, potentially leading to reasonable adjustments to the mitigation.

<sup>239</sup> Permanent residential buildings, subject to eligibility criteria, see HS2 Ltd Phase 2b Western Leg Information Paper E13: Control of construction noise and vibration.

- ground-borne noise and vibration can affect any room in a property, so the criteria consider situations where for example existing internal background sound/noise levels are at their lowest for a particular classification of receptor (e.g. rooms on a quiet façade of a residential receptor, auditoria, recording or broadcasting studios, rooms used for acoustic test measurements); and
- it provides a reasonable worst case assessment.

18.2.5 Ground-borne noise or vibration baseline surveys will generally not be carried out except for example as part of a site specific risk assessment.

## **Consultation and engagement**

### **Engagement as part of the EIA process**

18.2.6 Principal consultees on the approach to the assessment of ground-borne noise and vibration are the relevant local planning authorities.

18.2.7 Dialogue with local stakeholder groups will be via community areas during the design and assessment of the Proposed Scheme as well as through public consultation on the ES.

### **Key aspects of the Proposed Scheme for the topic**

18.2.8 The key aspects for ground-borne noise and vibration are the following generic types of potential significant adverse effect that could occur without control measures:

- potential cosmetic damage to buildings, but only at very high levels of vibration which rarely, if ever, occur during construction or operation because of the use of modern, e.g. non-percussive, piling techniques and current industry standards for trains and track;
- perceptible ground-borne noise and/or vibration in residential buildings;
- low levels of ground-borne noise caused by imperceptible vibration could adversely affect buildings where low ambient sound levels are critical to their operation (e.g. recording and broadcast studios, concert halls and theatres); and
- low levels of vibration that would be imperceptible to people can adversely affect facilities where low ambient vibration is critical to operations (e.g. nanotechnology laboratories).

18.2.9 The following are potential sources of ground-borne noise and vibration:

- temporary sources: e.g. tunnel boring machine(s) (TBMs) and their supporting temporary construction railways, some types of piling and vibro-compaction; and
- permanent sources: train operation and train and railway maintenance.

## Sources, receptors and types of effect that can be mitigated to avoid significant effects

- 18.2.10 The Phase One and Phase 2a EIAs reported, in line with industry best practice, that likely significant noise and/or vibration effects from a number of sources or at a number of types of receptor are avoided by mitigation incorporated into the Proposed Scheme. The sources and receptors described in the following paragraphs will therefore not be subject to a quantitative assessment for the Proposed Scheme with the exception of special cases which will be considered individually<sup>240</sup>.
- 18.2.11 Building damage due to vibration: a scheme designed, constructed and operated to current engineering standards for modern high-speed railway including the adoption of a CoCP will avoid any risk of damage to any building (including cosmetic damage).
- 18.2.12 TBMs: to excavate tunnels TBMs will be used, which can generate ground- borne noise and vibration as the rotating head of the TBM 'cuts' through the ground. TBMs can therefore give rise to ground- borne noise and vibration that is perceptible, albeit only for short periods of time (generally a matter of days) at any individual receptor. Due to the low level and short duration of ground-borne noise or vibration that results, there is a low likelihood of tunnel boring resulting in the identification of likely significant effects.
- 18.2.13 Temporary construction railways (within tunnels): materials (including tunnel lining segments) and equipment are likely to be transported from the surface to the TBM using a temporary railway which travels at relatively low speeds. It should be noted that other methods of moving material and equipment are available, but the temporary railway is the most likely and is also the method which represents a reasonably foreseeable worst case in terms of ground-borne noise or vibration impacts. Supply trains can also be used to transport spoil from the TBM to the surface, but it is more likely to be undertaken by conveyor. The temporary railway can generate ground- borne noise and vibration in the same way as the Proposed Scheme. HS2 will employ similar measures to those used by Crossrail to reduce vibration transfer through the rail support structures, and therefore significant effects from supply train ground- borne sound and vibration are considered unlikely. The Phase One construction design and EIA demonstrated how any residual ground-borne noise or vibration effects can be mitigated by a CoCP.
- 18.2.14 Temporary construction traffic (road vehicles): based on the commitment given in the CoCP that the surface of temporary and permanent access roads and temporary haul routes for the Proposed Scheme will be maintained through the construction of the Proposed Scheme, the effects of ground- borne noise or vibration from construction road traffic are not

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<sup>240</sup> Ground-borne noise and vibration (GBNV) sensitive receptors will be the subject of site specific risk assessment, see Table 55.

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considered to be significant. The Phase One construction design and EIA demonstrated how any residual ground-borne noise or vibration effects can be mitigated by a CoCP.

- 18.2.15 Vibro- compaction: it is considered that the use of vibratory rollers for minor works, such as road surfacing, reinstatement after utility diversions etc. will generate perceptible vibration<sup>241</sup>. However, the Phase One construction design and EIA showed that with due warning and the other mitigation measures committed to in a CoCP, they will not result in significant adverse effects due to the limited nature and short duration of such works.
- 18.2.16 Pneumatic breakers: pneumatic breakers are commonly required to break up existing concrete structures during demolition works. The use of such equipment can generate perceptible vibration. However, any adverse effects are generally limited to receptors very close to the equipment. The Phase One construction design and EIA demonstrated that based on the limited extent and duration of such works, and with due warning and the other mitigation measures committed to in a CoCP, any adverse vibration effects are considered unlikely to be significant.
- 18.2.17 Operation of the Proposed Scheme – ‘Rayleigh or bow waves’ (analogous to the bow waves caused by a ship on the surface of the water): the occurrence of high levels of vibration from ‘bow waves’ is a rare situation which can occur where trains are travelling at a speed, known as the critical speed, over a railway situated on very soft ground. The critical speed is dependent on the ground conditions below and is not confined to high speed railways. This phenomenon is well understood and is mitigated by appropriate design and construction techniques (e.g. HS1 across Wennington Marshes). Where this could occur, measures such as soil strengthening or bridging over soft ground to ensure bow waves do not adversely affect train operations, or damage the infrastructure, will be incorporated. Based on this, the Phase One design and EIA showed that any effects are unlikely to be significant.
- 18.2.18 Maintenance: ground-borne noise and vibration could be generated by activities such as ballast tamping or repair of trackform. Given the irregularity of the activity and short duration at any one location, maintenance work is considered unlikely to give rise to significant ground-borne noise or vibration effects on residential properties.

## Scope of assessment

- 18.2.19 Temporal scope: the construction of the Proposed Scheme will be assessed throughout the construction period. The operation of the Proposed Scheme will be assessed at the year of opening and for the year with the highest traffic patterns forecast for the first 15 years of operation. These will be compared, as necessary, with the future baseline in the year of opening (without the Proposed Scheme).

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<sup>241</sup> Transport Research Laboratory (TRL) (2000), *TRL Report 429: Groundborne vibration caused by mechanised construction works*, TRL.

- 18.2.20 Spatial scope for direct effects is based on the High Speed Rail (London - West Midlands) Act 2017, the United States (US) Federal Railroad Administration guidance<sup>242</sup>, Federal Transit Administration (FTA) guidance<sup>243</sup> and previous UK infrastructure projects. For a scheme designed, constructed and operated to current engineering standards, and taking account of reasonably foreseeable worst case assumptions, the US guidance sets the following screening distances for the assessment of the potential impact arising from the operation of a new rail system. A quantitative assessment will be undertaken for all receptors within the following areas:
- residential and non-residential receptors (except as defined below) - whichever is the greater of either 85m from the centreline of the track or nearest construction activity or the area within which impacts from ground-borne noise and/or vibration from the Proposed Scheme are forecast; and
  - non-residential receptors/land uses where low ambient vibration or sound is critical to operations, for example, very sensitive laboratory equipment such as nanotechnology laboratories, sound recording/broadcast studios, large auditoria/theatres or concert halls - 200m from centreline of the track or nearest construction activity.
- 18.2.21 Indirect effects: a qualitative assessment will be made where the increase or decrease in rail traffic volumes or types caused by the Proposed Scheme would cause a change in the baseline Vibration Dose Value (VDV) from existing railways greater than 25% (refer to Table 53).

## Assessment methodology

### Legislation, policy, standards and guidance

- 18.2.22 Relevant legislation includes the Control of Pollution Act 1974<sup>244</sup>, the Environmental Protection Act 1990, the Noise and Statutory Nuisance Act 1993<sup>245</sup> and the Land Compensation Act 1973<sup>246</sup> (all as amended).
- 18.2.23 Relevant regulation includes the EIA Regulations 2017<sup>247</sup>.
- 18.2.24 Relevant policy and guidance is set out in Section 18.1.

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<sup>242</sup> U.S. Department of Transportation and the Federal Railroad Administration (Office of Railroad Development) (2005), *High-Speed Ground Transportation Noise and Vibration Impact Assessment*, Federal Railroad Administration.

<sup>243</sup> U.S. Department of Transportation and the Federal Transport Administration (2006), *Transit Noise and Vibration Impact Assessment Guidance Manual*, Federal Transit Administration.

<sup>244</sup> *Control of Pollution Act 1974*. London: The Stationery Office.

<sup>245</sup> *Noise and Statutory Nuisance Act 1993*. London: The Stationery Office.

<sup>246</sup> *Land Compensation Act 1973*. London: The Stationery Office.

<sup>247</sup> *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017 No. 571)*, London, Her Majesty's Stationery Office.



18.2.25 Relevant standards include:

- BS5228-2 Code of Practice for Noise and Vibration Control on Open Construction Sites - Part 2: Vibration<sup>248</sup>;
- BS6472-1 Guide to evaluation of human exposure to vibration in buildings: 1-Vibration sources other than blasting<sup>249</sup>; 2-Blast-induced vibration<sup>250</sup>;
- BS7385-2 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration<sup>251</sup>; and
- ISO14837-1 Mechanical vibration – Ground-borne noise and vibration arising from rail systems – Part 1: General Guidance<sup>252</sup>.

## Calculation methods

18.2.26 The ground-borne noise and vibration potentially generated by the majority of construction activities will be calculated using the guidance in Transport Research Laboratory (TRL) Report 53<sup>253</sup> and TRL Report 429<sup>254</sup>, and guidance in BS5228-2<sup>255</sup>.

18.2.27 The ground-borne noise and vibration potentially generated by rail operations associated with the Proposed Scheme, both temporary operations during construction and permanent, will be calculated using the calculation method developed and validated for the design and construction of Phase One<sup>256</sup>. The method is empirical, developed from thousands of measurements, is fully consistent with ISO 14837<sup>257</sup>, and takes account of all key parameters, including train design, train speed, track design, tunnel design, tunnel depth,

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<sup>248</sup> British Standards Institute (BSi) (2009+A1:2014), *BS 5228-2 Code of Practice for Noise and Vibration Control on Open Construction Sites - Part 2: Vibration*, BSi.

<sup>249</sup> British Standards Institute (BSi) (2008), *BS6472-1 Guide to evaluation of human exposure to vibration in buildings: 1-Vibration sources other than blasting*, BSi.

<sup>250</sup> British Standards Institute (BSi) (2008), *BS6472-2 Guide to evaluation of human exposure to vibration in buildings: 2-Blast-induced vibration*, BSi.

<sup>251</sup> British Standards Institute (BSi), *BS7385-2 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration*, BSi.

<sup>252</sup> International Standards Organisation (ISO) (2005), *14837 Mechanical vibration – Ground-borne noise and vibration arising from rail systems – Part 1: General Guidance*, ISO.

<sup>253</sup> Transport Research Laboratory (TRL) (1986), *TRL Report 53: Ground vibration caused by civil engineering works*, TRL.

<sup>254</sup> Transport Research Laboratory (TRL) (2000), *TRL Report 429: Groundborne vibration caused by mechanised construction works*, TRL.

<sup>255</sup> British Standards Institute (BSi) (2009+A1:2014), *BS 5228-2 Code of Practice for Noise and Vibration Control on Open Construction Sites - Part 2: Vibration*, BSi.

<sup>256</sup> High Speed Two Ltd (2013), *High Speed Rail (London – West Midlands) Environmental Statement, Volume 5, Appendix SV-001-000 Methodology, assumptions and assessment (route-wide) - Sound, noise and vibration*. Available at: <https://www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-5-sound-noise-and-vibration/hs2-phase-one-environmental-statement-volume-5-sound-noise-and-vibration>.

<sup>257</sup> International Standards Organisation (ISO) (2005), *14837 Mechanical vibration – Ground-borne noise and vibration arising from rail systems – Part 1: General Guidance*, ISO.

ground conditions, receiving building foundations and receiving building type. The method has been further tested, validated and scrutinised at public inquiry on many urban mass transit systems around the world.

## Significance criteria – direct effects – residential receptors

18.2.28 With regard to the implementation of Government noise policy, the ground-borne noise and vibration adverse effect thresholds set out in Table 52 for permanent residential buildings are those defined by the High Speed Rail (London - West Midlands) Act 2017.

**Table 52 - Ground-borne noise and vibration effect levels for permanent residential buildings**

Sub- topic	Effect Level		dB L <sub>pASMax</sub>
Ground-borne noise	Lowest Observed Adverse Effect Level LOAEL		35
	Significant Observed Adverse Effect Level SOAEL		45
		Time of day	VDV m/s <sup>1.75</sup>
Vibration	Lowest Observed Adverse Effect Level LOAEL	Daytime (07:00-23:00)	0.2
		Night time (23:00 – 07:00)	0.1
	Significant Observed Adverse Effect Level SOAEL	Daytime (07:00-23:00)	0.8
		Night time (23:00 – 07:00)	0.4

18.2.29 Where the predicted ground-borne noise or vibration level exceeds the relevant SOAEL value in Table 52, then a likely significant adverse effect will be reported for each affected dwelling.

18.2.30 For residential receptors, effects likely to be considered significant on a community basis will also be determined where the calculated ground-borne noise and or vibration level exceeds the relevant LOAEL but is less than the relevant SOAEL values in Table 52 by taking into account:

- the type of effect being considered (e.g. annoyance);
- the magnitude of the effect (i.e. the calculated noise or vibration level compared the relevant LOAEL and SOAEL values and available dose-response information);
- the change in vibration level, where relevant, as classified using Table 53;
- the number and grouping of residential receptors affected;
- the potential combined effect of airborne sound, ground-borne noise and ground-borne vibration;
- any unique features of the Proposed Scheme’s noise or vibration in the area being considered (which may require secondary acoustic indicators/criteria);
- the frequency and duration over which temporary construction impacts may occur; and
- the effectiveness of mitigation through design or other means.

**Table 53 - Vibration change criteria for the assessment of disturbance (annoyance) of occupants and building users**

Change classification	Impact criteria where appreciable existing levels of vibration <sup>258</sup> exist
	% increase or decrease in VDV
Negligible	≤ 25
Minor	25 to 40
Moderate	> 40, to 100
Major	>100

## Significance criteria – direct effects – non-residential receptors

18.2.31 For non-residential receptors, significant effects will be determined on a receptor by receptor basis taking into account:

- the use and sensitivity of the receptor;
- the type of effect being considered;
- whether the calculated magnitude of ground-borne noise or vibration exceed the screening criteria set out in Table 54 and Table 55 and then;
- the design of the receptor affected;
- the existing ambient sound and vibration levels in the receptor affected;
- the potential combined impacts of airborne sound, ground-borne sound and vibration;
- any unique features of the Proposed Scheme’s sound or vibration impacts in the area being considered (which may require secondary acoustic indicators/criteria);
- the frequency and duration over which temporary construction impacts may occur; and
- the effectiveness of mitigation through design or other means.

**Table 54 - Ground-borne noise screening criteria for non-residential receptors**

Category of building	Screening criterion dB L <sub>pASmax</sub> (predicted inside the noise sensitive part of the receptor)
Theatres/large auditoria and concert halls	25
Sound recording/broadcast studios	30
Places of meeting for religious worship/courts/cinemas lecture theatres/museums/small auditoria or halls	35
Offices/ schools/colleges/hospitals/hotels/libraries	40

<sup>258</sup> Where there is an appreciable existing level of vibration and daytime and night-time vibration dose vales (VDVs) exceed 0.2ms-1.75 and 0.1ms-1.75 respectively.

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**Table 55 - Ground-borne vibration screening criteria for non-residential buildings**

Examples	VDV <sub>day</sub> m/s <sup>1.75</sup>	VDV <sub>night</sub> m/s <sup>1.75</sup>
Hotels; hospital wards; and education dormitories	0.2	0.1
Offices; Schools; and Places of Worship	0.4	n/a
Workshops	0.8	n/a
Vibration sensitive research and manufacturing (e.g. computer chip manufacture); hospitals with vibration sensitive equipment/operations; universities with vibration sensitive research equipment/operations	Risk assessment will be undertaken based on the information currently available for the relevant equipment/process, or where information provided by the building owner or equipment manufacturer.	

### Significance criteria - indirect impacts

- 18.2.32 Changes in road/rail traffic flows on the existing network will be used to calculate changes in vibration, at source, in VDV. These changes will be classified using the criteria in Table 53. Changes classified as minor, moderate or major will be used to inform a qualitative assessment of likely significant effects.

### Cumulative effects

- 18.2.33 Noise and vibration impacts, both permanent and temporary, will be identified for the Proposed Scheme and other developments, either under construction or consented as referred to in Section 4 of this SMR. The results of these assessments will then be used to qualitatively assess potential cumulative significant effects arising from the Proposed Scheme and any other developments having regard to, amongst other things, spatial and temporal overlap of the noise and vibration impacts.
- 18.2.34 Community, ecological, heritage or health adverse effects arising from impacts and effects identified for ground-borne noise and vibration will be considered and reported in the relevant sections of the ES.

### Assumptions

- 18.2.35 Assumptions, relevant to scope and methodology, for the ground-borne noise and vibration assessment include:
- design assumptions (e.g. train and track specification, revenue service speeds and timetables);
  - construction methods (e.g. type of piling, vibratory compaction methods); and
  - maintenance specifications.

