HS2

October 2018

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)

Working Draft Environmental Statement

Volume 2: Community Area report

LA07: Hucknall to Selston

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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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Preface

The working draft Environmental Statement

This report forms part of Volume 2 of the working draft Environmental Statement (ES) for Phase 2b of High Speed Two (HS2). The purpose of the working draft ES is to provide the public and other stakeholders with an opportunity to review and comment on preliminary environmental information for Phase 2b of HS2, which is based on a stage in the ongoing design development and environmental assessment process. Nothing included at this stage is intended to limit the form of the final scheme that will be presented in the hybrid Bill and formal ES in light of further scheme development and the ongoing discussions with stakeholders such as Transport for the North and Midlands Connect. Consultation on the working draft ES is being undertaken to help inform the ongoing design and environmental assessment in advance of producing a statutory formal ES. The formal ES will accompany the deposit of the hybrid Bill for Phase 2b of HS2.

Phase 2b comprises the section of the proposed HS2 rail network, from Crewe to Manchester (and a connection onto the West Coast Main Line (WCML)) (the western leg), and from the West Midlands to Leeds (and a connection onto, and part electrification of, the Midland Main Line (MML) and a connection onto the East Coast Main Line (ECML)) via the East Midlands and South Yorkshire (the eastern leg). Collectively, this is referred to in this working draft ES as the 'Proposed Scheme'. The working draft ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate those effects, based on a stage in the ongoing design and environmental assessment.

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, followed by ESs deposited with Additional Provisions to that Bill in 2014 and 2015. The Phase One hybrid Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in July 2017.

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, followed by a subsequent ES deposited with an Additional Provision to that Bill in March 2018. The Phase 2a Bill is expected to receive Royal Assent in 2019.

Consultation on the working draft Environmental Statement

The public has an opportunity to comment on this working draft ES. The period of public consultation is taking place during October 2018 – December 2018; the first day of the consultation period being the date the Secretary of State for Transport formally announces the consultation and the publication of the working draft ES documents on www.gov.uk/hs2

Structure of the HS2 Phase 2b working draft Environmental Statement

This report forms part of Volume 2 of the working draft ES for Phase 2b of HS2. The working draft ES describes the design of the Proposed Scheme and reports the likely significant environmental effects of the construction and operation of the Proposed Scheme and proposed mitigation and monitoring measures, based on a stage in the ongoing design and environmental assessment process. The report will be updated for the formal ES to reflect further work on the design, assessment and mitigation and monitoring measures between now and when the hybrid Bill is deposited. The structure of the working draft ES is shown Figure 1.

This working draft ES has been prepared by persons who have sufficient expertise to ensure the completeness and technical quality of the statement.

The working draft ES comprises the following documents:

Non-technical summary

This provides a summary in non-technical language of the following, identified at a stage in the ongoing design and environmental assessment:

- the Proposed Scheme and the reasonable alternatives studied;
- the likely significant beneficial and adverse effects of the Proposed Scheme;
- the means to avoid or reduce likely significant environmental effects; and
- an outline of the monitoring measures to manage the effects of construction and the effectiveness of mitigation post construction, as well as appropriate monitoring during operation.

Glossary of terms and list of abbreviations

This contains terms and abbreviations, including units of measurement, used throughout the working draft ES.

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques, based on a stage in the ongoing design;
- a summary of the scope and methodology for the environmental topics;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring, including measures to manage the effects of construction, the effectiveness of mitigation post construction, as well as the approach to monitoring during the operational phase, based on a stage in the ongoing design; and

- a summary of the reasonable alternatives studied (including local alternatives studied prior to the Government's announcement of the preferred route in July 2017). Local alternatives studied post July 2017 are reported in the relevant Volume 2: Community area reports.

Volume 2: Community area reports and map books

These cover the following community areas:

- western leg: 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; MA08 Manchester Piccadilly Station; and
- eastern leg: LA01 Lea Marston to Tamworth; LA02 Birchmoor to Austrey; LA03 Appleby Parva to Ashby-de-la-Zouch; LA04 Coleorton to Kegworth; LA05 Ratcliffe-on-Soar to Long Eaton; LA06 Stapleford to Nuthall; LA07 Hucknall to Selston; LA08 Pinxton to Newton and Huthwaite; LA09 Stonebroom to Clay Cross; LA10 Tibshelf to Shuttlewood; LA11 Staveley to Aston; LA12 Ulley to Bramley; LA13 Ravenfield to Clayton; LA14 South Kirkby to Sharlston Common; LA15 Warmfield to Swillington and Woodlesford; LA16 Garforth and Church Fenton; LA17 Stourton to Hunslet; and LA18 Leeds Station.