## **18.3 Airborne noise**

### **Introduction**

- 18.3.1 This section presents the proposed approach to assessing airborne noise associated with the construction, operation and maintenance of the Proposed Scheme. Airborne noise generated by the Proposed Scheme has the potential to cause disturbance to neighbouring homes, businesses, facilities and amenities, referred to as receptors.
- 18.3.2 During construction, airborne noise would be generated by construction equipment, construction worksites, construction vehicles on haul routes and public roads, and changes to road traffic.
- 18.3.3 During operation and maintenance, airborne noise would be generated by high speed trains in service, inspection/maintenance trains and other (fixed) sources such as: power supply equipment, ventilation shafts, depots and station building services. The Proposed Scheme may also cause changes in road and rail traffic flow on the current road and rail networks in addition to noise from altered roads and railways.
- 18.3.4 The assessment will cover all receptors, including those for which planning permission has been granted before the safeguarding date but are not yet completed, subject to the screening distances discussed within the specific subject areas. Where a receptor has multiple uses the assessment will be made based on the most sensitive use.

### **Establishment of baseline and definition of survey**

- 18.3.5 To facilitate dialogue with stakeholders, baseline information will be gathered incrementally through field surveys focused on locations where predicted effects are likely to be significant on an individual receptor or community basis. The baseline and impact assessment for the Proposed Scheme will be developed and refined in three stages.
- 18.3.6 Initially, existing data will be gathered to form the desk top baseline (Baseline 1). Baseline 1 data will be used early in the programme to support initial dialogue, assessment work and design development. Following Baseline 1, initial field surveys will be undertaken to fill gaps in Baseline 1 data and provide more detailed information at locations where significant effects are likely. Combined with Baseline 1, these data will form Baseline 2, to be used for the working draft ES. Further, more targeted surveys will be undertaken in responses to the findings of the working draft ES assessments and ongoing stakeholder dialogue. Combined with Baseline 2, these data will provide Baseline 3 for the ES.
- 18.3.7 The baseline data gathering will focus not just on collecting objective data that describes the ambient sound environment, but also information on the character of the local sound environment.
- 18.3.8 Future changes in the airborne sound baseline will be considered where significant effects of the Proposed Scheme might occur and where the future baseline is predictable with

reasonable certainty, for example, due to growth in traffic flows or the introduction of committed developments and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations<sup>259</sup>, Roads<sup>260</sup> or Railways<sup>261</sup>. HS2 Ltd will engage with the competent authorities responsible for the relevant Important Areas. This will be reported in the ES.

## Consultation and engagement

### Engagement as part of the EIA process

- 18.3.9 Principal consultees on the approach to the assessment of airborne noise are the relevant local planning authorities.
- 18.3.10 Engagement with local stakeholder groups will be via community areas during the design and assessment of the Proposed Scheme.

### Key aspects of the Proposed Scheme for the topic

- 18.3.11 The following are potential sources of airborne noise:
- temporary sources:
    - direct effects could be caused by airborne noise from construction activities such as tunnelling, demolition, earthworks, viaducts, bridges, road realignments, utility works and track works. These activities would be supported from local work compounds close to the structure or tunnel being constructed, local worksites, or larger worksites from where activities are coordinated; and
    - indirect effects could be caused by temporary changes to road and rail traffic patterns on the existing networks during construction;

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<sup>259</sup> Department for Environment, Food and Rural Affairs (2014), *Noise Action Plan: Agglomerations*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276228/noise-action-plan-agglomerations-201401.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276228/noise-action-plan-agglomerations-201401.pdf).

<sup>260</sup> Department for Environment, Food and Rural Affairs (2014), *Noise Action Plan: Roads* (including major roads). Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276237/noise-action-plan-roads-201401.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276237/noise-action-plan-roads-201401.pdf).

<sup>261</sup> Department for Environment, Food and Rural Affairs (2014), *Noise Action Plan: Railways* (including major railways). Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276238/noise-action-plan-railways-201401.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276238/noise-action-plan-railways-201401.pdf).

- permanent sources:
  - direct effects could be caused by the operational railway and its supporting systems (e.g. rolling stock and infrastructure maintenance depots, vent shafts, other line side equipment and maintenance); and
  - indirect effects could be caused by long term changes to road and rail traffic patterns on the existing networks.

## **Sources, receptors and types of effect that can be mitigated to avoid significant effects**

- 18.3.12 The HS2 Phase One and Phase 2a EIAs reported, in line with industry best practice, that likely significant noise and/or vibration effects from a number of sources or at a number of types of receptor are avoided by mitigation incorporated into the Proposed Scheme. The sources and receptors described in the following paragraphs will therefore not be subject to a quantitative assessment for the Proposed Scheme with the exception of special cases which will be considered individually.
- 18.3.13 Facilities that permit occasional overnight stays such as static moorings, camp sites or caravan parks but do not permit long term residential use are not considered to be significantly affected by noise during construction or operation of the Proposed Scheme due to the short and irregular exposure of occupants to noise from the Proposed Scheme.
- 18.3.14 PRoW are by their nature transitory in their use, with users not staying in any one location for any length of time. Levels of noise from the construction and operation of the Proposed Scheme will vary as the right of way moves closer to, and further from, the Proposed Scheme. Noise effects would generally be reduced by the control measures defined in the CoCP during construction. During operation, noise levels on PRoW would be reduced by engineering cuttings, landscape earthworks provided to reduce the visual impact of the Proposed Scheme and noise mitigation provided to protect adjacent residential and non-residential receptors. Train noise from the Proposed Scheme is intermittent. Significant noise effects are therefore considered unlikely on PRoW during either construction or operation.
- 18.3.15 Public open spaces and outdoor sports/recreation community facilities (e.g. football pitches, golf courses) are, by their nature, transitory in their use. Outdoor sport activities are unlikely to be significantly affected by noise at the levels associated with construction or operation of the Proposed Scheme, outside the route corridor or outside of any construction sites. Increases in noise due to construction and operation of the Proposed Scheme may adversely affect the acoustic character of the area around such facilities. However, as users will not be exposed to any increased noise for long periods the adverse noise effects on users are not considered significant. Quantitative assessments will be undertaken for any outdoor community facility formally identified or designated as a quiet area under Government regulations or policy.



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- 18.3.16 Construction noise from standard utilities work rises and falls in level as the works pass by a given receptor, usually within a period or less than one month. With due warning and the other mitigation measures committed to in the CoCP noise impacts from such works is of insufficient duration to cause significant effects.
- 18.3.17 It is anticipated that there may be some night-time working during works alongside, to cross, or to tie into existing roads and railways during possessions (for example a weekend). The duration of any noise exposure would be short-term and will be controlled and reduced by the management processes set out in the CoCP. With due warning and the other mitigation measures committed to in the CoCP, the effects are therefore considered unlikely to be significant.
- 18.3.18 Track laying, power system and signalling installation works along the route of the Proposed Scheme are likely to occur for a short duration in proximity to any individual community or receptor. Noise effects will be of short duration and would be controlled and reduced by the management processes set out in the CoCP. With due warning and the other mitigation measures committed to in the CoCP these works are therefore considered unlikely to result in significant construction noise effects.
- 18.3.19 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.
- 18.3.20 Permanent static equipment will be designed so that it will avoid significant effects and will minimise adverse noise effects as far as sustainable. This was achieved on Phase One via the assurances provided in Information Paper E22<sup>262</sup>. The effects are therefore considered unlikely to be significant.
- 18.3.21 During maintenance, airborne noise would be generated along the route by specialist engineering trains, rail grinding, ballast tamping and inspection. Given the irregularity and short duration at any one location of maintenance activities associated with these specific sources, maintenance work is considered unlikely to give rise to significant noise effects.

## Scope of assessment

- 18.3.22 Temporal scope: the construction of the Proposed Scheme will be assessed on a monthly basis throughout the construction period. The operation of the Proposed Scheme will be assessed, as necessary, in the short term at the year of opening; and in the long-term with the highest rail traffic patterns forecast for the first 15 years of operation. These will be compared, as necessary, with the future baseline in the year of opening (without the Proposed Scheme).

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<sup>262</sup> High Speed Two Ltd (2017), *Phase One Information Paper E22: Control of noise from the operation of stationary systems*, v1.4.



- 18.3.23 Spatial scope for direct effects - for the Proposed Scheme, and taking account of reasonably foreseeable worst case assumptions, the following screening distances will be used which are consistent with Phase One and Phase 2a, HS1 and in excess of guidance from sources such as US Federal Railroad Administration Guidance for high speed rail:
- construction (from BS5228-1<sup>263</sup>) - 300m from any construction activity or the area within which sound levels from the Proposed Scheme are forecast to give rise to potential impacts, whichever is the greater; and
  - operational Proposed Scheme - 500m and 1km from the centre line of the HS2 line of route or re-aligned rail or road routes in urban and rural areas respectively, or the area within which sound levels from the Proposed Scheme are forecast to give rise to potential impacts, whichever is the greater.
- 18.3.24 Spatial scope for indirect effects - a qualitative assessment will be made where the increase or decrease in road or rail traffic volumes or traffic types caused by the construction or operation of the Proposed Scheme would be likely to cause a change in noise level (equivalent continuous sound level,  $L_{pAeq,T}$ ) from that road or rail traffic exceeding 1dB during either the day (07:00 to 23:00) or night time periods (23:00 to 07:00).

## Assessment methodology

### Legislation and guidance

- 18.3.25 Relevant legislation includes the Control of Pollution Act 1974, the Environmental Protection Act 1990, the Noise and Statutory Nuisance Act 1993, the Land Compensation Act 1973 (including the Noise Insulation Regulations) and the European Communities Act 1972 (including the Environmental Noise (England) Regulations 2006) (all as amended).
- 18.3.26 Relevant policy and guidance are set out in Section 18.1.
- 18.3.27 Relevant guidance and standards include, in part, the Transport Analysis Guidance<sup>264</sup>, and as identified in each of the following sections.

### Calculation methods

- 18.3.28 The airborne noise generated by construction activities will be predicted in line with the method set out in BS5228-1.
- 18.3.29 The airborne noise generated by rail operations associated with the Proposed Scheme, high speed trains running on high speed tracks, connecting chords, and conventional lines will be

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<sup>263</sup> British Standards Institute (BSi) (2009+A1:2014), *BS 5228-1 Code of Practice for Noise and Vibration Control on Open Construction Sites - Part 1: Noise*, BSi.

<sup>264</sup> Department for Transport (DfT) (2015), *Transport Analysis Guidance (TAG), Unit A3 Environmental Impact Appraisal*, Section 2, Noise Inputs, DfT.

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calculated using the calculation method developed and validated for the Phase One environmental assessment<sup>265</sup> and being used on Phase 2a. The method is empirical, developed from over a thousand measurements. The method calculates maximum sound levels for each train, as well as equivalent continuous sound levels.

- 18.3.30 The Calculation of Road Traffic Noise (CRTN) 1988<sup>266</sup> will be used to predict the airborne sound from road traffic within the spatial scope (see Section 19, Traffic and transport).
- 18.3.31 The number and location of properties estimated to qualify under the Noise Insulation Regulations and the HS2 construction and operational policies will be reported.

## Significance criteria - direct impacts - residential receptors

- 18.3.32 With regard to the implementation of Government noise policy during the EIA, the construction and operational airborne noise effect thresholds are set out in Table 56<sup>267</sup> and Table 57 respectively for permanent residential receptors.

**Table 56 - Airborne noise from construction of the Proposed Scheme - adverse effect thresholds for environmental impact assessment stage for permanent residential buildings (façade levels)**

Time of day	Lowest Observed Adverse Effect Level LOAEL <sup>(1)</sup>	Significant Observed Adverse Effect Level SOAEL
Day (07:00-19:00) L <sub>pAeq</sub> , 12hr	65 dB	75 dB or the ambient sound level, whichever is the higher
Evening (19:00-23:00) L <sub>pAeq</sub> , 4hr	55 dB L <sub>pAeq,T</sub>	65 dB or the ambient sound level, whichever is the higher
Night (23:00 - 07:00) L <sub>pAeq</sub> , 8hr	45 dB L <sub>pAeq,T</sub>	55 dB or the ambient sound level, whichever is the higher

<sup>265</sup> High Speed Two Ltd (2013), *High Speed Rail (London – West Midlands) Environmental Statement, Volume 5, Appendix SV-001-000 Methodology, assumptions and assessment (route-wide) - Sound, noise and vibration*. Available at: <https://www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-5-sound-noise-and-vibration/hs2-phase-one-environmental-statement-volume-5-sound-noise-and-vibration>.

<sup>266</sup> Department of Transport Welsh Office (1988), *Calculation of Road Traffic Noise*, HMSO.

<sup>267</sup> For this assessment the thresholds for construction noise are based upon the BS5228-1 'ABC Method' and reflect the level of detail of construction information that is available at EIA stage. At delivery stage further detailed construction noise predictions will be completed. These predictions will enable implementation, as necessary, of HS2 Ltd's commitments on noise insulation and temporary rehousing, to prevent significant adverse effects at residential properties, as laid out for Phase One in Information Paper E23 and the CoCP. At delivery stage the noise predictions would be carried out by the contractor. The detail construction information available later in the delivery stage will also enable the preparation of Section 61 consents to control and minimise construction noise as required on Phase One by its CoCP.

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Note: (1) consistent with the BS5228 ABC Method, the LOAEL is increased by 5 or 10 dB in higher baseline noise environments.

**Table 57 - Airborne noise from operation of the Proposed Scheme – adverse effect thresholds for permanent residential buildings (free-field levels)**

Time of day	Lowest Observed Adverse Effect Level LOAEL LOAEL	Significant Observed Adverse Effect Level SOAEL
Day (07:00 – 23:00) dB <i>L<sub>pAeq, 16hr</sub></i>	50 dB	65 dB
Night (23:00 – 07:00) <i>L<sub>pAeq, 8hr</sub></i>	40 dB	55 dB
Night (23:00 – 07:00) <i>L<sub>pAFMax</sub></i>	60 dB (at the façade, from any regular night time noise event)	80 dB (at the façade, from more than 20 night time train passbys), or 85 dB (at the façade, from 20 or fewer night time train passbys)

18.3.33 Where the predicted construction or operational noise level exceeds the relevant SOAEL values then a likely significant adverse effect will be reported for each receptor affected.

18.3.34 For residential receptors, likely significant adverse effects (positive from noise reductions and negative from noise increases) will also be determined on a community basis where the calculated noise level exceeds the relevant LOAEL but is less than the relevant SOAEL values in Table 56 or Table 57 by taking into account the following factors:

- type of effect being considered (e.g. annoyance);
- the magnitude of the predicted noise level compared to the relevant LOAEL and SOAEL values and available dose-response information;
- for construction of the Proposed Scheme the assessment category as identified using Table 58;
- for the operation of the Proposed Scheme the predicted change in noise level (day or night) as classified using Table 59;
- the existing sound environment in terms of the absolute level<sup>268</sup> and the character of the existing environment;
- the number and grouping of receptors subject to noise effect and noise change<sup>269</sup>;

<sup>268</sup> As one example: for operational rail sound, greater weight will be given to a sound level change between 1 dB and 3 dB if the area is already exposed to high levels of noise. High levels of noise exposure will be evaluated having regard to the criteria contained in the Noise Insulation (Railway and Other Guided Transport Systems) Regulations 1996 (SI 1996 No. 428), and the Noise Action Plans in England (Defra 2012) for 'First Priority Locations' and 'Important Areas'.

<sup>269</sup> Evaluated using the impact criteria set out earlier in this section.

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- any unique features of the Proposed Scheme or the receiving environment;
- the potential combined impacts of sound and vibration;
- the duration of impact for temporary sources; and
- the effectiveness of mitigation through design or other means.

18.3.35 Construction noise categories are set out in Table 58 in line with BS5228-1 and what is referred to as the 'ABC Method'.

**Table 58 - Airborne noise from construction - criteria at residential receptors (construction noise only)**

Period	Assessment category		
	A	B	C
Day (07:00-19:00) $L_{pAeq, 12hr}$	>65 dB $L_{pAeq,T}$	>70 dB $L_{pAeq,T}$	>75 dB $L_{pAeq,T}$
Evening (19:00-23:00) $L_{pAeq, 4hr}$	>55 dB $L_{pAeq,T}$	>60 dB $L_{pAeq,T}$	>65 dB $L_{pAeq,T}$
Night (23:00 – 07:00) $L_{pAeq, 8hr}$	>45 dB $L_{pAeq,T}$	>50 dB $L_{pAeq,T}$	>55 dB $L_{pAeq,T}$

Notes:  
 All sound levels are defined at the façade of the receptor.  
 Assessment Category A: criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are less than these values.  
 Assessment Category B: criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are the same as category A values.  
 Assessment Category C: criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are higher than category A values.  
 If the ambient sound level exceeds the Assessment Category C threshold values given in the table (i.e. the ambient sound level is higher than the above values), then an effect on a residential receptor is deemed to occur if the construction  $L_{pAeq,T}$  for the period is greater than the ambient sound level.

18.3.36 Noise change criteria for the operation of the Proposed Scheme are set out in Table 59.

**Table 59 - Airborne noise from operational train and road movements – classification of noise change permanent residential receptors<sup>270</sup>.**

Long term Noise change classification	Short term Noise change classification	Noise level change dB $L_{pAeq, T}$ (positive or negative) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB

<sup>270</sup> Based on the Highways Agency (2011), *Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment*, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration document HD213/11.

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Long term Noise change classification	Short term Noise change classification	Noise level change dB $L_{pAeq, T}$ (positive or negative) T = either 16hr day or 8hr night
Major		$\geq 10$ dB

## Significance criteria - non-residential receptors and land uses

18.3.37 For non-residential receptors and land uses, significant effects will be determined, on a receptor-by-receptor basis, by taking into account:

- the type of effect being considered;
- the use and sensitivity of the receptor or land use;
- the calculated level of noise compared to the precautionary screening criteria in Table 60; and then
- the design of the receptor or land use affected;
- the existing sound environment in the receptor, or on the land use, affected;
- the potential combined impacts of sound and vibration;
- any unique features of the Proposed Scheme's sound or impacts in the area being considered (which may require secondary acoustic indicators/criteria);
- the frequency and duration over which temporary construction impacts may occur; and
- the effectiveness of mitigation through design or other means.

**Table 60 - Noise screening criteria for noise sensitive non-residential buildings and external amenity spaces**

Examples	Day (07:00-23:00)	Night (23:00-07:00)
Large and small auditoria; concert halls; sound recording and broadcast studios; and theatres	60 dB $L_{pAFMax}$ or 50 dB $L_{pAeq, 16hr}$	60 dB $L_{pAFMax}$ or 50 dB $L_{pAeq, 8hr}$
Places of meeting for religious worship; courts; cinemas; lecture theatres; museums; and small auditoria or halls	50 dB $L_{pAeq, 16hr}$	n/a
Schools; colleges; hospitals; hotels; and libraries	50 dB $L_{pAeq, 16hr}$	45 dB $L_{pAeq, 8hr}$
Offices <sup>271</sup> and external amenity spaces	55 dB $L_{pAeq, 16hr}$	n/a

<sup>271</sup> Consistent with HS2 Phase One and HS2 Phase 2a assessments, offices with lower sensitivity to noise will, in the construction assessment, be considered against the A and B categories from the ABC method as described in Table 60.