The reports provide the following information for each area, as identified at a stage in the ongoing design and environmental assessment:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area;
- a summary of the local alternatives considered since the Government's announcement of the preferred route in July 2017;
- a description of the environmental baseline;
- a description of the likely significant beneficial and adverse effects of the Proposed Scheme;
- the proposed means of avoiding, reducing or managing the likely significant adverse effects; and
- where possible, the proposals for monitoring, including measures during and post construction, and during the operational phase.

The maps relevant to each community area are provided in a separate Volume 2: Community area map book. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and operation features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing proposed viewpoint and photomontage locations (Map Series LV-00, LV-02, LV-03, and LV-04, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: Community area reports), operational sound contour maps (Map Series SV-01, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: Community area reports) and maps showing key surface water and groundwater features (Map Series WR-01 and WR-02, to be read in conjunction with Section 15, Water resources and flood risk of the Volume 2: Community area reports).

In addition to the community areas detailed above, reports are provided for community areas within which electrification of a section of the MML is proposed: MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station. These reports are provided at an earlier stage of the design and environmental assessment process, following the amendment of the route of the Proposed Scheme to include the electrification of a section of the MML between Clay Cross and Sheffield Midland Station. This would enable high speed trains to connect to Chesterfield and Sheffield as part of the Proposed Scheme. They include for each area:

- an overview of the area;
- a description of the proposed works within the area, based on a stage in the ongoing design;
- an outline of potential effects; and
- an overview of stakeholder engagement and consultation to be carried out as part of the EIA process.

Mitigation measures have not been identified at this stage of the design and environmental assessment process in relation to the likely effects arising from construction and operation of the Proposed Scheme for the MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station areas. Any required mitigation measures will be reported in the formal ES. In addition, any required environmental monitoring during operation of the Proposed Scheme will be reported in the formal ES.

Volume 3: Route-wide effects

This describes the effects that are likely to occur at a geographical scale greater than the community areas described in the Volume 2: Community area reports, based on a stage in the ongoing design and environmental assessment.