## Significance criteria - quiet areas

18.3.38 Quiet areas comprise:

- areas designated under Local Plans as being prized for their tranquillity;
- areas designated under Local Plans or Neighbourhood Development Plans as Local Green Spaces; and
- areas identified as Quiet Areas through implementation of the Environmental Noise Regulations.

18.3.39 Tranquillity assessment is multi- disciplinary and will be led for this EIA by the landscape and visual topic area. The methodology employed is set out in Section 15, Landscape and visual of this SMR and is centred on assessing tranquillity on designated Landscape Character Areas. Sound (or the absence of man- made sound) is only a potentially material consideration where areas are assessed as having high tranquillity.

18.3.40 Effects on quiet areas or other resources which are valued for providing tranquillity will be assessed on a receptor by receptor basis having regard to:

- the type of effect being considered;
- the criteria set out in the Noise Action Plans in England for 'Quiet Areas'<sup>272</sup>;
- tranquillity indicators (for land use) - refer also to Section 15;
- any unique features of the Proposed Scheme's sound or impacts in the area being considered (which may require secondary acoustic indicators criteria);
- the duration over which temporary construction impacts may occur; and
- the effectiveness of mitigation through design or other means.

## Significance criteria - indirect impacts

18.3.41 Changes in traffic flows on the existing road and rail network will be used to calculate changes, at source, in equivalent continuous sound level ( $L_{pAeq,16hr}$ ). A minor impact (3dB or greater change) will be taken as an indicator of a potential significant effect unless the area being considered is currently exposed to high levels of sound, in which case, a change of 1dB or greater may be taken as an indicator of potential significance. Communities and receptors subject to noise changes exceeding these indicators will be subject of a qualitative assessment.

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<sup>272</sup> Department for Environment, Food and Rural Affairs (2014), *Noise Action Plan: Agglomerations*. Available online at:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276228/noise-action-plan-agglomerations-201401.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276228/noise-action-plan-agglomerations-201401.pdf).

## Cumulative effects

18.3.42 Noise and vibration impacts, both permanent and temporary, will be identified for the Proposed Scheme and other developments, either under construction or consented as referred to in Section 4.4 (Cumulative effects) of this SMR. The results of these assessments will be used to qualitatively assess potentially significant cumulative effects arising from the Proposed Scheme and these committed developments having regard to, amongst other things, spatial and temporal overlap of the sound and vibration impacts.

## Assumptions

18.3.43 Assumptions, relevant to scope and methodology, for the airborne sound assessment include:

- design assumptions (e.g. train specification, revenue service speeds and timetables);
- maintenance specifications;
- construction methods (e.g. type of piling, vibratory compaction methods); and
- sound emission limits as set by the Technical Specification for Interoperability as amended<sup>273</sup>.

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<sup>273</sup> European Commission (2014), Commission Regulation (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem 'rolling stock -noise' amending Decision 2008/232/EC and repealing Decision 2011/229/EU.

## 19 Traffic and transport

### 19.1 Introduction

**Table 61 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Paragraph 19.5.5	Temporal scope	Updates to reflect updated construction period and opening year.
Paragraph 19.6.4	Guidance	Updates to reflect recent guidance and revisions.
Paragraph 19.6.8	Public transport delays	Updates to determination of significant effect for public transport delay.
Paragraph 19.6.12 and 19.6.39	Vulnerable road users	Updates to determination of significant effect for vulnerable road users.
Paragraph 19.6.14 and 19.6.41	Traffic related severance	Additional text added for clarity.
Paragraph 19.6.15 and 19.6.42	Traffic related severance	Terminology update to include cyclists and equestrians.
Paragraph 19.6.16 to 19.6.20	Non-traffic related severance	Change to terminology for classification of impacts.
Paragraph 19.6.29 and Table 48	Amenity and ambience	Updated to define numbers of travellers affected and the terminology for defining the change in amenity and ambience.

- 19.1.1 This section of the SMR covers traffic and transport which includes the environmental topic areas of traffic, infrastructure, journey times, accessibility and interchanges.
- 19.1.2 The traffic and transport assessment will present an assessment of the impacts on pedestrians, cyclists, equestrians, mobility impaired people, highways, public transport and waterways. It will cover the impacts that are likely to occur during both the construction and, where appropriate, the operational periods of the Proposed Scheme. The principles set out in this section should be applied wherever there are impacts attributable to the Proposed Scheme, although a simplified approach may be appropriate where traffic and transport impacts are considered to be limited.
- 19.1.3 The Proposed Scheme is a transport project and therefore by its very nature will affect existing transport networks. A transport assessment is being undertaken which will inform the traffic and transport section of the ES.



## **Issues to be considered:**

19.1.4 The following key effects will be among those assessed:

- changes in traffic (including heavy goods vehicles (HGV)), public transport, pedestrian and cyclist flows;
- the impacts of alterations to highways and PRow including road layout/closures/diversions/widening/alterations (including stopping and passing places)/junction improvements/ diversion of PRow;
- changes to journey times and journey distances for private and commercial vehicle occupants;
- changes in accessibility and journey times for public transport users;
- changes to interchange, parking, taxi parking/operation, and delivery and servicing;
- changes to bus routes and stop locations; and
- changed journey times and distances, and changes in amenity and ambience, for vulnerable road users and waterway users.

19.1.5 Effects will be classified according to the following four broad levels: no impact, minor, moderate and major.

## **19.2 Establishment of baseline and definition of survey**

19.2.1 Traffic data, traffic surveys and, where appropriate, modelling will be undertaken to inform the transport assessment along the route of the Proposed Scheme. This transport data will also be used to provide information to determine the baseline for the traffic and transport assessment within the ES.

19.2.2 The future baseline will include consideration of the growth in travel demand, including the changes arising from other developments and proposed transport network improvements.

## **19.3 Consultation and engagement**

### **Engagement as part of the EIA process**

19.3.1 Organisations that will be consulted on traffic and transport issues include:

- highway authorities;
- combined authorities;
- Highways England; and
- Network Rail.

19.3.2 As the Proposed Scheme develops, other relevant stakeholders may also be consulted.

## 19.4 Key aspects of the Proposed Scheme for the topic

- 19.4.1 Construction and operation of the following elements, where relevant to traffic and transport, will include:
- the route itself;
  - new and redeveloped stations;
  - stabling, infrastructure maintenance and rolling stock depots;
  - interfaces with other public transport and highway networks including changes to existing, new and improved infrastructure and services;
  - PRoW and users (pedestrians, cyclists etc.);
  - all construction including tunnelling, tunnel portals and vent shafts, HGV routes and points of access, haul routes, construction sites and use of borrow pits;
  - car parking;
  - waiting and loading; and
  - waterway users.

## 19.5 Scope of assessment

### Spatial scope

- 19.5.1 The spatial scope of the traffic and transport assessment will be different for the construction and operational impacts being assessed.

### Spatial scope – construction

- 19.5.2 The assessment will focus on traffic and transport issues resulting from land required for the Proposed Scheme, land required for worksites, the presence of construction traffic on the local road network, and effects on routes crossing the construction areas (PRoW and highways). The extent of the assessment will include:
- the highway network (including parking, loading and access arrangements) affected by construction worksites and on routes used by construction traffic, focusing on routes between worksites and the strategic road network surrounding the Proposed Scheme;
  - public transport networks affected by construction works including rail, bus and coach services, including lines, routes, services and stations/interchanges that may be indirectly affected by the Proposed Scheme;
  - transport interchange arrangements such as bus to rail in the vicinity of the Proposed Scheme;
  - pedestrian, cyclist and equestrian routes in the vicinity of the Proposed Scheme;

- railways used to transport materials and excavated materials; and
- navigable waterways.

## **Spatial scope – operation**

19.5.3 The spatial scope will include the transport routes where there is a substantial change in the usage either through people accessing the Proposed Scheme, or from changes to travel demand on other routes or modes. It will also include roads and other rights of way that are permanently diverted or stopped up.

19.5.4 The assessment will therefore include:

- the highway network where changes to the highway layout or levels of use are likely to occur as a result of the Proposed Scheme;
- the public transport system (and transport networks used to access the public transport system) where it is affected by the increased usage or changed journey patterns arising from the Proposed Scheme, including heavy and light rail and bus and coach services;
- pedestrian, cyclist and equestrian routes in the vicinity of the Proposed Scheme; and
- navigable waterways potentially affected by the Proposed Scheme.

## **Temporal scope**

19.5.5 Potential effects of the Proposed Scheme will be considered for the following:

- construction period 2025 to 2038 (including commissioning) to be assessed against a common base year of 2030: impacts arising from construction;
- opening year for operation (2038): impacts associated with operation; and
- future assessment year for operation consistent with the Phase One assessment and assumed to reflect the full technical capacity and operation of HS2 as a whole (Phase One, Phase 2a and the Proposed Scheme). This has been determined to coincide with appropriate census year data<sup>274</sup>, and will be 2046.

## **19.6 Assessment methodology**

19.6.1 The traffic and transport effects arising from the construction strategy and engineering design for the Proposed Scheme will be assessed as part of the EIA process. The traffic and transport assessment developed for the Proposed Scheme will provide the forecasts of passenger and vehicle movements and transport network characteristics that will be used in the EIA.

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<sup>274</sup> The UK census is undertaken every ten years with transport modelling forecasts often coinciding with five year intervals from an appropriate census year.

- 19.6.2 Having established the likely changes on the road, public transport, PRow or waterway networks during construction and operation, impacts will be assessed using a set of criteria developed for the Proposed Scheme.
- 19.6.3 The criteria used for the identification and assessment of potentially significant impacts are provided below. The magnitude of each impact and its significance will be assessed by a variety of mechanisms, including as necessary computer modelling and professional judgement.

## Guidance

- 19.6.4 Whilst there is no legislation on how traffic and transport assessments should be undertaken the following guidance documents are relevant:
- DfT's Guidance on Transport Assessment, 2007<sup>275</sup> (withdrawn in 2014 and now archived);
  - NPPF, February 2019 and associated Planning Policy Guidance on Travel Plans, Transport Assessments and Statements; and
  - DCLG, March 2014, Guidance on Travel Plans, transport assessments and statements in decision-taking<sup>276</sup>.

## Significance criteria for construction assessment

- 19.6.5 The criteria outlined below will be used to assess the significance of temporary traffic and transport impacts during the construction of the Proposed Scheme from work sites along the route. Some of the significance criteria may be further refined in the development of the traffic and transport assessment.
- 19.6.6 The criteria have been based on information included in the guidance documents previously referenced, in the following documents, and using professional judgement:
- DMRB Volume 11: Environmental Assessment (1993 and updates):
  - DfT's TAG<sup>277</sup>;
  - Guidelines for the Environmental Assessment of Road Traffic<sup>278</sup>;

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<sup>275</sup> Department for Transport (DfT) (2007), *Guidance on Transport Assessment*, DfT – now archived.

<sup>276</sup> Department for Communities and Local Government (2014), *Guidance on Travel Plans, transport assessments and statements in decision-taking*.

<sup>277</sup> Department for Transport (2019), *Transport Analysis Guidance*. Available online at: <https://www.gov.uk/guidance/transport-analysis-guidance-tag>.

<sup>278</sup> Institute of Environmental Assessment (IEA) (1993), *Guidelines for the Environmental Assessment of Road Traffic*, IEA.

- Guidelines for Traffic Impact Assessment<sup>279</sup>; and
- Assessment criteria used for assessing Crossrail<sup>280</sup> and other major schemes including HS2 Phase One<sup>281</sup> and Phase 2a<sup>282</sup>.

19.6.7 With the exception of accidents and safety, impacts with duration of less than four consecutive weeks in any 12 month period are not generally considered significant.

## Public transport delay

19.6.8 A significant impact on journeys by bus and heavy and light rail affected by the Proposed Scheme is defined as any of the following where this lasts for more than four consecutive weeks in any 12 month period:

- a change of more than 10% in a majority of (or typical) journey times by any public transport mode;
- a change in journey distance by bus of more than 400m in urban areas and 1km in rural areas;
- a relevant delay, disruption or overcrowding impact affecting the public transport network over a wide area; and
- a relevant change to service frequency, capacity, loss of through connections or reduction in hours of operation.

## Station/interchange impacts

19.6.9 Potential impacts during construction and operation will be assessed at new and redeveloped stations. A significant impact on stations/interchanges is defined as a change in the vicinity of stations/interchanges that lasts for more than four consecutive weeks in any 12 month period including:

- loss of physical linkage for the next stage of the journey;
- loss of, or relocation of, more than 100m of bus facilities and operations (e.g. of bus stops, passenger waiting facilities, bus stands or operator facilities);
- loss of, or relocation of, more than 100m of taxi facilities and operations (e.g. taxi stands, passenger waiting facilities or operator facilities); and

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<sup>279</sup> Institution of Highways and Transportation (1994), *Guidelines for Traffic Impact Assessment*, Institution of Highways and Transportation.

<sup>280</sup> Crossrail (2005), *Crossrail Environmental Statement: Volume 8a Appendices Transport Assessment: Methodology and Principal Findings*, (Section 5 Assessment Criteria). Available online at: [http://74f85f59f39b887b696f-ab656259048fb93837ecc0ecbcf0c557.r23.cf3.rackcdn.com/assets/library/document/v/original/volume\\_08a.pdf](http://74f85f59f39b887b696f-ab656259048fb93837ecc0ecbcf0c557.r23.cf3.rackcdn.com/assets/library/document/v/original/volume_08a.pdf).

<sup>281</sup> High Speed Two Ltd (2013), *High Speed Rail (London – West Midlands) Environmental Statement, Volume 1: Introduction to the Environmental Statement and the Proposed Scheme*, HS2 Ltd.

<sup>282</sup> High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe) Environmental Statement, Volume 1: Introduction and methodology*.

- loss of, or relocation of, more than 100m of 'park-and-ride' facilities or operations (e.g. dropping off areas).

## **Traffic delays to vehicle occupants**

- 19.6.10 A significant change in driver/vehicle passenger delay (including delays to bus and coach passengers) that is expected to last for more than four consecutive weeks in any 12 month period is defined as any one of the following:
- a diversion that leads to an increase in journey length of more than 1km on a route carrying more than 100 vehicles per day, or 5km on a route carrying more than 40 vehicles per day, or 10km on any other route;
  - where a significant change in delay relating to junction congestion resulting from the construction of the Proposed Scheme is forecast. This will be measured either as the forecast ratio of flow to capacity (RFC) or degree of saturation (DoS). The junctions for consideration will be discussed with the relevant Highways Authority; and
  - where there is a change in traffic flow along a road link and the capacity of that link is constrained to a greater extent than the junctions along it, then a similar approach to that set out for junctions will be used to assess potential delays to road users.

## **Vulnerable road users**

- 19.6.11 Vulnerable road users (also referred to as non-motorised users) include pedestrians, cyclists and equestrians. They are affected by:
- traffic related severance;
  - severance caused by extended travel distances or broken links (barriers to movement); and
  - changes to amenity and ambience.
- 19.6.12 Where such impacts are not expected to last for more than four consecutive weeks in any 12 month period they will be assessed as not significant.

## **Traffic related severance**

- 19.6.13 A change in traffic levels can result in changes to traffic-related severance for non-motorised road users, particularly pedestrians using or seeking to cross a road. A significant change is defined as a 30% increase in daily traffic flows (either HGVs or all vehicles), where the increase is greater than 40 vehicles per day in urban areas or 10 vehicles per day in rural areas.
- 19.6.14 Where HGV traffic, including HS2 related traffic, is less than 10% of total traffic the impact on vulnerable road users of increased HGV traffic would be less as general traffic will be the dominant factor. As a consequence, any adverse impact could be reduced such that, for example, what would otherwise be assessed as a major effect could be considered to be a moderate effect.

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19.6.15 Where the road affected by increased traffic levels is not, in any case, used by non-motorised users (such as a high speed dual carriageway) or safe and adequate crossing points already exist, increased traffic levels would not generally be considered significant in relation to traffic-related severance for non-motorised users. Similarly, for example where there are existing crossings or segregated cycleways, the significance level of any adverse effect may be reduced.

### Non-traffic related severance

19.6.16 Severance due to, for example, extended travel distances or broken links, can affect travellers using non-motorised modes, especially pedestrians. Where reasonably practicable, public footpaths and routes will be reinstated or convenient alternatives provided. Cyclists and equestrians are less susceptible to severance because they can travel more quickly than people on foot, although there may still be significant impacts on these groups.

19.6.17 To ensure a consistent approach, the classification and assessment will be based only on pedestrian movements, unless a change in route is only relevant for cyclists and/or equestrians in which case the distances set out as having the potential to result in significant effects would be adjusted accordingly. The proposed categories of effect are discussed in the following paragraphs.

19.6.18 Low: In general the current journey pattern is likely to be maintained, but there may be some hindrance to movement, for example:

- pedestrians at-grade crossing of a new road carrying less than 8,000 vehicles per day (AADT) in the assessment year without adequate priority crossings; or
- a new bridge or subway or other constraint such as stairs, which involves a material change in levels to be climbed/descended; and/or
- journey lengths being increased by up to 100-250m (less than 100m increase in journey length is considered to be of no impact).

19.6.19 Medium: Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive, for example:

- two or more of the hindrances set out under 'low' applying to an individual journey; or
- pedestrians at-grade crossing of a new road accommodating between 8,000-16,000 vehicles per day (AADT) in the assessment year without adequate priority crossings; and/or
- journeys lengths being increased by 250 - 500m.

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- 19.6.20 High: People are likely to be deterred from making trips to an extent sufficient to induce a change in their habits. This could lead to a change in the location of centres of activity or in some cases to a permanent loss to a particular community. Alternatively, considerable hindrance will be caused to people making their existing journeys. Such impacts can result from:
- pedestrians at-grade crossing of a new road carrying over 16,000 vehicles per day (AADT) in the assessment year without adequate priority crossings;
  - journey lengths being increased by over 500m; and/or
  - three or more of the hindrances set out under 'low' or two or more set out under 'medium'.
- 19.6.21 An overall assessment for the option will then be based on the following guidelines (in each case, the assessment is beneficial if severance is reduced and adverse if severance is increased):
- the overall assessment is likely to be of no impact if increases in severance are broadly balanced by relief of severance;
  - the overall assessment is likely to be minor where the change in severance is low or the total numbers of people affected across all levels of severance is less than 200 per day;
  - the overall assessment is likely to be moderate where the change in severance is medium and between 200 and 1,000 people per day are affected; and
  - the overall assessment is likely to be major where the change in severance is high and affects between 200 and 1,000 people per day, or the total numbers of people affected across all levels of severance is greater than 1,000 per day.

## Amenity and ambience

- 19.6.22 The convenience and attractiveness of the routes for vulnerable users will be assessed in relation to the scale of any change, although this will require a more qualitative assessment. TAG Unit A4.1<sup>283</sup>, describes the assessment of ambience, which includes traveller's amenity. Traveller's journey ambience can be affected by:
- traveller care;
  - travellers' views; and
  - traveller stress.
- 19.6.23 Traveller care for pedestrians, cyclists, equestrians and others will be considered in relation to changes to the provision and design of facilities (e.g. footpaths, cycle lanes and crossings, information), as well as their cleanliness and environment.

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<sup>283</sup> Department for Transport (DfT) (2020), TAG Unit A4.1 Social Impact Appraisal.



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- 19.6.24 The extent to which travellers can see the landscape view will vary with the relative height of the Proposed Scheme and the surrounding ground, vegetation, buildings and structures. Views can be categorised as providing:
- no view - where the route is in a deep cutting, a tunnel or surrounded by environmental barriers;
  - restricted view - where there are frequent cuttings, tunnels or barriers;
  - intermittent view - where there are shallow cuttings or barriers; and
  - open view - where the view extends over many miles.
- 19.6.25 Traveller stress is the adverse mental and physiological effects experienced by travellers. Three main factors influence traveller stress:
- frustration;
  - fear of potential accidents; and
  - route uncertainty.
- 19.6.26 Taken together, these can lead to feelings of discomfort, annoyance, frustration or fear culminating in physical and emotional tension that detracts from the quality and safety of a journey.
- 19.6.27 Assessments will be made of the traveller care, travellers' views and traveller stress ambience factors using the matrix in Table 62<sup>284</sup>. These assessments will consider the impact of the Proposed Scheme on each of these sub-factors using a simple three point scale (i.e. better, neutral or worse than existing ambience).

**Table 62 - Environment: journey ambience**

Factor	Sub-factor	Better	Neutral	Worse
Traveller care	Facilities			
	Cleanliness			
	Information			
	Environment			
Travellers' views	-			
Traveller stress	Frustration			
	Fear of potential accidents			
	Route uncertainty			

<sup>284</sup> Department for Transport (2020), *TAG Unit A4.1 Social Impact Appraisal*, Table 6.1.

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- 19.6.28 An overall impact score for the quality of a journey will be determined using the following guidelines:
- the overall assessment is likely to be neutral if the assessment is neutral for all or most of the sub-factors, or improvements on some sub-factors are generally balanced by deterioration on others; and
  - if the change in impact across the sub-factors is, on balance, for the better, the assessment is likely to be beneficial, and, conversely, it is likely to be adverse if there is an overall change for the worse.
- 19.6.29 The scale of impact will vary with both the numbers of travellers affected and the scale of the change in amenity and ambience as set out in Table 63. For example, major adverse effects will only occur when both the change in amenity and ambience and the number of travellers affected are high whereas moderate effects will occur when changes are high and numbers of travellers medium or where changes are medium and numbers of travellers high.

**Table 63 - Effect levels for travellers affected by changes to amenity and ambience during construction**

Changes in amenity and ambience	Number of travellers affected		
	High	Medium	Low
Low	Minor	Neutral	Neutral
Medium	Moderate	Minor	Neutral
High	Major	Moderate	Minor

- 19.6.30 The methodology set out above will be applied to the Proposed Scheme on a locational basis where amenity or ambience issues for pedestrian, cyclists, equestrians and others are considered likely to be of concern.

## Accidents and safety

- 19.6.31 Significant impacts on accidents and safety risks will be defined for links and junctions for which data is available that have experienced more than nine personal injury accidents in the latest available three-year period<sup>285</sup> and which would also be subject to an increase of 30% or more in total traffic flow during construction.

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<sup>285</sup> Where more than 3 years accident data are used, then the number of accidents should be pro-rated to represent three years' worth of data e.g. if five years accident data were used the number of accidents would be multiplied by 3/5.

## Parking and loading

- 19.6.32 A significant impact arising from the Proposed Scheme on parking and loading, where facilities are identified to be heavily used, is defined as a change for more than four consecutive weeks in any 12 month period of:
- a predicted increase of 10 vehicles, equivalent to the use of 10 spaces or more, or 10%, whichever is the greater, in on-street parking demand;
  - a loss of any designated on-street or off-street spaces, including spaces for disabled persons, buses, taxis, doctors, ambulances, police vehicles and car club bays;
  - a loss of 10 or more, or 10%, whichever is the greater, of on-street parking including restricted on-street parking (such as residents' parking bays) and of private off-street car parking spaces;
  - a loss of 10 or more, or 10%, whichever is the greater, off-street station car parking spaces;
  - a loss of 10 or more, or 10%, whichever is the greater, pedal or motorcycle parking spaces; and
  - a loss of 10% or more designated loading bay spaces or facilities.

## Waterways

- 19.6.33 The Canal & River Trust (formerly known as British Waterways) document Code for Practice Works Affecting the Canal & River Trust<sup>286</sup> identifies the requirements that need to be followed in relation to works affecting the navigation or amenity of canals. In summary, these are that generally no stoppages of the canal or navigation or towpath will be allowable, except for technical reasons. Stoppages must be discussed and agreed in advance with the Canal & River Trust and the duration of stoppages must be minimised. For the purpose of the ES, a significant stoppage is defined as occurring when an unbroken stoppage exceeding six weeks in duration is required, as this is when specific arrangements regarding the transfer of boats around the works by road may be required.
- 19.6.34 The Canal & River Trust also require that towing paths must remain open wherever possible. If a diversion is unavoidable, these should be localised. They may be used by the Canal & River Trust's maintenance plant and be of a standard to allow continued use by existing visitors – walkers, anglers, people with disabilities, cyclists etc. Only as an unusual event would towing paths be permitted to be used for access to the temporary and permanent works for the Proposed Scheme because of conflict with visitors and the unsuitability of the towing path for vehicular use. Impacts on pedestrians, cyclists, mobility impaired persons and equestrians using the towing paths will be assessed in relation to the vulnerable road user and ambience heading and associated criteria.

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<sup>286</sup> Previous guidance from British Waterways, Third Party Works' Procedures Section 2 Code of Practice, British Waterways (2012) is now superseded by the Canal & River Trust (2017), Code for Practice Works Affecting the Canal & River Trust.

## **Significance criteria for operational assessment**

19.6.35 The criteria outlined below will be used to assess the significance of traffic and transport impacts during the operational phase of the Proposed Scheme.

### **Public transport delay**

19.6.36 Significant permanent impacts on journeys by bus and heavy and light rail affected by the Proposed Scheme are defined as any of the following:

- changes of more than 10% in a majority of (or typical) journey times by any public transport mode;
- a change in journey distances by bus of more than 400m in urban areas and 1km in rural areas;
- a relevant delay, disruption or overcrowding impact affecting the public transport network over a wide area; and
- a relevant change to service frequency, capacity, loss of through connections or reduction in hours of operation.

### **Station/interchange impacts**

19.6.37 Stations/interchanges within the Proposed Scheme will be assessed for potential impacts. Impacts that may be caused by additional passengers of the Proposed Scheme arriving and departing at the stations/interchanges will be assessed to identify any changes in forecast numbers of additional passengers. Where the change in forecast passenger numbers is expected to be minor, no further assessment will be undertaken. Where it is considered that any change may have a significant effect, further assessment will be undertaken taking account of:

- forecast numbers of additional passengers;
- local transport conditions at each location;
- resulting increases in crowding and congestion levels arising from increased usage or changed journey patterns arising from the arrival and departure, by all available modes, of passengers using the Proposed Scheme; and
- any loss of physical linkage or facilities for the next stage of the journey or access to public transport.

19.6.38 The results from the traffic and transport assessment will be used to identify if there are any significant journey time, interchange and accessibility changes for travellers.

## Traffic delays to vehicle occupants

- 19.6.39 A significant change in driver and vehicle passenger delay will be defined as any of the following:
- a permanent diversion that results in an increase in journey length of more than 1km;
  - where a significant change in delay relating to junction congestion resulting from the operation of the Proposed Scheme is forecast. This will be measured either as the forecast RFC or DoS. The junctions for consideration will be discussed with the local Highways Authority; and
  - where there is a change in traffic flow along a road link and the capacity of that link is constrained to a greater extent than the junctions along it, then a similar approach to that set out for junctions will be used to assess potential delays to road users.

## Vulnerable road users

- 19.6.40 Vulnerable road users (also referred to as non-motorised users), which include pedestrians, cyclists and equestrians, are affected by:
- traffic related severance;
  - severance caused by extended travel distances or broken links (barriers to movement); and
  - changes to amenity and ambience.

## Traffic related severance

- 19.6.41 A change in traffic levels can result in changes to traffic-related severance for non-motorised road users, particularly pedestrians using or seeking to cross a road. A significant change is defined as:
- a 10% increase change in peak hour two-way traffic flows where the increase is greater than 40 vehicles per day in urban areas or 10 vehicles per day in rural areas; and
  - a 30% increase in the average daily two-way traffic flows where the increase is greater than 40 vehicles per day in urban areas or 10 vehicles per day in rural areas.
- 19.6.42 Where HGV traffic, including HS2 related traffic, is less than 10% of total traffic, the impact on vulnerable road users of increased HGV traffic would be less as general traffic will be the dominant factor. As a consequence, an adverse impact that could, for example, otherwise be assessed as a major effect would be reduced to a moderate effect.
- 19.6.43 Where the road affected by increased traffic levels is not, in any case, used by non-motorised users (such as a high speed dual carriageway) or safe and adequate crossing points already exist, increased traffic levels would not generally be considered significant in relation to traffic-related severance for non-motorised users. Similarly, for example where there are existing crossings or segregated cycleways, the significance level of any adverse effect may be reduced.

## **Non-traffic related severance, amenity and ambience**

19.6.44 The assessment criteria for the operational phase of the Proposed Scheme will be the same as that described previously for the construction phase.

## **Accidents and safety**

19.6.45 The assessment criteria for the operational phase of the Proposed Scheme will be the same as that described previously for the construction phase.

## **Parking and loading**

19.6.46 The assessment criteria for the operational phase of the Proposed Scheme will be the same as that described previously for the construction phase.

## **Waterways**

19.6.47 The assessment criteria for the operational phase of the Proposed Scheme will be the same as that described previously for the construction phase.

# **19.7 Assumptions**

19.7.1 The following assumptions are relevant to the traffic and transport assessment:

- operational patterns and capacities of the Proposed Scheme;
- number of train services associated with the Proposed Scheme;
- change in operational patterns and stations serviced by other operators;
- changes to both temporary and permanent PRoW; and
- construction related volumes (HGV and other) and workforce trips.

19.7.2 The traffic and transport assessment will require a number of assumptions to be made, including:

- committed developments and transport schemes;
- socio-economic forecasts (e.g. population, employment and economic conditions);
- demand forecasts; and
- travel characteristics including:
  - modal share of trips;
  - traffic flows;
  - public transport passenger flows;
  - traffic speeds and congestion; and
  - journey times.

## 20 Waste and material resources

### 20.1 Introduction

**Table 64 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 20.2	Local and regional baseline - Waste management infrastructure capacity	Updated temporal scope for both construction and operation. SEPA added to the list of information sources.
Section 20.3	Consultation and engagement	Inclusion of Scottish stakeholders.
Section 20.5	Scope of assessment - Spatial scope	Amendments to the spatial scope to reflect the off-route works locations.
Section 20.5	Scope of assessment - Temporal scope	Updated temporal scope.
Section 20.6	Assessment methodology - legislation	Inclusion of reference to Scottish legislation and applicability to the assessment.
Section 20.6	Assessment methodology - policy and plans	Updates to policy and planning framework, reflecting new and updated policy and plans.
Section 20.6	Assessment methodology - Consideration of IEMA guidance	A new section added to the assessment methodology to consider the implications of the publication of the IEMA 2020 Guidance on the scope and methodology for the Proposed Scheme.
Section 20.7	Assumptions	Updated assumptions in relation to mineral sites.

- 20.1.1 This section of the SMR covers waste and material resources which includes the environmental topic areas of solid waste and the beneficial reuse of materials during construction and operation of the Proposed Scheme.
- 20.1.2 Liquid waste such as wastewater from dewatering operations is covered in Section 21 (Water resources and flood risk) of this SMR. Other liquid waste, such as waste oil, will not be considered as it will be insignificant compared to solid waste. It is typically being recovered as the landfill disposal of liquid waste was banned in 2007.
- 20.1.3 The consideration of material resources in the context of this SMR comprises maximising the beneficial reuse of materials arising from the construction of the Proposed Scheme (e.g. excavated material). Only if excavated material is not required or is unsuitable for the construction of the Proposed Scheme will it potentially become waste.
- 20.1.4 The likely significant environmental effects from the use of materials (e.g. aggregate, concrete, brick and steel) for the construction or operation of the Proposed Scheme will be addressed in the ES with respect to the greenhouse gas impacts associated with the embedded carbon, which is covered in Section 8 (Climate Change).

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- 20.1.5 Safeguarding and extraction of mineral resources located along the route of the Proposed Scheme will be considered as part of the route engineering design, and construction logistics, as well as within Section 14 (Land quality).
- 20.1.6 The principal objective of sustainable waste and material resource management is to use material resources more efficiently, thereby preventing and reducing the amount of waste generated as well as minimising the quantity of waste that requires final disposal to landfill as a last resort. This will include incorporating HS2 Ltd's circular economy principles, where practicable, to prevent waste generation and extracting the maximum value from resources whilst in use, then recovering/regenerating products and materials at the end of each service life<sup>287</sup>.
- 20.1.7 Where waste is generated, HS2 Ltd proposes that it will be dealt with in line with the Government's waste hierarchy (see Figure 12), which is a guide to sustainable waste and material resource management, and implements the EU Waste Framework Directive<sup>288</sup>.

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<sup>287</sup> High Speed Two Ltd (2017), *HS2 Circular Economy Principles*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/657833/hs2\\_circular\\_economy\\_principles.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/657833/hs2_circular_economy_principles.pdf).

<sup>288</sup> The EU Waste Framework Directive was adopted on 20 October 2008, signed on behalf of the European Parliament and the Council on 19 November 2008, and published in the Official Journal of the European Union on 22 November (L312/3) as Directive 2008/98/EC. The revised WFD entered in to force on 12 December 2008. Available online at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:EN:PDF>.

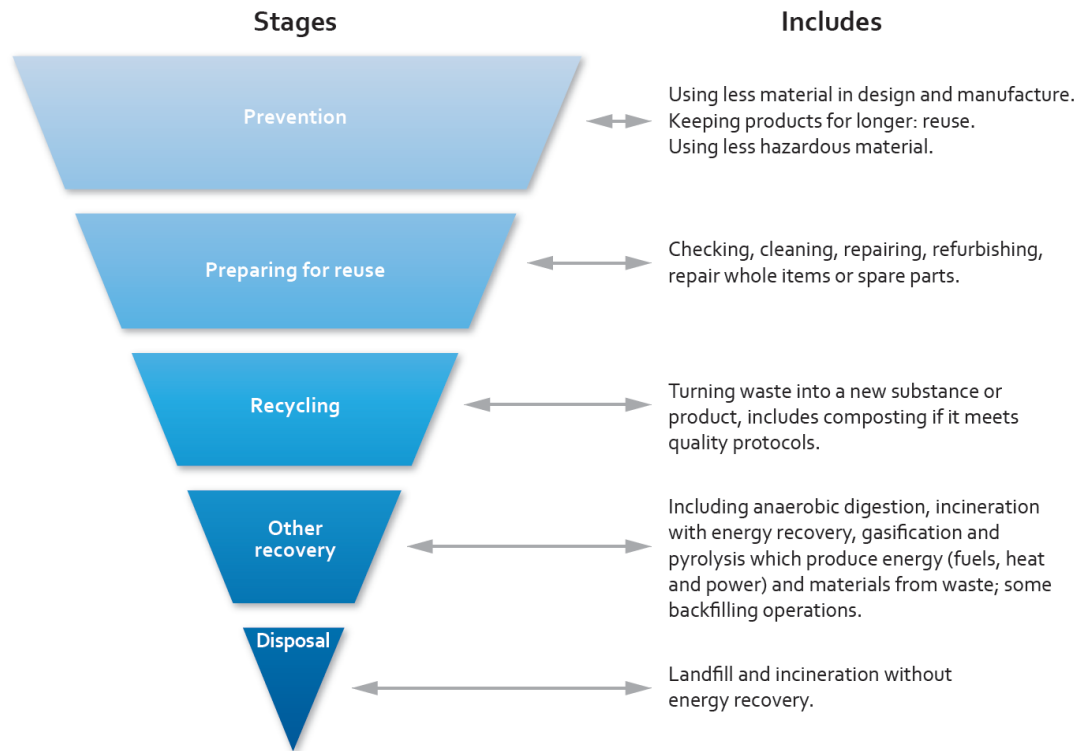


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Figure 12 - The Government's Waste Hierarchy<sup>289</sup>



20.1.8 The waste hierarchy generally describes a priority order of what constitutes the best overall environmental option for the management of waste. It advocates the use of disposal only as a last resort, due to the loss of finite resources and the range of potential adverse environmental effects associated with its use, such as loss of valuable land resources, GHG emissions, and nuisance effects (e.g. dust and odour emissions).

20.1.9 The following types of waste to be generated by construction of the Proposed Scheme will be considered in the assessment:

- excavation wastes;
- demolition wastes;
- construction wastes; and
- worker accommodation site waste.

20.1.10 The following types of waste to be generated by operation of the Proposed Scheme will be considered in the assessment:

- railway station and train waste;
- rolling stock maintenance waste;
- track maintenance waste; and
- ancillary infrastructure waste.