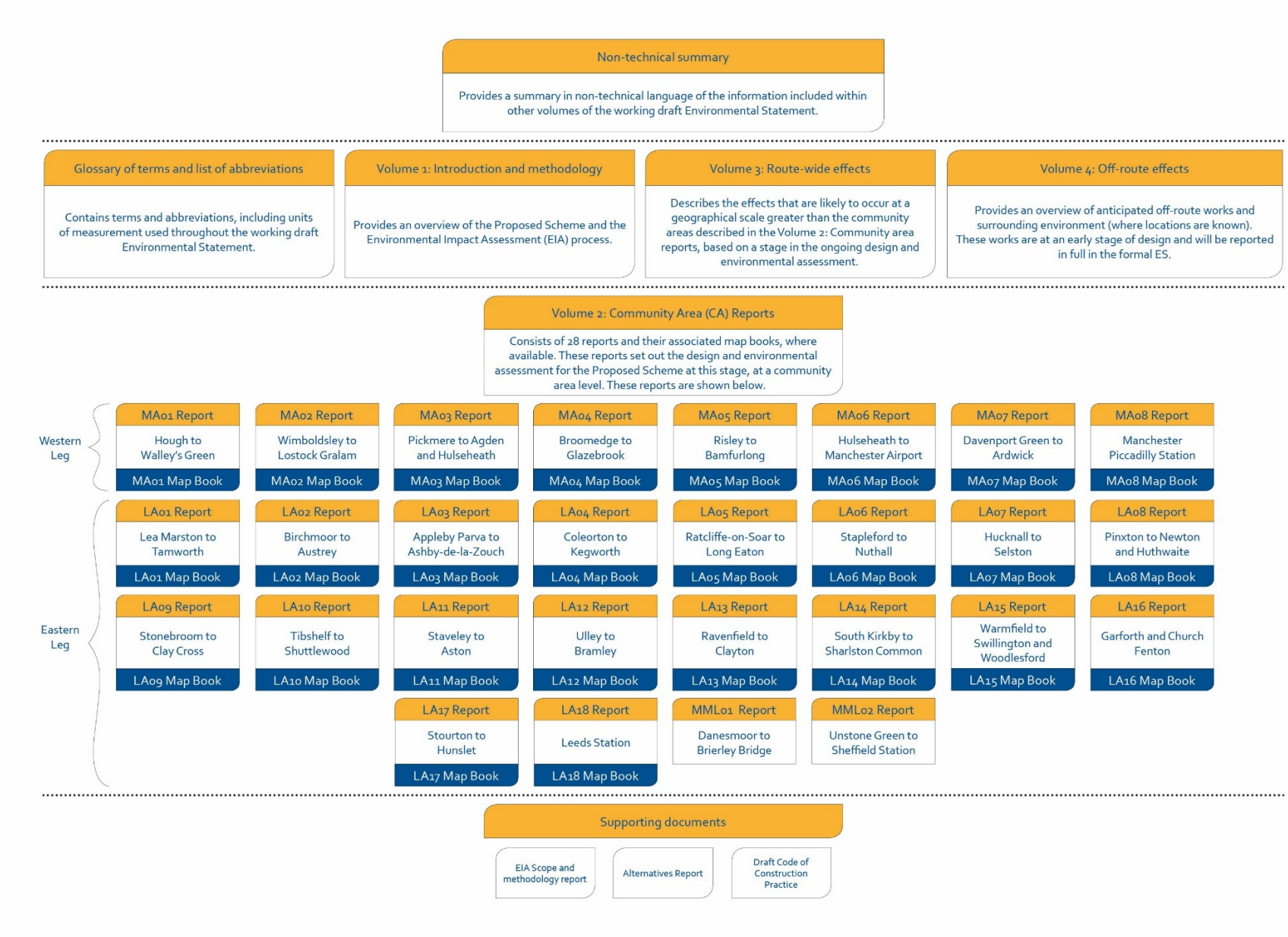
Volume 4: Off-route effects

This provides an overview of anticipated off-route works and surrounding environment (where locations are known). These works are at an early stage of design and will be reported in full in the formal ES.

Supporting documents

- EIA Scope and Methodology Report: this outlines the scope and methodology adopted for the EIA. HS2 Ltd consulted on a draft of the EIA Scope and Methodology Report (SMR) between July and September 2017. This updated version takes into consideration comments received, where appropriate, in addition to changes required as a result of updates to legislation or industry best practice guidance.
- Alternatives report: this describes the evolution of the Proposed Scheme and the reasonable alternatives considered at this stage of the design, at the strategic, route-wide, route corridor and local levels.
- Draft Code of Construction Practice (CoCP): this sets out measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

Figure 1: Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester, East Midlands and South Yorkshire will be served by high speed trains running at speeds of up to 360 kilometres per hour (kph) (225 miles per hour (mph)).

1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London and the West Midlands that will commence operations in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London - West Midlands) Bill in November 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London - West Midlands) Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in 2017.