<sup>289</sup> Department for Environment, Food and Rural Affairs (2011), *Government Review of Waste Policy in England 2011*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69401/pb13540-waste-policy-review110614.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69401/pb13540-waste-policy-review110614.pdf).

## **20.2 Establishment of baseline and definition of survey**

- 20.2.1 A baseline will be developed for waste and material resources as part of the ES. Baseline conditions will be identified with respect to:
- types, quantities and management of construction, demolition and excavation waste arisings generated in England and within each of the county, unitary and/or former regional planning jurisdictions through which the route of the Proposed Scheme will pass, and within each of the counties and former regional planning areas in which the off-route works will be located;
  - types, quantities and management of commercial and industrial waste generated in England and within each of the county, unitary and/or former regional planning jurisdictions through which the route of the Proposed Scheme will pass, and within each of the counties and former regional planning areas in which the off-route works will be located; and
  - availability (types and capacity) of waste infrastructure within each of the county, unitary and/or former regional planning jurisdictions through which the route of the Proposed Scheme will pass, and within each of the counties and former regional planning areas in which the off-route works will be located.
- 20.2.2 The local area will be defined as the relevant unitary or county council or combined authority of the recognised regional areas through which the route of the Proposed Scheme will pass, where off-route works will be located, or off-route stations will be impacted. These include: North West England, East of England, South East England, Dumfries and Galloway and Glasgow City. Waste planning authorities are usually constituted at a county or unitary authority (e.g. most cities and larger towns) level, sometimes operating as combined authorities.

### **Local and regional baseline - waste arisings**

- 20.2.3 Data on construction, demolition and excavation waste arisings for the route of the Proposed Scheme will be identified as part of baseline data gathering where this information exists using information from, for example, the Environment Agency and other public sources.
- 20.2.4 Data on commercial and industrial waste generated for the route of the Proposed Scheme will be identified as part of the baseline data gathering where this information exists. Sources of information will include:
- operational waste data from train operating companies, where available; and
  - operational waste data for existing railway stations along the route of the Proposed Scheme (e.g. Birmingham New Street and Crewe) and rail stabling and maintenance depots operated by Network Rail, where available.

## Local and regional baseline - waste management infrastructure capacity

- 20.2.5 Information on the availability of waste management infrastructure will be identified as part of the baseline data gathering from published sources of information and in consultation with the relevant waste planning and disposal authorities. Sources of information that will be used to provide this information include, but will not be limited to:
- Defra Waste and Recycling Statistics<sup>290</sup>;
  - Environment Agency Waste Data and Information<sup>291</sup>;
  - Scottish Environmental Protection Agency Waste Data and Information<sup>292</sup>; and
  - relevant waste planning authority Waste and Minerals Development Plan Documents.
- 20.2.6 Waste and minerals plans, together with any relevant supporting evidence and up to date waste capacity information held by the Environment Agency and Scottish Environmental Protection Agency, will be used to indicate where and how much landfill void space is likely to be available during construction (2025 to 2038) and operation (first full year in 2039) of the Proposed Scheme. This information will be used to assess whether or not there is likely to be a shortfall of suitable landfill void space for the management of waste requiring off-site disposal to landfill.

## 20.3 Consultation and engagement

### Engagement as part of the EIA process

- 20.3.1 Consultation will be undertaken primarily with the Environment Agency to confirm the previously agreed approach for reuse of excavated material and other materials resulting from construction is applicable to the Proposed Scheme, for example, in scheme-wide landscaping works such as construction of noise and landscape bunds. For works in Scotland, engagement will be undertaken with Scottish Natural Heritage and Scottish Environmental Protection Agency, where required.
- 20.3.2 Consultation will also be undertaken with county and unitary councils (i.e. the waste planning authorities) to identify and confirm the following:
- waste arisings used to inform the baseline and assessment of the likely significant environmental effects of waste;

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<sup>290</sup> Department for Environment, Food and Rural Affairs (2013), *Statistics; Environment and wildlife statistics; Waste and recycling*. Available online at: [www.defra.gov.uk/statistics/environment/waste/](http://www.defra.gov.uk/statistics/environment/waste/).

<sup>291</sup> Environment Agency (2020), *Waste Data Interrogator information*. Available online at: <https://www.gov.uk/government/statistics/waste-management-for-england-2015>.

<sup>292</sup> Scottish Environmental Protection Agency, *Waste data*. Available online at: <https://www.sepa.org.uk/environment/waste/waste-data/>.

- availability of waste infrastructure to be used to inform the baseline and assessment of the likely significant environmental effects of waste; and
- planning, development management and waste management policies to be considered during the assessment process; and particularly with respect to defining any mitigation measures required.

20.3.3 This information will be used to establish the baseline waste quantities, understand the future disposal capacity within the appropriate study area and to identify opportunities for reuse and recovery of excavation and demolition materials from the Proposed Scheme.

## 20.4 Key aspects of the Proposed Scheme for the topic

- 20.4.1 The construction of the Proposed Scheme will generate large quantities of excavated material and other aggregate materials mainly associated with the excavation of cuttings, cut and cover tunnels, bored tunnels, foundations and drainage.
- 20.4.2 The demolition of existing commercial and residential buildings within the line of the route of the Proposed Scheme will generate demolition materials such as steel, concrete, timber and brick. The development of stations, rebuilding of highways and bridges and the construction of stabling and maintenance depots will also generate construction waste.
- 20.4.3 Waste may also arise from the interaction with operational and closed landfill sites, removal of fly-tipped waste, and management of contaminated land where present along the route: see Section 14 (Land quality).
- 20.4.4 Waste will be generated during the operation of the Proposed Scheme by passengers, railway staff and maintenance activities. Environmental effects associated with the management of this waste are likely to be relatively small compared with the management of excavated material that is surplus to the requirements of the Proposed Scheme during construction.

## 20.5 Scope of assessment

- 20.5.1 The likely significant environmental effects of solid waste generation and management associated with the Proposed Scheme will be assessed with respect to both the construction and operational phases. These effects may be negligible, beneficial or adverse dependent on the measures employed to prevent and/or manage the waste generated.

### **Construction**

- 20.5.2 Construction effects will address the permanent, indirect impacts of solid waste that will be generated by earthworks, demolition and construction activities and that may require off-site disposal during the proposed construction period. Demolition materials will be generated as a result of site clearance works and from the demolition of buildings and other

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structures currently in existence along the route of the Proposed Scheme. Natural, uncontaminated and contaminated excavated material is likely to be generated as a result of construction of the Proposed Scheme. It is likely that the majority of the excavated material will comprise natural and inert soils.

- 20.5.3 The assessment of contaminated soils and materials is addressed in Section 14 (Land quality) of this SMR. The quantity and type of waste likely to be generated from contaminated land after remedial measures have been applied will be assessed and the impacts and effects assessed in the ES.
- 20.5.4 Solid waste is likely to be generated during the construction and fit-out of above ground structures such as new and redeveloped stations, stabling and infrastructure maintenance depots. Waste will also be generated by the construction and installation of rail infrastructure components, including stations, tunnelling sections, the laying of new tracks and installation of line-side equipment, including new power supply connections and sub-stations.
- 20.5.5 Excavated material that can be used, in its natural state, for site engineering and restoration purposes will be excluded from the assessment of likely significant environmental effects of construction. This is in accordance with the scope of the EU Waste Framework Directive (2008/98/EC) and should reflect the incorporated mitigation measures considered during the design phase to prevent waste<sup>293</sup>. It is also assumed that such materials will meet the requirements of The Definition of Waste: Development Industry Code of Practice<sup>294</sup>. This industry Code of Practice has been developed to enable the transfer or reuse of excavated material and provides a framework for proactively managing contaminated materials on the sites of production or their movement between sites. Consultation will be undertaken with the Environment Agency to confirm the approach adopted for Phases One and 2a, for the reuse of materials resulting from construction, remains applicable to this phase of the Proposed Scheme.
- 20.5.6 Borrow pits can provide a local source of the acceptable engineering materials (typically sand and gravel) required for the construction of the Proposed Scheme, for example, rail embankments. The resultant void can then be backfilled with suitable excavated material arising from construction of the Proposed Scheme. Consequently, they avoid the need for longer distance transport of both remote-won mineral and materials to an off-site deposition destination. Consultation will be undertaken with the Environment Agency and other relevant authorities to confirm the approach to be adopted regarding the location and restoration of borrow pits. Consequent effects on residential property and community infrastructure/organisations are addressed in Section 9 (Community).

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<sup>293</sup> The scope of Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives excludes 'uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated'.

<sup>294</sup> Contaminated Land: Applications in Real Environments (CL:AIRE), (2011), *The Definition of Waste: Development Industry Code of Practice*, CL:AIRE.

## **Operation**

- 20.5.7 Operational effects will address the permanent, indirect impacts of solid waste that will be generated and require off-site disposal to landfill during the first full year of operation of the Proposed Scheme. This includes solid waste that will be generated by passengers and staff at stations, and at staff depots and rail maintenance facilities. Waste will also be generated by passengers and staff on trains whilst these are in use along the route of the Proposed Scheme and from track maintenance works.
- 20.5.8 The operation of the Proposed Scheme will also generate waste at locations beyond the route corridor at terminal stations (where train waste will be unloaded) and depots (both on or remote from the Proposed Scheme). The waste would be related to increased passengers travelling on the railway and rolling stock maintenance activities. The location of some of the off-route terminal stations and depots from the route corridor means that in some cases they are located in regional areas through which the route of the Proposed Scheme does not pass.

## **Spatial scope**

- 20.5.9 Waste and material resources will be assessed on a route-wide basis having regard to the local (i.e. counties or unitary authorities) and regional (i.e. former regional planning jurisdictions) areas along the route of the Proposed Scheme, and each of the counties and former regional planning areas in which the off-route works will be located. The latter is significant with respect to historical methods of waste infrastructure planning and capacity reporting.

## **Temporal scope**

- 20.5.10 The temporal scope of the assessment will be 2025 to 2038, including commissioning, for construction (i.e. the proposed construction period) and 2039 for operation (i.e. the first full year of operation of the Proposed Scheme).

## **20.6 Assessment methodology**

- 20.6.1 The proposed assessment methodology is based on EIA practitioners' professional judgement and experience with the application of EIA to rail-related and other large scale transport infrastructure projects such as HS2 Phase One and Phase 2a. This methodology has been chosen in preference to the IEMA methodology, that was published in March 2020, for the reasons outlined in the 'Consideration of the IEMA Guidance' section below.
- 20.6.2 The assessment will consider the types and quantities of solid waste that will be generated during construction and operation, and the severity of the likely significant environmental effects that may arise from the quantity of waste requiring disposal to landfill (this being the least preferred waste management option, with a finite usable capacity). The assessment will

consider waste arisings and waste infrastructure capacity in county and unitary authorities through which the route of the Proposed Scheme will pass.

## Legislation and guidance

- 20.6.3 The assessment will consider relevant waste management legislation, policies and guidance applicable to all buildings and infrastructure components along the route of the Proposed Scheme. This will include, but will not be limited to the legislation, policy and guidance set out within this section.
- 20.6.4 This section sets out in detail English waste management legislation, policy and guidance. It is recognised that there are different legislation and policies for waste management in Scotland, including The Waste (Scotland) Regulations 2012, Scotland's Zero Waste Plan and Waste Management Licensing (Scotland) Regulations 2011. Scottish legislation and policies have been considered as part of developing the scope and methodology for the assessment. However, the expected quantity of waste generated from works in Scotland will form a very small proportion of the overall waste generated by the Proposed Scheme. The majority of the waste generated from the works in Scotland will be inert waste. It is anticipated this will be managed primarily in England, for which the legislation, policy and guidance set out below is relevant.

## Legislation

- 20.6.5 The Environmental Protection Act 1990 defines the fundamental structure and authority for waste management and control of emissions into the environment. It outlines:
- definition of controlled waste;
  - requirements of the duty of care in respect of waste and transferral of waste; and
  - waste collection and waste disposal authorities and their roles.
- 20.6.6 The Waste (England and Wales) Regulations 2011 SI No. 988<sup>295</sup> (as amended), which transpose the provisions of the EU Waste Framework Directive (2008/98/EC)<sup>296</sup> into England and Wales.
- 20.6.7 The Controlled Waste (England and Wales) Regulations 2012 SI No. 811<sup>297</sup> (as amended), which sets out the definition of controlled waste to which regulatory waste management controls apply.

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<sup>295</sup> *The Waste (England and Wales) Regulations 2011 (SI 2011 No. 988)*. London, Her Majesty's Stationery Office.

<sup>296</sup> *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives*.

<sup>297</sup> *The Controlled Waste (England and Wales) Regulations 2012 (SI 2012 No. 811)*. London, Her Majesty's Stationery Office.



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- 20.6.8 The Environmental Permitting (England and Wales) Regulations 2016 (SI2016/1154, as amended (the 2016 Regulations) provide a consolidated system for permitting of waste operations and came into force on 1 January 2017. The 2016 Regulations will replace and revoke Environmental Permitting (England and Wales) Regulations 2010 SI No 675<sup>298</sup> (as amended) with the exception of Regulations 1, 67 and 107.
- 20.6.9 The Hazardous Waste (England and Wales) Regulations 2005 SI No. 894<sup>299</sup> (as amended), which sets out the regime for the control and tracking of the movement of hazardous waste.
- 20.6.10 The Landfill (England and Wales) Regulations 2002 (as amended) require that landfill sites are classified into one of three categories (hazardous, non-hazardous and inert) dependent on the chemical composition of the waste that it may accept. Prior to disposal (if required), all waste must be pre-treated, and waste producers must apply the waste hierarchy in the management of their wastes.
- 20.6.11 Following amendments made to Decision 2000/532/EC in December 2014, the List of Wastes (England) Regulations 2005 SI No. 895<sup>300</sup> (as amended) has been revoked, in order to reflect changes to EU chemicals classifications. This Decision combines and simplifies existing provisions by establishing a single, integrated Community list of wastes in accordance with Directive 2008/98/EC, on waste. This list is commonly referred to as the European Waste Catalogue.
- 20.6.12 The Site Waste Management Plans Regulations 2008 SI No. 314<sup>301</sup> were repealed on 1 December 2013, as part of the Defra Red Tape Challenge<sup>302</sup>. The purpose of the site waste management plan was to identify opportunities to design out waste; as well as identifying the types and quantities of waste likely to be produced during construction; the opportunities for sustainable management of the waste to be identified; and to monitor and report on the actual management of these wastes throughout the construction period.
- 20.6.13 HS2 Ltd will apply these principles to the construction of the Proposed Scheme ensuring an integrated approach to the design of the Proposed Scheme, aiming to maximise the beneficial reuse of excavated material where possible, and minimise the generation of waste, which will be facilitated through the implementation of the CoCP for the Proposed Scheme.

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<sup>298</sup> *The Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675)*. London, Her Majesty's Stationery Office.

<sup>299</sup> *The Hazardous Waste (England and Wales) Regulations 2005 (SI 2005 No. 894)*. London, Her Majesty's Stationery Office.

<sup>300</sup> *The List of Wastes (England) Regulations 2005 (SI 2005 No. 895)*. London, Her Majesty's Stationery Office.

<sup>301</sup> *The Site Waste Management Plans Regulations (SI 2008 No. 314)*. London, Her Majesty's Stationery Office (2008). Available online at: <http://www.legislation.gov.uk/ukxi/2008/314/contents/made>.

<sup>302</sup> Department for Environment, Food and Rural Affairs (2012), *Red Tape Challenge – Environment Theme Proposals March*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69584/pb13728-red-tape-environment.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69584/pb13728-red-tape-environment.pdf).



## Policy and plans

- 20.6.14 The Resources and Waste Strategy for England<sup>303</sup>, published in December 2018, sets out how resource use will be optimised by minimising waste, promoting resource efficiency and moving towards a circular economy in England. It gives a clear longer-term policy direction in line with the 25 Year Environment Plan.
- 20.6.15 The Government's 25 Year Plan to Improve the Environment<sup>304</sup>, published in January 2018, aims to maximise resource efficiency, minimise environmental impacts at the end of life of materials and products, and embed the 'environmental net gain' principle in all new infrastructure projects; however, as an existing project, HS2 is not included. The Government's 25 Year Plan to Improve the Environment commits to eliminating all avoidable plastic waste by the end of 2042 and achieving an overall target of zero avoidable waste by the end of 2050. It also seeks to deliver a substantial reduction in litter and littering behaviour.
- 20.6.16 The National Planning Policy Framework (NPPF)<sup>305</sup> does not contain any specific policies on waste planning but sets an overarching sustainable development objective of using natural resources prudently and minimising waste. The National Planning Policy for Waste<sup>306</sup>, published in October 2014, sets out waste planning policies that all local planning authorities in England must follow when discharging their responsibilities associated with waste management.
- 20.6.17 The Waste Management Plan for England<sup>307</sup> provides an analysis of the waste management situation in England, as at the end of 2013, and a framework to support a more sustainable and efficient approach to resource use and management. Its purpose is to consolidate several existing policies within the context of a single national waste management plan.

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<sup>303</sup> HM Government (2018), *Our Waste, Our Resources: A Strategy for England*. Available online at: <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>.

<sup>304</sup> Department for Environment, Food & Rural Affairs (2018), *25 Year Environment Plan*, The Stationary Office (2019). Available online at: <https://www.gov.uk/government/publications/25-year-environment-plan>.

<sup>305</sup> Ministry of Housing, Communities and Local Government (2019), *National Planning Policy Framework*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/779764/NPPF\\_Feb\\_2019\\_web.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf).

<sup>306</sup> Department for Communities and Local Government (2014), *National Planning Policy for Waste*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/364759/141015\\_National\\_Planning\\_Policy\\_for\\_Waste.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364759/141015_National_Planning_Policy_for_Waste.pdf).

<sup>307</sup> Department for Environment, Food & Rural Affairs (2013), *Waste Management Plan for England*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/265810/pb14100-waste-management-plan-20131213.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/265810/pb14100-waste-management-plan-20131213.pdf).