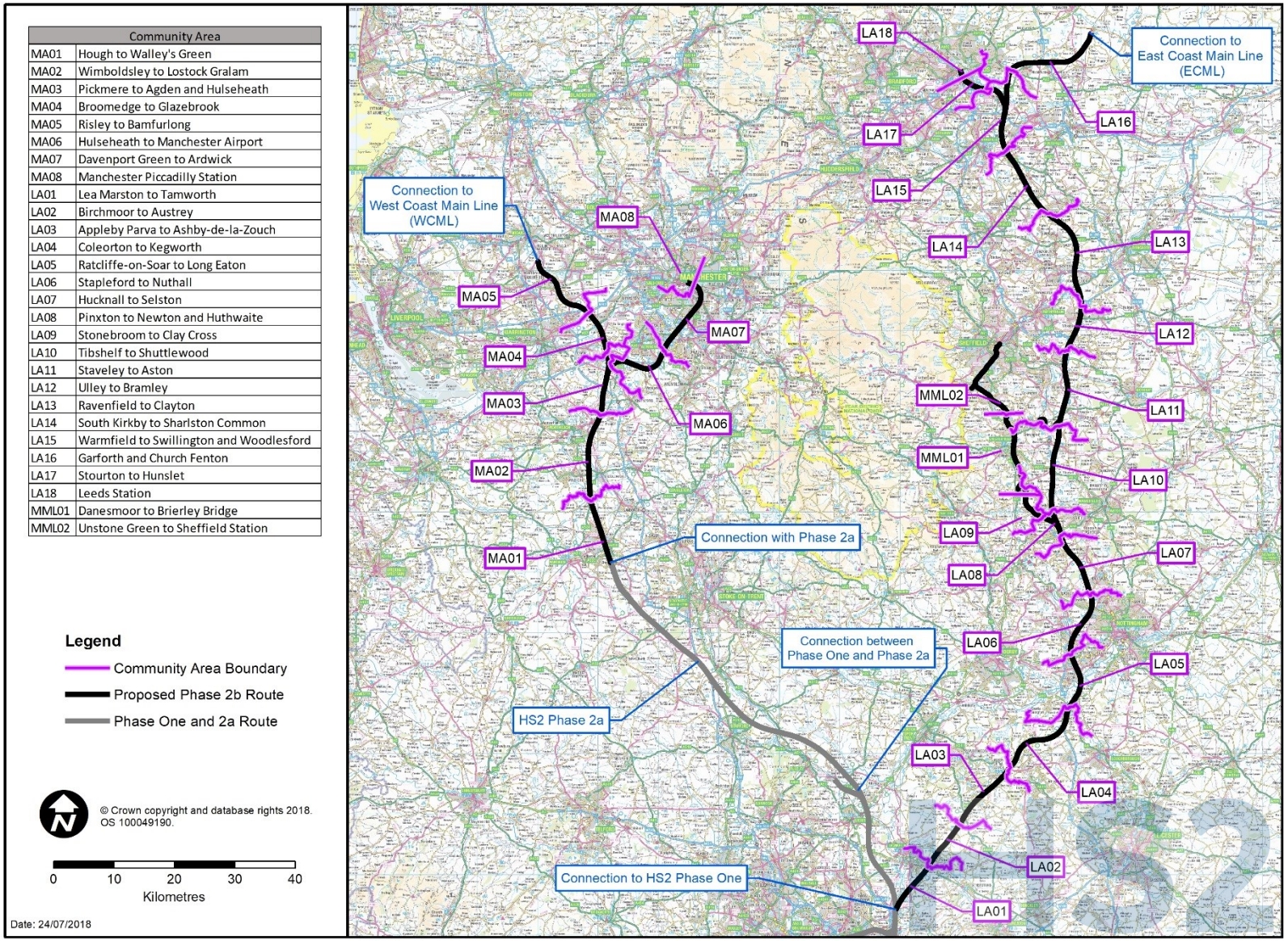
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland Main Line (MML) south-east of Chesterfield and the East Coast Main Line (ECML) approaching York (approximately 198 km (123 miles)), completing what is known as the 'Y network'.

1.1.4 Phase Two of HS2 is being taken forward in two stages, referred to as Phase 2a and Phase 2b. Phase 2a of HS2 includes the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands - Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals and deposited in Parliament in July 2017. A subsequent ES was deposited with Additional Provisions to that Bill in March 2018.

1.1.5 Phase 2b (the Proposed Scheme), the subject of this working draft ES, comprises the route from Crewe to Manchester (and connections into the WCML) (referred to as the 'western leg'), and from the West Midlands to Leeds (and connections into the Midland Main Line (MML and the ECML)) via the East Midlands and South Yorkshire (referred to as 'the eastern leg'). The connection to and electrification of an approximately 30km (19 miles) section of the existing MML would enable high speed trains to connect to Chesterfield and Sheffield. Construction of the Proposed Scheme would commence in 2023, with operation planned to start in 2033.

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Hucknall to Selston area (CA number LA07) which is located on the eastern leg of the Proposed Scheme.

Figure 2: The HS2 Phase 2b route and community areas



1.2 Purpose of this report

1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point-in-time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Hucknall to Selston area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

1.2.2 The design development and environmental assessment process is ongoing. Consultation on the working draft ES is being carried out to assist early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. Parliamentary Standing Orders do not require a working draft ES. Developing a working draft ES and consulting on it in advance of the formal ES means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.

1.2.3 As this is a working draft ES, where information is not available at this time, professional judgement and reasonable worst-case assumptions have been used to provide an indication of the likely impact to inform the consultation.

1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal ES to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)[1,2]. It is possible that the effects and mitigation described in the formal ES may differ from those presented in this working draft ES, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.

1.2.5 The working draft ES has been undertaken on the assumption that the policies adopted for Phase One and Phase 2a will also apply to Phase 2b. The assessment also assumes that any general mitigation measures required as a result of those policies are implemented appropriately in the delivery and operation of the Proposed Scheme. Where policies are referred to in this working draft ES it is on this basis.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1: an introduction to HS2 and the purpose and structure of this report;
- Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;

[1] *Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment)*, House of Commons.
[2] House of Lords, 2005, Standing Orders of the House of Lords - Private Business, The Stationery Office.

- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);
  - ecology and biodiversity (Section 7);
  - health (Section 8);
  - historic environment (Section 9);
  - land quality (Section 10);
  - landscape and visual (Section 11);
  - socio-economics (Section 12);
  - sound, noise and vibration (Section 13);
  - traffic and transport (Section 14); and
  - water resources and flood risk (Section 15).

1.3.2 Each environmental topic section (Sections 4 to 15) comprises:

- an introduction to the topic;
- a description of the existing environmental baseline within the community area;
- a description of the impacts or likely significant environmental effects identified to date arising during construction and operation of the Proposed Scheme; and
- a description of any proposed mitigation and monitoring measures that have been identified to date to address any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Hucknall to Selston area are provided in a separate corresponding document entitled Volume 2: LA07 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: LA07 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and

[3] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Hucknall to Selston area covers an approximately 11.1km section of the Proposed Scheme, passing from Nuthall to Pinxton and through the parishes of Greasley, Annesley, Felley, Selston, Hucknall and Kirkby-in-Ashfield. The area falls within the local authority areas of Broxtowe Borough Council (BBC) and Ashfield District Council (ADC) as well as Nottinghamshire County Council (NCC). The boundary between Nuthall parish and Greasley parish forms the southern boundary of this section, while the boundary between Selston and Pinxton parishes and the NCC forms the northern boundary of this section.

2.1.2 As shown in Figure 3, the Stapleford to Nuthall area (LA06) lies to the south and the Pinxton to Newton and Huthwaite area (LA08) lies to the north.

Settlement, land use and topography

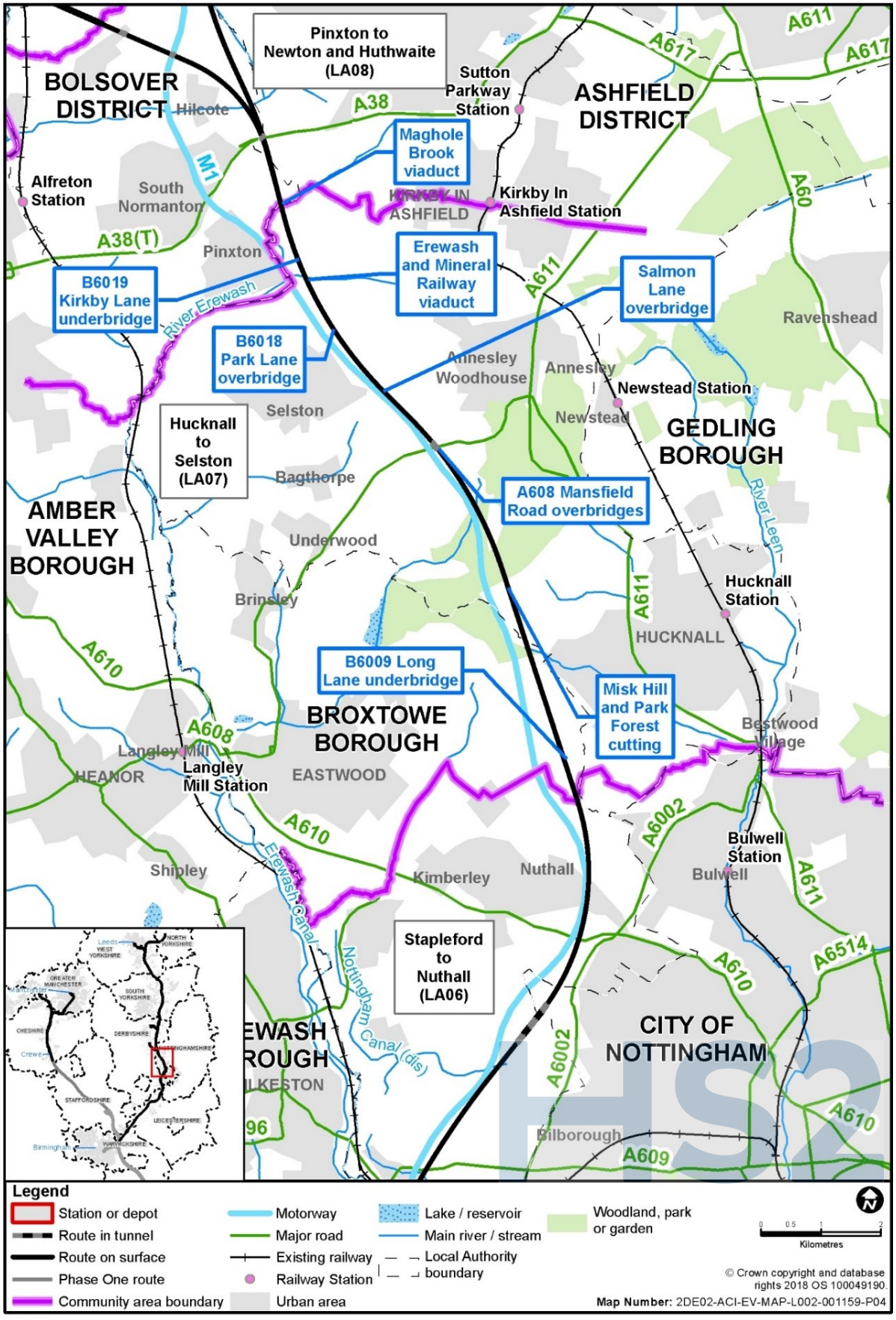
2.1.3 The Hucknall to Selston area is predominantly rural in character, with a number of towns, villages and a scattering of isolated dwellings and farmsteads. The area is predominantly open land with agriculture being the main land use. There are also a number of woodlands, including Watnall Coppice Ancient Woodland and Park Forest, which would be bisected by the Proposed Scheme.