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- 20.6.18 Construction 2025: industrial strategy for construction (Construction 2025)<sup>308</sup> is a joint Government and industry initiative that aims to promote the concept of sustainability within the construction industry by setting out a long-term strategic action plan to be followed by both parties. The document remains as current national policy and there are continued efforts to meet the ambitions and targets set within it. Construction 2025 recognises that outputs from the construction industry have a major effect on both the economy and the environment, and that a significant volume of construction, demolition and excavation waste is generated and not reused due, in large part, to the approach to risk across the supply chain. In addition, many procurement processes are bureaucratic and consequently wasteful. Construction 2025 predicts that the practice of off-site construction could halve waste generation.
- 20.6.19 The National Policy Statement for Hazardous Waste: A Framework Document for Planning Decisions on Nationally Significant Hazardous Waste Infrastructure 2013<sup>309</sup> sets out the need for large-scale hazardous waste infrastructure, and the framework for decision-making on relevant development consent applications within England.

## Guidance

- 20.6.20 Relevant guidance includes the CL:AIRE<sup>310</sup> Definition of Waste: Development Industry Code of Practice, and the Waste and Resources Action Programme (WRAP) guidance developed to achieve better resource efficiency in construction projects.

## Significance criteria

- 20.6.21 Significance criteria for the assessment have been derived from professional experience previously gained from the application of EIA to large-scale infrastructure projects (including Phase One and Phase 2a of HS2), which take into account:
- the net change in solid waste arisings overall as a result of the Proposed Scheme;
  - the magnitude of the quantity of waste requiring landfill disposal; and
  - the availability of landfill disposal capacity in the local and regional area.
- 20.6.22 The tables below set out the significance criteria to be used for the assessment of the likely significant environmental effects of solid waste generation; further details are provided in

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<sup>308</sup> HM Government (2013), *Construction 2025: Industrial Strategy: government and industry in partnership*. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf).

<sup>309</sup> Department for Environment, Food & Rural Affairs (2013), *National Policy Statement for Hazardous Waste: A Framework Document for Planning Decisions on Nationally Significant Hazardous Waste Infrastructure*. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/205568/pb13927-hazardous-waste-policy-20130606.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/205568/pb13927-hazardous-waste-policy-20130606.pdf).

<sup>310</sup> Contaminated Land: Applications in Real Environments. <http://www.claire.co.uk/>.

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the Technical Note: Rationale for landfill significance criteria (provided in Annex L of this SMR).

**Table 65 - Inert landfill significance criteria**

Degree of significance	Inert landfill criteria
Major adverse	Net increase in waste arisings relative to the future baseline leading to a severe, national and regional scale reduction in inert landfill void space capacity. Need for additional large-scale waste treatment and/or disposal capacity of greater than 10,000,000 tonnes per annum. Effect may be judged to be of importance in the national planning context and, therefore, of potential concern to a project depending upon the importance attached to the issue in the decision-making.
Moderate adverse	Net increase in waste arisings relative to the future baseline leading to regional scale reduction in inert landfill void space capacity. Need for additional medium-scale waste treatment and/or disposal capacity of between 2,000,000 to 10,000,000 tonnes per annum. Effect may be judged to be of importance in the regional planning context, e.g. where effects are permanent or long-term and the effect on local waste treatment and disposal infrastructure is such that additional capacity may be required.
Minor adverse	Net increase in waste arisings relative to the future baseline leading to local scale reduction in inert landfill void space capacity. Need for additional small-scale waste treatment and/or disposal capacity of up to 2,000,000 tonnes per annum. Effect is of low importance in the decision-making process but may be of relevance to the detailed design and mitigation of a project.
Negligible	No significant increase in waste arisings relative to the future baseline or reduction in landfill void space capacity for inert waste. No appreciable adverse or beneficial effects.
Beneficial	Net reduction in waste arisings and diversion of waste from landfill relative to the future baseline resulting in an environmental improvement. Positive effect on waste arisings overall and available capacity of waste treatment and disposal infrastructure.

**Table 66 - Non-hazardous landfill significance criteria**

Degree of significance	Non-hazardous landfill criteria
Major adverse	Net increase in waste arisings relative to the future baseline without the Proposed Scheme leading to a severe, national and regional-scale reduction in landfill void space capacity for non-hazardous waste. Need for additional large-scale waste treatment and/or disposal capacity of greater than 250,000 tonnes per annum <sup>311</sup> . Effect may be judged to be of importance in the regional planning context and, therefore, of potential concern to a project depending upon the importance attached to the issue in decision-making.
Moderate adverse	Net increase in waste arisings relative to the future baseline without the Proposed Scheme leading to regional-scale reduction in landfill void space capacity for non-hazardous waste. Need for additional medium-scale waste treatment and/or disposal capacity of between 50,000 <sup>312</sup> to 250,000 tonnes per annum. Effect may be judged to be of importance in the local planning context, e.g. where effects are permanent or long-

<sup>311</sup> Waste throughput capacity based on large-scale waste infrastructure project experience.

<sup>312</sup> The waste throughput capacity of greater than 50,000 tonnes per annum has been selected with reference to Indicative Screening Thresholds paragraph 057 of the National Planning Practice Guidance (reference ID: 4-057-2070720); which states under 'Installations for the disposal of waste (unless included in Schedule 1); "...Installations (including landfill sites) for the deposit, recovery and/or disposal of household, industrial and/or commercial wastes where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste ...".

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Degree of significance	Non-hazardous landfill criteria
	term and the effect on local waste treatment and disposal infrastructure is such that additional capacity may be required.
Minor adverse	Net increase in waste arisings relative to the future baseline without the Proposed Scheme leading to local-scale reduction in landfill void space capacity for non-hazardous waste. Need for additional small-scale waste treatment and/or disposal capacity of up to 50,000 tonnes per annum. Effect is of low importance in the decision-making process but may be of relevance to the detailed design and mitigation of a project.
Negligible	No significant increase in waste arisings relative to the future baseline without the Proposed Scheme or reduction in landfill void space capacity for non-hazardous waste. No appreciable adverse or beneficial effects.
Beneficial	Net reduction in waste arisings and diversion of waste from landfill relative to the future baseline without the Proposed Scheme resulting in an environmental improvement. Positive effect on waste arisings overall and available capacity of waste treatment and disposal infrastructure.

**Table 67 - Hazardous landfill significance criteria**

Degree of significance	Hazardous landfill criteria
Major adverse	Net increase in waste arisings relative to the future baseline leading to a severe national and regional-scale reduction in hazardous waste landfill void space capacity. Need for additional large-scale hazardous waste disposal capacity of greater than 100,000 tonnes per annum <sup>313</sup> . Effect may be judged to be of importance in the regional planning context and, therefore, of potential concern to a project depending upon the importance attached to the issue in the decision-making process.
Moderate adverse	Net increase in waste arisings relative to the future baseline leading to regional-scale reduction in hazardous waste landfill void space capacity or need for additional medium-scale waste hazardous waste disposal capacity of between 20,000 to 100,000 tonnes per annum. Effect may be judged to be of importance in the local planning context, e.g. where effects are permanent or long-term and the effect on local waste treatment and disposal infrastructure is such that additional capacity may be required.
Minor adverse	Net increase in waste arisings relative to the future baseline leading to local-scale reduction in hazardous waste landfill void space capacity or need for additional small-scale hazardous waste disposal capacity of up to 20,000 tonnes per annum. Effect is of low importance in the decision-making process but may be of relevance to the detailed design and mitigation of a project.
Negligible	No significant increase in waste arisings relative to the future baseline or reduction in landfill void space capacity. No appreciable adverse or beneficial effects.
Beneficial	Net reduction in hazardous waste arisings and diversion of waste from landfill relative to the future baseline resulting in an environmental improvement. Positive effect on waste arisings overall and available capacity of hazardous waste treatment and disposal infrastructure.

<sup>313</sup> Waste throughput capacity based on National Policy Statement for Hazardous Waste: A framework document for planning decisions on Nationally significant hazardous waste infrastructure (Defra), (2013). Paragraph 1.2.1 identifies the construction or alteration of a facility for the disposal of hazardous waste by landfill that exceeds 100,000 tonnes per annum to be nationally significant. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/205568/pb13927-hazardous-waste-policy-20130606.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/205568/pb13927-hazardous-waste-policy-20130606.pdf).

## **Construction effects**

- 20.6.23 The assessment will identify the types and quantities of solid waste forecast to be generated during each of the demolition, excavation and construction stages of the Proposed Scheme. It will also identify types and quantities of waste forecast to be generated by occupants of the worker accommodation sites during the overall construction programme. Quantification will be on the basis of survey information, using published waste generation rates or forecasting tools such as the WRAP Net Waste Tool.
- 20.6.24 Assumptions regarding the type and quantity of waste to be diverted from landfill via reuse, recycling and recovery will be applied. Following this, the type and quantity of demolition materials, excavated material, construction materials and worker accommodation site waste requiring landfill disposal will be assessed in relation to the projected quantity of landfill disposal capacity in the designated study areas throughout the proposed construction period.
- 20.6.25 Further information regarding the waste forecasting and assessment methodology for construction effects is provided in the Technical Note: Waste forecast and assessment methodology (provided in Annex L of this SMR).

## **Operation effects**

- 20.6.26 The assessment will identify the types and quantities of solid waste forecast to be generated during the first full year of operation of the Proposed Scheme. This forecast will be based on an assumption of maximum capacity of the Proposed Scheme and any effects will be assumed to be annual. Quantification may be on the basis of existing operational waste management performance data or using published operational waste generation rates for the relevant land use activities.
- 20.6.27 Assumptions regarding the type and quantity of waste to be diverted from landfill via reuse, recycling and recovery will be applied. Following this, the type and quantity of station and train waste, track maintenance waste and ancillary infrastructure waste requiring landfill disposal will be assessed in relation to the projected quantity of landfill disposal capacity in the designated study areas throughout the proposed construction period.

## **Cumulative effects**

- 20.6.28 Cumulative effects will be assessed qualitatively (based on professional judgment) taking into account other major development proposals along the route of the Proposed Scheme. The cumulative impacts of construction effects of Phase 2a will be considered.
- 20.6.29 Further information regarding the waste forecasting and assessment methodology for operational effects is provided in the Technical Note: Waste forecast and assessment methodology (provided in Annex L of this SMR).

## Mitigation, enhancement and off-setting

20.6.30 Mitigation and enhancement for waste management during construction, demolition and operation will be considered in line with the waste hierarchy and residual environmental effects identified.

## Consideration of the IEMA Guidance

20.6.31 At the time of publication of the 2017 SMR and 2018 SMR, there was no recognised methodology or waste significance criteria to assess the likely significant environmental effects of solid waste generation from either construction or operation of the Proposed Scheme.

20.6.32 In March 2020, IEMA published new guidance titled 'Materials and waste in Environmental Impact Assessment' (the 'IEMA Guidance')<sup>314</sup>. Consideration was given to whether this new industry guidance offers an improved approach over that proposed in the 2017 SMR and 2018 SMR, used for Phase One and Phase 2a of HS2, and whether there is value in changing from the assessment methodology and significance criteria thresholds for the EIA.

20.6.33 The IEMA Guidance describes an alternative proportionate approach for assessing the sensitivity of receptors, magnitude of impact and significance of effect from materials and waste, during construction and operation of a wide range of development sectors. The IEMA Guidance represents a first for this topic at an industry-wide level. The IEMA Guidance also recognises that some of its principles and approaches will be relevant to developments of all scales and natures, but some will not.

20.6.34 The IEMA Guidance considers the following elements:

- effects of development on the consumption of material resources;
- effects of development on allocated mineral sites through direct and indirect sterilisation;
- effects of the development on regional inert and non-hazardous landfill void capacity; and
- effects of the development on national hazardous landfill void capacity.

20.6.35 The method set out in this SMR has been developed, through previous HS2 phases, to be bespoke to an assessment of the Proposed Scheme. A review of the IEMA Guidance against the proposed method applied to Phase One and Phase 2a was carried out. It is considered that the methodology set out in this SMR, which follows the same approach as Phase One and Phase 2a, sufficiently aligns with the relevant elements set out in the IEMA Guidance, and no further changes to the assessment methodology on the basis of the IEMA Guidance

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<sup>314</sup> Institute of Environmental Management and Assessment (2020), *IEMA guide to: Materials and Waste in Environmental Impact Assessment*.

is required. The sections which follow show how the elements of the IEMA Guidance are addressed within the method set out in this SMR.

## **Consumption of material resources**

- 20.6.36 Site won excavated material will be used as an assessment proxy in the EIA for the effects of the Proposed Scheme on the consumption of key materials, given that these materials are likely to represent a significant proportion (>80%) of the materials used during the construction phase.
- 20.6.37 The effects of the Proposed Scheme on the consumption of other key construction materials during construction and operation will not be considered within the EIA; as the forecast consumption of these materials during the operational year are considered negligible in relation to the use of site won earthworks materials during construction.
- 20.6.38 Notwithstanding the above, the embedded carbon impact of imported materials during the construction and operation of the Proposed Scheme will be considered within Section 8 (Climate change) of this SMR, and the ES will provide a summary of the combined impacts of Phase One, Phase 2a and the Proposed Scheme which will include quantities of excavated materials, concrete and steel.
- 20.6.39 A Sustainable Sourcing Plan will be prepared for the Proposed Scheme, and key supply chain sustainability risks and opportunities specific to each contract will be provided in the contract-specific Sustainable Sourcing Plans to be prepared by the appointed Contractors.

## **Sterilisation of mineral safeguarding sites**

- 20.6.40 The effects of the Proposed Scheme on mineral safeguarding areas and mineral planning applications and allocated sites located along the route of the Proposed Scheme will be considered as part of the route engineering design, and construction logistics, as well as within the Land quality assessment, as described in Section 14 (Land quality) of this SMR. Where relevant, these sites will also be included in the schedule of planning data and committed developments included in the ES.

## **Use available landfill void capacity**

- 20.6.41 The effects of the Proposed Scheme on inert, non-hazardous and hazardous landfill void capacity will be addressed in the ES. This will be based on the significance criteria in this SMR which is considered to provide a more relevant and extensive methodology for the Proposed Scheme than the IEMA Guidance and maintains consistency with the HS2 Phase One and Phase 2a EIA and the reporting of cumulative effects.

## **20.7 Assumptions**

- 20.7.1 The assessment of the likely significant effects of the Proposed Scheme on mineral safeguarding areas and mineral planning applications and allocated sites located along the



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route of the Proposed Scheme will be covered in the land quality assessment, as set out in this SMR.

- 20.7.2 The assessment of likely significant environmental effects resulting from waste generated due to the interaction with operational and closed landfill sites, fly-tipped waste, hazardous materials and contaminated land present along the route will be covered in the Land quality assessment, as set out in this SMR. This will also include hazardous materials. The off-site disposal to landfill of hazardous materials will be included in the waste and material resources assessment.
- 20.7.3 Assumptions will be required as to the proportion of solid construction, demolition and operational waste that would be diverted from landfill via reuse, recycling and recovery. This will be informed by information gathered at the time of the assessment as to any waste management measures proposed to divert waste from landfill. Alternatively, landfill diversion performance for other similar rail-related projects, such as Crossrail, will be considered.
- 20.7.4 Waste transferred off-site would be handled by a registered waste carrier authorised by the Environment Agency and taken to a permitted or exempt facility authorised to receive and handle that waste under Duty of Care arrangements (i.e. this assessment does not consider the likely significant environmental effects of any illegal waste management and disposal). It is assumed that all construction and operational activities will be in accordance with the relevant environmental regulatory requirements.
- 20.7.5 The assessment of likely significant environmental effects associated with waste-related transport, including the inter-related effects of air quality, climate, sound and noise will be addressed in Section 7 (Air quality), Section 8 (Climate change), Section 18 (Sound, noise and vibration) and Section 19 (Traffic and transport) of this SMR.



## 21 Water resources and flood risk

### 21.1 Introduction

**Table 68 - Summary of changes made to this section since the publication of the October 2018 EIA SMR**

Section/paragraph number	Section/subsection title	Summary of change
Section 21.2	Establishment of baseline and definition of survey	Updated to reflect the Proposed Scheme being the Phase 2b Western Leg.
Table 69 - Baseline data and sources	Baseline data and sources	Updated to include reference to Scottish Environment Protection Agency and Scottish Natural Heritage.
Paragraph 21.3.1	Engagement as part of the EIA process	Updated to include reference to Scottish Environment Protection Agency and Scottish Natural Heritage.
Paragraph 21.5.5	Scope of assessment - Temporal scope	Updated temporal scope.
Paragraph 21.6.1	Assessment methodology - Legislation and guidance	Updated to include reference to Scottish legislation and guidance and transposition of EU WFD into UK law.
Paragraph 21.6.2	Assessment methodology - Legislation and guidance	Updated to include reference to Scottish policy and regulations.
Paragraph 21.6.4	Assessment methodology - Significance criteria	Updated to reflect revised guidance.

- 21.1.1 This section of the SMR covers water resources and flood risk which includes the environmental topic areas of surface water and groundwater bodies, including their associated water resources, water quality, hydromorphology, hydrology and flood risk. Surface water includes natural water bodies such as rivers, streams and lakes, and artificial water bodies such as canals, land drainage systems, sewers (foul, surface water and combined) and reservoirs. Groundwater includes all water within soil and rock below the ground surface, within the saturated and unsaturated zones.
- 21.1.2 Technical notes provided in Annex M include further detail on the assessment methodology.

### 21.2 Establishment of baseline and definition of survey

- 21.2.1 The baseline conditions will be those at the time of undertaking the assessment (i.e. documented during the baseline data collection phase). Given the variable nature of the water environment through time, it is not usually feasible to set a baseline for the future (i.e. the time of construction or operation of the Proposed Scheme). Where projections of climate change effects predict a future trend, a future baseline condition will be identified based on

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current guidance. This future baseline is assessed as part of the in-combination climate change impacts and resilience assessments in the climate change section (Section 8).