2.1.4 The town of Hucknall and the settlements of Beauville and Westville, lie in the southern end of the Hucknall to Selston area. In the central section of the area, there are a number of residential dwellings and businesses, including farms and industrial estates such as Sherwood Business Park, south of Annesley Woodhouse village. The village of Selston lies near the northern boundary of the Hucknall to Selston area.

2.1.5 The Hucknall to Selston area is characterised by undulating low hills and woodland cover. Settled river valley landscapes and floodplain pasture at lower levels are present around the River Erewash and Maghole Brook.

2.1.6 The southern end of the Hucknall to Selston area lies approximately 100m above Ordnance Datum (AOD), rising to 180m AOD near the A608 Mansfield Road at the M1 junction 27 crossing, before falling to 105m AOD towards the northern boundary of the Hucknall to Selston area, by Maghole Brook.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The M1 passes through the Hucknall to Selston area in a south-north orientation, and the Proposed Scheme would follow the alignment of the M1 for much of the area.

2.1.8 Primary roads in the Hucknall to Selston area include the A608 Mansfield Road, which connects to the M1 junction 27, and the A611 Hucknall Road, which runs between Nottingham and Mansfield.

2.1.9 Local routes in the Hucknall to Selston area include the B6009 Long Lane/Watnall Road, which connects Watnall and Hucknall, the B6018 Mansfield Road/Park Lane, which links Selston and Kirkby-in-Ashfield, the B6019 Kirkby Lane, which links Pinxton to Kirkby-in-Ashfield. The Wood Lane/Common Lane/Whyburn Lane lies north of Hucknall and the Forest Road/Salmon Lane, which connects Annesley Woodhouse with Selston lies north of the Hucknall to Selston area.

2.1.10 The Sutton Junction to Pye Bridge Railway, connecting the Erewash Valley line (Clay Cross-Long Eaton) to the Robin Hood line (Nottingham-Worksop) lies within the Hucknall to Selston area.

2.1.11 The route of the Proposed Scheme would also cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide transport links between scattered dwellings and villages. The Greasley Bridleway 15, which forms part of the Robin Hood Way, a long distance footpath from Nottingham to Edwinstowe, lies in the southern part of the Hucknall to Selston area. The Greasley Bridleway 21, which forms part of the Broxtowe Country Trail is also in the area, crossing the Proposed Scheme at Westville.

Socio-economic profile

2.1.12 Within the ADC area there is a wide spread of business types reflecting a diverse range of commercial activities. The construction sector accounts for the largest proportion of businesses (14%), with retail the second largest (12%), followed by professional, scientific and technical (10%).

2.1.13 According to the Annual Population Survey (2016)[4], the employment rate[5] within ADC was 73% (55,500 people), and unemployment in the ADC area was 4.7%.