- 21.2.2 The Proposed Scheme would incorporate over 70 separate watercourse and canal crossings, including a number of currently navigable canals. A number of these watercourses are associated with floodplain zones with elevated levels of flood risk. It is proposed to cross larger watercourses using viaducts whilst many of the smaller ordinary watercourses are likely to be culverted beneath the route.
- 21.2.3 The western leg intersects a number of groundwater source protection zones (SPZs) and would pass close to several water supply boreholes. At Pocket Nook, the route will pass in cutting through an area of SPZ2, potentially affecting abstraction from a nearby borehole. The route will also pass through an extensive SPZ associated with several water supply boreholes in the Golborne area.
- 21.2.4 Baseline conditions will be defined using existing information, supplemented by additional surveys and modelling where appropriate, as follows:
- floodplain extent (1 in 20, 100, 100 + climate change and 1,000 year return periods);
  - floodplain depth/velocity/hazard (1 in 20, 100, 100 + climate change and 1,000 year return periods);
  - surface water flood extent (1 in 30, 1 in 100 and 1 in 1,000 year);
  - surface water quantity and quality and Water Framework Directive<sup>315</sup> (WFD) Status (physico-chemical and hydromorphology quality elements<sup>316</sup>);
  - surface water designations, licences/consents;
  - surface water/groundwater interactions;
  - hydrogeology, including geology, aquifer hydraulic parameters, groundwater level and flow directions;
  - groundwater quality and quantity (including WFD quantitative and chemical quality elements);
  - hydrological and geomorphological interactions;
  - groundwater yield, licences/consents;
  - water dependent terrestrial ecosystems (WDTes); and
  - hydrometeorological conditions and variability arising from climate change.
- 21.2.5 The detailed field survey requirements to refine this baseline will be defined based on desk study review of all existing information held by the consultees outlined in Section 21.3 below followed by a walkover survey of key features along the route. This may include site

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<sup>315</sup> European Commission (EC) (2000) Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. Strasbourg, European Parliament and European Council.

<sup>316</sup> Biological quality elements are considered within the ecology assessments of the EIA, but consideration of all quality elements will be included in a WFD compliance assessment.

investigations in advance to help verify or rule out hydrological and hydrogeological connectivity between the Proposed Scheme and sensitive receptors. Specialist WFD surveys will be undertaken, where required and where land access is possible. These surveys and investigations will be undertaken in collaboration with ecology specialists.

## Baseline data and sources

21.2.6 Table 69 sets out the baseline data to be collected (or generated if applicable, e.g. flood risk), along with the likely source.

**Table 69 - Baseline data and sources**

Baseline data	Sources
Floodplain extent, depth, velocity, hazard Surface water flood extents River flow data Groundwater flooding susceptibility datasets Groundwater level and flow directions Groundwater yield Aquifer extent (vertical and horizontal) and hydraulic parameters	Targeted hydraulic modelling or calculations, making best use of existing information held by the Environment Agency, Scottish Environment Protection Agency, Lead Local Flood Authorities (LLFAs), Canal & River Trust and water companies. Information contained within local planning authorities' Strategic Flood Risk Assessments and Surface Water Management Plans. Guidance on hydro-meteorological conditions and variability arising from climate change. Topographical surveys of the channel and WFD surveys. Site walkovers. River flow, groundwater and hydrogeological data from the Environment Agency, British Geological Survey and water companies
Surface water quality, groundwater quality	Targeted water sampling and testing at accredited laboratory. Information held by the Environment Agency/Scottish Environment Protection Agency including within River Basin Management Plans, local authorities, Natural England and water companies
Surface water designations Water dependent terrestrial ecosystems	Information held by the Environment Agency/Scottish Environment Protection Agency and Natural England/ Scottish Natural Heritage
Surface water licences/consents/ permits Groundwater licences/permits Unlicensed abstractions	Information held by the Environment Agency/Scottish Environment Protection Agency Information held by the Environment Agency/Scottish Environment Protection Agency Information held by local authorities
Hydro-meteorological data, as needed	Met Office, Environment Agency, Scottish Environment Protection Agency

## 21.3 Consultation and engagement

### Engagement as part of the EIA process

21.3.1 As part of the EIA process, the following organisations as a minimum will be consulted:

- Environment Agency;
- Scottish Environment Protection Agency;
- local authorities (including LLFAs);
- Internal Drainage Boards (IDBs);

- Canal & River Trust;
- Natural England;
- Scottish Natural Heritage;
- water and sewerage companies;
- water supply companies; and
- landowners.

## 21.4 Key aspects of the Proposed Scheme for the topic

21.4.1 The following aspects of the Proposed Scheme are of particular relevance to this topic:

- sections of the Proposed Scheme are located in Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding), as well as areas at heightened risk of surface water flooding. It also passes through areas that are at potential risk of inundation from reservoirs in the event of a dam failure. Flood risk from all sources will be considered, including impacts on flood risk during construction and operation of the Proposed Scheme, taking account of potential climate change impacts;
- the assessment will consider whether existing surface water or groundwater flow paths and natural or artificial drainage systems will be impeded. Where this is the case, the assessment will identify appropriate mitigation measures;
- the assessment will consider the likely effects of increases in impermeable area on surface water flood risks and appropriate mitigation measures will be identified;
- physical modification of some water bodies will be required, including diversions, realignments and culverting operations. The assessment will incorporate summary information from a separate WFD compliance assessment demonstrating how any related impacts would be reduced insofar as reasonably practicable;
- potential impacts on the hydrology and hydrogeology of water dependent habitats (aquatic and terrestrial) will be assessed in close consultation with the ecology teams and appropriate mitigation identified where necessary;
- potential impacts on water quality within the groundwater and surface water bodies potentially affected by the Proposed Scheme will be considered, as well as the risk of pollution from the construction and operation of the Proposed Scheme. Appropriate measures will be identified to mitigate these effects as far as is reasonably practicable; and
- sections planned to be in cutting or in tunnel may require temporary or permanent groundwater dewatering. The assessment will consider the likely effects on the quality and yield of the aquifer's protected rights and how these can be mitigated.

- 21.4.2 Environmental benefits that may result from the Proposed Scheme include the creation of new landscaped water features and diverted/realigned watercourses of enhanced ecological value. There may also be opportunities to reduce flood risk.

## 21.5 Scope of assessment

### Spatial scope

- 21.5.1 The spatial scope of the assessment will be based upon the identification of surface water and groundwater features within 1km of the centreline of the Proposed Scheme, except where there is clearly no hydraulic connectivity with the Proposed Scheme. In urban areas the distance will be 500m. Outside of these distances it is unlikely that direct impacts upon the water environment will be attributable to the Proposed Scheme.
- 21.5.2 Where works extend more than 200m from the centreline, for example at stations and depots, professional judgement will be used in selecting the appropriate limit to the extension in spatial scope required.
- 21.5.3 Exceptions to the above will be required in some locations where:
- major groundworks are required (e.g. tunnels and associated portals);
  - infrastructure is to be placed within floodplains;
  - the route of the Proposed Scheme is within a groundwater SPZ or overlies a Principal aquifer where the abstraction may be over 1km away;
  - pathways are identified to the wider environment (e.g. canal or stream routing to distant river or highly transmissive aquifer);
  - where the Proposed Scheme has potential implications for the wider network of canals or navigable waterways, including future restoration proposals;
  - where there is a potential impact pathway to a very high value receptor, such as a designated site;
  - the route of the Proposed Scheme intersects the inundation area of a reservoir; and
  - other scenarios, as deemed appropriate when the route is reviewed in line with data received.
- 21.5.4 When considering the possible effects of the Proposed Scheme on a watercourse or aquifer, the assessment will consider the possible effects throughout the catchment of the affected watercourse or the wider aquifer extent.

### Temporal scope

- 21.5.5 The effect of construction impacts will be assessed up to when the Proposed Scheme is due to open (2025 to 2038). The permanent effects of the Proposed Scheme will be assessed for the year when the Proposed Scheme goes into operation (2038). Where impacts are likely to

vary with time, for example where features such as wetlands will take time to become fully established, the temporal scope will be adjusted accordingly.

- 21.5.6 The methodology and timeframes for assessing climate change impacts on flood risk will align with the guidance issued by the Environment Agency<sup>317</sup>. These assessments will inform the in-combination climate change impacts and resilience assessments in Section 8 (Climate change) of this SMR.

## 21.6 Assessment methodology

### Legislation and guidance

- 21.6.1 The following legislation, policy and guidance will be taken into account in the assessment of water resources and flood risk. Assessment of the Proposed Scheme and its impacts in relation to the provisions of this legislation and policy will form an essential step in the assessment of the significance of effects associated with the Proposed Scheme.

- EU WFD<sup>318</sup> and associated Water Resources (Water Framework Directive) (England and Wales) Regulations<sup>319</sup>; EU Groundwater Directive<sup>320</sup>; EU Floods Directive<sup>321</sup> and associated UK Flood Risk Regulations 2009<sup>322</sup>;
- EU Habitats Directive<sup>323</sup>;

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<sup>317</sup> Environment Agency (2016), *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*. Available online at: <https://www.gov.uk/government/publications/adapting-to-climate-change-for-risk-management-authorities>. Note that this guidance was withdrawn in July 2020, however the 2016 guidance and allowances will be used as the basis of assessment for the hybrid Bill ES.

<sup>318</sup> Water Framework Directive, *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*. Strasbourg, European Parliament and European Council.

<sup>319</sup> The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 2003 No. 3242), London: The Stationery Office. As the WFD is fully transposed into UK law, it remains in place following the United Kingdom's exit from the EU in January 2021.

<sup>320</sup> *Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration*, European Commission.

<sup>321</sup> *Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks*, European Commission.

<sup>322</sup> *The Flood Risk Regulations 2009 (SI 2009 No. 3042)*. London: The Stationery Office.

<sup>323</sup> *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora*. Strasbourg, European Parliament and European Council.

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- Flood and Water Management Act<sup>324</sup>; Water Act<sup>325</sup>; the Environmental Protection Act 1990; the Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009<sup>326</sup>; Land Drainage Act<sup>327</sup>;
- Water Environment and Water Services (Scotland) Act 2003<sup>328</sup>; Flood Risk Management (Scotland) Act 2009<sup>329</sup>; Climate Change (Scotland) Act 2009<sup>330</sup>;
- water and flood risk local planning policy for local authorities along the route of the Proposed Scheme (saved local plan policies and adopted Local Development Framework policy);
- government groundwater protection guides covering requirements, permissions, risk assessments and controls<sup>331</sup>; and
- Non statutory technical standards for sustainable drainage systems, Defra, 2015<sup>332</sup>.

21.6.2 The assessment will also need to have due regard to the NPPF and its Technical Guidance, Scottish Planning Policy (SPP) and associated Scottish Environment Protection Agency Guidance and Advice Notes, the Water Environment (Controlled Activities) (Scotland) Regulations 2011<sup>333</sup> and also to Environmental Permitting Regulations and amendments<sup>334</sup>.

21.6.3 A separate stand-alone, route-wide WFD compliance assessment will be undertaken. This assessment will be a comprehensive review of the impacts of the Proposed Scheme on the aspects of the water environment covered by WFD legislation. It will outline measures that would be taken to ensure that the Proposed Scheme achieves compliance with this

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<sup>324</sup> *Flood and Water Management Act 2010*. London, The Stationery Office.

<sup>325</sup> *The Water Act 2003 (Commencement No. 11) Order 2012*. London, The Stationery Office.

<sup>326</sup> *Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 (SI 2009/3104)*. London, The Stationery Office.

<sup>327</sup> *Land Drainage Act 1994*. London, The Stationery Office.

<sup>328</sup> *Water Environment and Water Services (Scotland) Act 2003*. Available online at: <https://www.legislation.gov.uk/asp/2003/3/contents>.

<sup>329</sup> *Flood Risk Management (Scotland) Act 2009*. Available online at: <https://www.legislation.gov.uk/asp/2009/6/contents>.

<sup>330</sup> *Climate Change (Scotland) Act 2009*. Available online at: <https://www.legislation.gov.uk/asp/2009/12/contents>.

<sup>331</sup> Environment Agency and Department for Environment, Food and Rural Affairs (2017), *Groundwater protection guidance*. Available online at: <https://www.gov.uk/government/collections/groundwater-protection>.

<sup>332</sup> Department for Environment, Food and Rural Affairs (2015), *Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems*, 2015. Available online at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415773/sustainable-drainage-technical-standards.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf).

<sup>333</sup> *The Water Environment (Controlled Activities) (Scotland) Regulations 2011*. – more commonly known as the Controlled Activity Regulations (CAR) – and their further amendments of 2013 and 2017. Available online at: <https://www.legislation.gov.uk/ssi/2011/209/contents/made>.

<sup>334</sup> *The Environmental Permitting (England and Wales) (Amendment) Regulations 2012 (SI 2013 No. 390)*. London: The Stationery Office.



legislation. The outputs from the WFD compliance assessment will help to inform the ES of issues related to impacts on water quantity, quality and hydromorphology. These effects will be reported in the water resources and flood risk section of the ES. The WFD compliance assessment will also be used to inform the ES of issues related to impacts on ecological habitats that are dependent on surface water and/or groundwater. These effects will be reported in the ecology and biodiversity section of the ES. Following submission of the ES, discussions in relation to WFD compliance will continue with the Environment Agency during the passage of the Bill.

21.6.4 There is no established methodology for assessing compliance with WFD legislation. The WFD Assessment will be based largely on internal Environment Agency guidance<sup>335</sup>, the prior experience of HS2 Ltd on Phase One and Phase 2a and professional judgement. The approach applied is also in general accordance with recently published advisory note provided by the Planning Inspectorate<sup>336</sup>.

## Significance criteria

21.6.5 The significance of an effect is defined by the magnitude of the impact and the overall value of the receiving water feature or receptor (see Table 70). Table 70 and Table 71 have been adapted from the tables in Design Manual for Roads and Bridges, Sustainability and Environmental Appraisal, LA 113: Road Drainage and the Water Environment. Significant effects on the water environment are those that have a moderate significance of effect or greater.

**Table 70 - Significance of effects**

Value of receptor	Magnitude of impact			
	Negligible	Minor	Moderate	Major
Very high	Negligible – not significant	Moderate adverse – significant	Major adverse – significant	Major adverse – significant
High	Negligible – not significant	Moderate adverse – significant	Moderate adverse – significant	Major adverse – significant
Moderate	Negligible – not significant	Minor adverse – not significant	Moderate adverse – significant	Moderate adverse – significant
Low	Negligible – not significant	Negligible – not significant	Minor adverse - not significant	Minor adverse – not significant

21.6.6 Table 71 provides an indication of possible impacts and their magnitude. These may be reported as either beneficial or adverse. The list is not exhaustive and is intended as a guide.

<sup>335</sup> Environment Agency (2010), *Assessing new modifications for compliance with WFD: detailed supplementary guidance*.

<sup>336</sup> The Planning Inspectorate (2017), *Advice note eighteen: The Water Framework Directive*.



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**Table 71 - Magnitude of possible impacts**

Magnitude	Criteria	Examples
Major	Adverse: Loss of an attribute and / or quality and integrity of an attribute Beneficial: Creation of new attribute or major improvement in quality of an attribute	Adverse: Increase in peak flood level* (> 100mm); loss of a fishery; <i>deterioration</i> in surface water ecological or chemical WFD element status or groundwater qualitative or quantitative WFD element status Beneficial: Creation of additional flood storage and decrease in peak flood level* (> 100mm); increase in productivity or size of fishery; <i>improvement</i> in surface water ecological or chemical WFD element status; <i>improvement</i> in groundwater qualitative or quantitative WFD element status
Moderate	Adverse: Loss of part of an attribute or decrease in integrity of an attribute Beneficial: Moderate improvement in quality of an attribute	Adverse: Increase in peak flood level* (> 50mm); partial loss of fishery; measurable decrease in surface water ecological or chemical quality or flow <i>with potential for deterioration in WFD element status</i> . Reversible change in the yield or quality of an aquifer, such that existing users are affected, <i>with potential for deterioration in WFD element status</i> Beneficial: Creation of flood storage and decrease in peak flood level* (> 50mm); <i>measurable increase in surface water ecological or chemical quality or flow with potential for WFD element status to be improved</i> . <i>Measurable increase in the yield or quality of an aquifer, benefiting existing users, with potential for WFD element status to be improved</i>
Minor	Adverse: Measurable change to the integrity of an attribute Beneficial: Measurable increase, or reduced risk of negative effect to an attribute	Adverse: Increase in peak flood level*(> 10mm); measurable decrease in surface water ecological or chemical quality or flow; decrease in yield or quality of aquifer, not affecting existing users or changing any WFD element status Beneficial: Creation of flood storage and decrease in peak flood level* (> 10mm); measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD element status
Negligible	No change to integrity of attribute	Negligible change to peak flood level* (< +/- 10mm); discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity

\* Peak flood level for floods up to and including a 1% annual probability event, including climate change. Where access or egress routes are affected, the magnitude of the impact will be defined by the change in the Flood Hazard Rating as defined in Defra/Environment Agency report FD2320.

21.6.7 Table 72 provides an indication of the value of receiving water feature or receptor. The examples, and in particular the specified Q95<sup>337</sup> flow thresholds, are not exhaustive and are intended as a guide.

<sup>337</sup> Q95 is defined as the flow in a watercourse that is equalled or exceeded for 95% of the time.

**Table 72 - Examples of the value of possible water bodies or receptors**

Value	Criteria	Examples
Very high	Nationally significant attribute of high value	Watercourse with a Q95 <sup>299</sup> flow $\geq 1.0 \text{ m}^3/\text{s}^*$ , public drinking water supply within a Principal aquifer, essential infrastructure or highly vulnerable development**
High	Locally significant attribute of high value	Watercourse with a Q95 flow $> 0.01 \text{ m}^3/\text{s}^*$ , industrial/ agricultural water abstraction $> 100 \text{ m}^3/\text{d}$ , private drinking water supply, Principal aquifer, more vulnerable development**
Moderate	Of moderate quality and rarity	Watercourse with a Q95 flow $> 0.002 \text{ m}^3/\text{s}$ to $\leq 0.01 \text{ m}^3/\text{s}^*$ , Secondary aquifer, less vulnerable development**
Low	Lower quality	Watercourse with a Q95 flow $\leq 0.002 \text{ m}^3/\text{s}^*$ , surface water sewer, minor pond or ditch, non-aquifer, water compatible development**

\* based on watercourse Q95 flow estimate at location of Proposed Scheme and intended as a guide only.

\*\* as defined in Table 2 of the Flood Risk section of the Technical Guidance to the NPPF.

## Construction effects

21.6.8 The following possible effects arising from the construction of the Proposed Scheme will be considered:

- effects on the water quality of receiving surface water and groundwater bodies due to the deposition or spillage of soils, sediment, fuels or other construction materials, or through mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site runoff;
- effects on river or stream flows during temporary disruption, discharges or diversion of surface water or groundwater flows, during adjacent works;
- effects on DWTE and water bodies that support habitats and ecosystems;
- effects on aquifers from groundworks, abstractions/dewatering, discharges to ground, and obstructions to groundwater flow by tunnelling, cuttings, cut offs etc.;
- effects on areas with critical drainage problems (as notified by the Environment Agency, LLFAs and local planning authorities);
- effects of liquid wastes generated by construction activities on the environment;
- effects on flood risk receptors, flood defence assets and schemes;
- effects on water abstractors; and
- effects on local flood risk due to uncontrolled site runoff, deposition of silt, sediment in drains or ditches, temporary diversion of rivers, sewers or ditches, temporary earthworks affecting natural drainage paths.

21.6.9 The effects on groundwater, both in quantitative and qualitative terms, will be assessed using a suitable combination of professional judgement, analytical calculation and computational modelling. This will include the impacts of any contaminated land causing an effect on groundwater quality; see Section 14 Land quality of this SMR.

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- 21.6.10 The assessment of flood risk will be made using the NPPG and associated Environment Agency guidance. Flood risk assessments will also be prepared as separate, stand-alone documents, but these will similarly inform the ES and mitigation proposed.
- 21.6.11 Where significant adverse effects are identified on groundwater, the design will be amended as far as is reasonably practicable to mitigate the effects, for example by reducing the effect of dewatering through use of cut off walls or by recharging water to aquifers. In some cases, groundwater sources may need to be augmented with alternative supplies or boreholes deepened, with agreement from owners.
- 21.6.12 Potential ecological and human health impacts associated with changes in the water environment will be considered by those undertaking the ecology and land quality assessments, see Sections 10 and 14 respectively of this SMR.
- 21.6.13 Assessment of the effects arising from construction of the Proposed Scheme will take into account the requirements of the CoCP and will include proposals for ongoing environmental monitoring.

## Operational effects

- 21.6.14 The following examples of possible effects will be assessed:
- effects on water quality due to the contamination of groundwater or surface waters from both routine discharges from the railway or associated infrastructure and from accidental spillages;
  - effects on water bodies that support habitats and ecosystems; and
  - effects on water abstractors.
- 21.6.15 When assessing the effects on the quality of surface watercourses, details of the receiving watercourse and an estimate, based on a combination of expert judgement and analysis, for the quantity of pollution that could be released during routine operations, will be used. Estimates will generally be conservative and assume little or no dispersion. An assessment will be made of the risk of accidental spillages and the possible effects on water quality.
- 21.6.16 Effects on surface waters could be mitigated insofar as reasonably practicable by the use of sustainable drainage systems. Pollution risk could similarly be mitigated through pollution prevention measures.
- 21.6.17 The assessment will include recommendations for ongoing environmental monitoring of measures designed to mitigate the impacts of significant effects.

## Cumulative effects

21.6.18 Cumulative effects may occur due to the combination of one or more separate impacts. These may be due to the coincidence of impacts or the cumulative impact of separate events occurring at different times. The following are examples of possible cumulative effects that may be assessed:

- impacts from the Proposed Scheme will be assessed together with impacts from adjacent development, such as flood defence schemes and HS2 Phase 2a, to derive an assessment of the cumulative effects from all the schemes;
- accumulation of minor, moderate or major impacts on a river or aquifer that, when considered together, constitute a major impact leading to a significant effect; and
- a minor impact on river hydrology which, together with a minor impact on the riparian habitat (an ecological impact), when considered together, constitute a major impact leading to a significant effect.

## 21.7 Assumptions

- 21.7.1 The assessment will assume that track drainage will, wherever reasonably practicable, be kept separate from existing land drainage that crosses the Proposed Scheme.
- 21.7.2 Discharges of surface water from the new infrastructure will, wherever reasonably practicable, be managed in accordance with the principles of the non-statutory technical standards for sustainable drainage systems (Defra, 2015) and reference to CIRIA C753v2 The SuDS Manual<sup>338</sup>.
- 21.7.3 Effects on watercourses that are affected by third party abstractions and discharges will be taken into consideration where records are available.

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<sup>338</sup> Construction Industry Research and Information Association (2015), *The SuDS Manual C753*.

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# Part C

## **Annex A – List of consultees and relevant stakeholders**

Comment was sought from the following list of consultees on the content of the 2017 SMR and consultees were subsequently engaged with as part of the development of the design and assessment of the full Phase 2b scheme. This includes statutory consultees as well as non-statutory organisations. Consultees are not limited to this list.

Further consultation was undertaken on the 2018 SMR alongside the working draft ES, the outcome of which is set out in the Working Draft Environmental Statement Consultation Summary Report (CSR).

Engagement with relevant consultees has continued following the Government's announcement in February 2020 to proceed with development of the Phase 2b Western Leg.

Action on Hearing Loss

Age UK

Ancient Monuments Society

Annesley Parish Council

Appleby Magna Parish Council

Arriva Plc

Ashby Canal Association

Ashby-de-la-Zouch Parish Council

Ashfield District Council

Association of Directors of Public Health

Association of Drainage Authorities

Association of Geotechnical and Geo-environmental Specialists

Aston cum Aughton Parish Council

Ault Hucknall Parish Council

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Austhorpe (East and West) Parish Meeting

Austrey Parish Council

Barkston Ash Parish Council

Barlborough Parish Council

Barnburgh with Harlington Parish Council

Barnsley Biodiversity Trust

Barnsley Clinical Commissioning Group

Barnsley Metropolitan Borough Council

Barnsley, Dearne and Dove Canal Trust

Bat Conservation Trust

Battlefields Trust

Berks, Bucks & Oxon Wildlife Trust

Birmingham and Warwickshire Archaeological and Historical Society

Blackwell Parish Council

Bolsover District Council

Braithwell with Micklebring Parish Council

Bramley Parish Council

Breedon on the Hill Parish Council

British Association of Shooting and Conservation

British Drilling Association

British Geological Survey

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British Horse Society

British Chambers of Commerce

British Land

British Transport Police Authority

British Waterways Marinas Limited

Brodsworth Parish Council

Broxtowe Borough Council

Broxtowe Borough Council (Conservation Group)

Byways and Bridleways Trust

Campaign for Better Transport

Campaign to Protect Rural England

Canal and River Trust

Carr Vale Community Association

Central Association of Agricultural Valuers

Chartered Institute of Highways & Transportation

Cheshire Agricultural Society

Cheshire and Warrington Local Enterprise Partnership

Cheshire Brine

Cheshire East Council

Cheshire Fire Authority

Cheshire Gardens Trust



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Cheshire Police Authority

Cheshire West & Chester Council

Chesterfield and District Civic Society

Chesterfield Borough Council

Chesterfield Canal Partnership

Chesterfield Community Energy PLC

Chilterns AONB

Christie NHS Foundation Trust

Church Buildings Council

Church Commissioners

Church Fenton Parish Council

Citizens Advice Manchester

City of Wakefield District Council

City of Wolverhampton Council

City of York Council

Civic Voice

Civil Aviation Authority

Clay Cross Parish Council

Clayton with Frickley Parish Council

Clowne Parish Council

Coal Authority

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Coal Pro (The Confederation of UK Coal Producers)

Coleorton Parish Council

Commercial Boat Operators Association

Committee on Climate Change

Community Forest - Forest of Mercia

Community Forest - Greenwood

Community Forest - Mersey

Community Forest - Red Rose

Community Forest - White Rose

Community Forest Partnership - South Yorkshire

Confederation of Forest Industries

Conisbrough Parks Parish Council

Council for British Archaeology

Country Land and Business Association

Country Landowners Association

Countryside Alliance Eastern Region (Leicestershire and Rutland,  
Nottinghamshire)

Countryside Alliance Midlands Region (Staffordshire and Warwickshire)

Countryside Alliance Northern Region (Yorkshire, Derbyshire, Greater  
Manchester and Cheshire)

Coventry and Warwickshire Local Enterprise Partnership

CPRE Cheshire

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CPRE Derbyshire

CPRE East Midlands

CPRE Lancashire Branch

CPRE Leicestershire

CPRE North Yorkshire

CPRE North-West

CPRE Nottinghamshire

CPRE South Yorkshire

CPRE Warwickshire

CPRE West Yorkshire Branch

CPRE Yorkshire and the Humber

Crofton Parish Council

Crown Estate Commissioners

Culcheth and Croft Horse Riders and Bridleways Association

Curdworth Parish Council

Cycling UK

Denaby Parish Council

Department for Business, Energy and Industrial Strategy

Department for Communities and Local Government

Department for Culture, Media and Sport

Department for Environment, Food and Rural Affairs

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Derby City Council

Derby Diocesan Board of Finance Limited

Derbyshire Community Housing Society Limited

Derbyshire County Council

Derbyshire Wildlife Trust

Design Council

Diocese of Chester

Diocese of Leeds

Diocese of Manchester

Diocese of Sheffield

Disability Charities Consortium

Disability Resource Centre

Disability Rights UK

Disabled Persons Transport Advisory Committee

Doncaster Clinical Commissioning Group

Doncaster Metropolitan District Council

Dordon Parish Council

Dudley Metropolitan Borough Council

East Midlands Health Authority

East Riding of Yorkshire Council

Ecclesfield Conservation and Local History Group

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Eckington Parish Council (Derbyshire)

English Heritage

Environment Agency

Equality and Diversity Forum

Equality and Human Rights Commission

Erewash Borough Council

Erewash Partnership

Erewash Ramblers

Felley Parish Council

Forestry Commission

Freight on Rail

Friends of Carlton Marsh and Rabbit Ings Nature Reserve

Friends of Haw Park Wood and Anglers Country Park

Friends of Marie Louise Gardens

Friends of Rabbit Ings

Friends of the Earth

Friends of the Earth Chesterfield & NE Derbyshire

Friends of the Earth East Midlands

Friends of Totton Fields

Garden History Society

Georgian Group

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Glapwell Parish Council

Greasley Parish Council

Greater Birmingham and Solihull Local Enterprise Partnership

Greater Manchester Coalition of Disabled People

Greater Manchester Combined Authority

Greater Manchester Local Enterprise Partnership

Greengauge21

Greenpeace

Greensqueeze (Erewash greenbelt)

Greenwood Community Forest Partnership

Hallam Land Management Ltd

Hardwick Clinical Commissioning Group

Harthill with Woodall Parish Council (Rotherham)

Harworth Estates

Harworth Estates Investments Limited

Harworth Group PLC

Havercroft with Cold Hiendley Parish Council

Hayhurst Foundation

Health and Safety Executive

Heath and Holmewood Parish Council

Hellaby Civil Parish

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Hemsworth Town Council

Heritage Alliance

Hickleton Parish Council

High Melton Parish Council

Highways England

Hinckley and Bosworth District Council

Historic England

Historic Houses Association

Historic Stone Ltd

Hooten Pagnell Parish Council

Huddleston with Newthorpe Parish Council

Hull City Council

Inland Waterways Association

International Union of Railways

Joint Committee of National Amenity Societies

Kegworth Parish Council

Keuper Gas Storage Project

Killamarsh Parish Council

King Street Energy

Kingsbury Parish Council

Lancashire County Council

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Land Trust

Laughton en le Morthen Parish Council

Lea Marston Parish Council

Leeds City Council

Leeds City Region LEP

Leeds Civic Trust

Leeds North Clinical Commissioning Group

Leeds South and East Clinical Commissioning Group

Leicester City Council

Leicestershire Archaeological and Historical Society

Leicestershire County Council

Leigh Ornithological Society

LGBT Consortium

Lifeways

Lincolnshire County Council

Little Fenton Parish Council

Living Streets

Local Access Forum - Barnsley

Local Access Forum - Cheshire East

Local Access Forum - Cheshire West & Chester

Local Access Forum - Derby and Derbyshire



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Local Access Forum – Doncaster

Local Access Forum – Leeds

Local Access Forum – Leicestershire

Local Access Forum - Manchester, Salford and Trafford

Local Access Forum – Nottinghamshire

Local Access Forum - Rotherham

Local Access Forum – Stockport

Local Access Forum – Wakefield

Local Access Forum – Wigan

Local Access Forum for North Yorkshire County Council

Local Access Forum for York

Local Flood Authorities

Local Government Association

Long Eaton Natural History Society

Long Whatton and Diseworth Parish Council

Lowton Business Park

Manchester Airport Group

Manchester City Council

Mansfield and Ashfield Clinical Commissioning Group

Marr Parish Council

Measham Parish Council

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Mencap

Mexborough & District Heritage Society

Micklefield Parish Council

Mid Cheshire Health Trust

Midlands Connect

Minerals Planning Authority

Ministry of Defence

Morton Parish Council

National Association of Areas of Outstanding National Beauty

National Association of Boat Owners

National Cycling Charity

National Farmers Union

National Federation of Bridleways Association

National Forest Company

National Grid Plc

National LGB&T Partnership

National Parks England (Formerly English National Park Authorities Association)

National Police Chiefs Council

National Trust

Natural England

North East Derbyshire Industrial Archaeology Society

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Network Rail

Network Rail Infrastructure Limited

Newland-with-Woodhouse Parish Council

Newlife Foundation for Disabled Children

NHS England Midlands and East

NHS England North

NHS Staffs and Surround Clinical Commissioning Group

Normanton Town Council

North Crofton Co-operative Colliery

North Derbyshire Clinical Commissioning Group

North East Derbyshire District Council

North East Health Authority

North East Combined Transport Activists Roundtable

North Lincolnshire Council

North Staffordshire Bridleways Association

North Warwickshire Borough Council

North West Health Authority

North West Leicestershire District Council

North West Transport Activists Roundtable

North Yorkshire County Council

Nostell Estate

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Nottingham City Council

Nottingham Express Transit

Nottingham Wildlife Trust

Nottinghamshire and Derbyshire Federation of Small Businesses

Nottinghamshire County Council

Nottinghamshire Wildlife Trust

Nuthall Parish Council

Official Custodian for Charities

Office of Rail Regulators and Approved Operators

Old Bolsover Town Council

Open Spaces Society

Oulton and Woodlesford Neighbourhood Forum

Packington Parish Council

Peak District National Park Authority

Peaks and Northern Footpaths Society

Peel Ports

Penny Hill Windfarm

Pilsley Parish Council

Pinxton Parish Council

Polesworth Parish Council

Police Federation of England/Wales

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Public Health England

Public Health England North West

Public Health England West Midlands

Rail Delivery Group

Rail Forum East Midlands

Rail Freight Group

Rail Future

Railway Heritage Trust

Ramblers

Ramblers Trafford Group

Ramblers West Riding Area

Ramblers Wetherby and District Group

Ratcliffe Coal Power Station

Ratcliffe on Soar Parish Council

Ravenfield Parish Council

RESCUE

Retford & Worksop (Chesterfield Canal) Boat Club Ltd

Ridware History Society

Risley Moss Action Group

Rochdale Borough Council

Rotherham Clinical Commissioning Group

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Rotherham Metropolitan Borough Council

Royal Association for Deaf People

Royal Institute of Chartered Surveyors

Royal National Institute of Blind People

Royal Society for the Protection of Birds

RSPB Midlands

RSPB Northern England

Royal Society of Wildlife Trusts

Royal Town Planning Institute

Rushcliffe Borough Council

Ryhill Parish Council

Sandiacre Parish Council

Sandwell Metropolitan Borough Council

SAVE Britain's Heritage

Saxton-cum-Scarthingwell & Lead Parish Council

Scarcliffe Parish Council

Scope

Scottish Association for Public Transport

Selby District Council

Severn Trent Water Limited

Sharlston Parish Council

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Sheffield Area Geology Trust

Sheffield City Region LEP

Sheffield Metropolitan Borough Council

Sherburn in Elmet Parish Council

Shirland & Higham Parish Council

Shropshire Union Canal Society

Sir John Moore Foundation

Society for the Protection of Ancient Buildings

South Hiendley Parish Council

South Kirkby and Moorthorpe Town Council

South Normanton Parish Council

South Staffordshire Water

South Yorkshire Industrial History Society

South Yorkshire Local Nature Partnership

Sports England

Stafford Borough Council

Staffordshire Archaeological and Historical Society

Staffordshire County Council

Stanton by Dale Parish Council

Stapleford Parish Council

Staveley Town Council

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Stockport Council

Stoke-on-Trent City Council

Stonewall

Sustrans

Sustrans East Midlands

Sutton cum Duckmanton Parish Council

Swillington Parish Council

Tameside Metropolitan Borough Council

Tame Valley Wetlands Landscape Partnership

Tamworth Borough Council

TATA Europe

Taylor Business Park

Theatres Trust

The Equality Trust

The Joint Nature Conservation Committee

The Office of Rail Regulators and Approved Operators

The Trents Rivers Trust

The Yarlet Trust

Thoroton Society

Thrumpton Parish Council

Tibshelf Parish Council



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Town and Country Planning Association

Towton Parish Council

Trafford Council

Trans Pennine Trail

Transport Focus

Transport for the North

Trent and Mersey Canal Society

Trowell Parish Council

Twentieth Century Society

Twycross Parish Council

UK Coal

UK Fire Service

Ulleskelf Parish Council

United Utilities Water

Universities UK

Vale of York Clinical Commissioning Group

Victorian Society

Wakefield Clinical Commissioning Group

Wakefield District Biodiversity Group

Wales Parish Council

Wallsall Council

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Walton Neighbourhood Plan (part of Walton Parish)

Warmfield-cum-Heath Parish Council

Warrington Borough Council

Warwickshire County Council

Water Services Regulation Authority

West Midland Bird Club

West Midlands Combined Authority

West Midlands Health Authority

West Riding Area Countryside Committee Ramblers Association

West Yorkshire Archaeology Advisory Service

West Yorkshire Combined Authority

Wigan Council

Wildlife Habitat Protection Trust

Wildlife Trust - Cheshire

Wildlife Trust - Derbyshire

Wildlife Trust - Lancashire, Manchester & North Merseyside

Wildlife Trust - Leicestershire and Rutland

Wildlife Trust - Nottinghamshire

Wildlife Trust - Sheffield and Rotherham

Wildlife Trust - Staffordshire

Wildlife Trust - Warwickshire

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Wildlife Trust - Yorkshire

Winterset Parish Meeting

Woodland Trust

Working Families

Worthington Parish Council

Yorkshire & The Humber Health Authority

Yorkshire Farming and Wildlife Partnership

Yorkshire Flood & Coastal Committee

Yorkshire Water Services Limited

In addition to the list of consultees above, engagement with stakeholders in Scotland has been undertaken since the publication of the 2017 and 2018 SMRs. This includes the following stakeholders in Scotland:

- Scottish Environment Protection Agency;
- Historic Environment Scotland;
- NatureScot;
- Transport Scotland;
- Scottish Forestry; and
- Dumfries and Galloway Council.







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