2.1.14 According to the Annual Population Survey (2016)[6], 16.1% of Ashfield residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31.3% in the East Midlands and 38% in England, while 8.5% of residents had no qualifications.

Notable community facilities

2.1.15 The main concentrations of community facilities are in the town of Hucknall and the villages of Selston and Annesley Woodhouse.

[4] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[5] The proportion of working age (16-64 year olds) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment'.
[6] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk

2.1.16 Hucknall town is located towards the south-east of the Hucknall to Selston area. The town acts as a major district centre, offering a range of community facilities including Edgewood Leisure Centre and Rolls Royce Leisure Club, Edgewood Primary and Nursery School, West Hucknall Baptist Church and St Peter and St Paul's Church. Hucknall also has public houses, restaurants and sports facilities.

2.1.17 Annesley Woodhouse is a village located towards the north-east of the Hucknall to Selston area. The main community facilities include a number of primary schools, religious institutions, local shops and services and a number of outdoor play facilities, sports pitches and allotments. To the south of Annesley Woodhouse and the A608 Mansfield Road there is a major employment centre, the Sherwood Business Centre.

2.1.18 Selston, a village located towards the north-west of the Hucknall to Selston area, features a set of community facilities including Selston surgery and a Lloyd's pharmacy, Selston Church of Christ, Selston Methodist Church and educational facilities including the Holly Hill Primary, Nursery School and Selston High School.

Recreation, leisure and open space

2.1.19 The route would bisect a number of PRoW, including the Greasley Bridleway 15, which forms part of the Robin Hood Way and the Greasley Bridleway 21, which forms part of the Broxtowe Country Trail, both long distance routes.

2.1.20 There are a number of open spaces publicly accessible within the area, notably Park Forest, which is located north-west of Hucknall and bisected by the M1. It is managed by the Forestry Commission and is also a local wildlife site (LWS).The forest is accessible by a number of PRoW and informal forestry tracks. Recreational open spaces such as sports grounds and playing fields are located in the settlements of Hucknall, Annesley Woodhouse and Selston.

2.1.21 The Hucknall to Selston area is located wholly within the Greenwood Community Forest, a partnership to enable Nottinghamshire's communities to create, care for and use woodlands and other high quality accessible green spaces in a sustainable way that benefits the environment, landscape and the local economy.

Policy and planning context

Planning framework

2.1.22 Volume 1 provides an overview of the policy case for HS2. Relevant development plan documents and policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

2.1.23 The following local policy documents have been considered and referred to where appropriate to the assessment:

- the adopted (saved) policies of the Ashfield Local Plan Review (2007)[7];

[7] The adopted (saved) policies of the Ashfield Local Plan can be found at: https://www.ashfield.gov.uk/residents/planning-and-building-control/forward-planning/local-plan-review-2002/

- the adopted (saved) policies of the Broxtowe Local Plan (2007)[8];
- the Greater Nottingham Broxtowe Borough Gedling Borough Nottingham City Aligned Core Strategies Part 1 Local Plan (2014)[9];
- the adopted (saved) policies of the Nottinghamshire Minerals Local Plan (2008)[10];
- the adopted (saved) policies of the Nottinghamshire and Nottingham Waste Local Plan (2007)[11];
- the Nottinghamshire and Nottingham Replacement Waste Core Strategy Part 1 (2013)[12];
- the Nottinghamshire Local Transport Plan (2011-2026)[13]; and
- the Selston Neighbourhood Plan (2017 – 2032)[14].

2.1.24 Emerging policies are not considered as part of this assessment unless a document has been submitted to the Secretary of State for Examination.

Committed development

2.1.25 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme.

2.1.26 Where it is likely that committed developments will have been completed by 2023, these will be identified as 'future baseline' schemes and taken into account in the formal ES.

2.1.27 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

2.1.28 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

[8] The adopted (saved) policies of the Broxtowe Local Plan available online at: https://www.broxtowe.gov.uk/media/2044/saved-policies-list.pdf
[9] The Greater Nottingham Broxtowe Borough Gedling Borough Nottingham City Aligned Core Strategies Part 1 Local Plan available online at:: https://www.broxtowe.gov.uk/media/2160/broxtowe-aligned-core-strategy.pdf
[10] The adopted (saved) policies of the Nottinghamshire Minerals Local Plan available online at:http://www.nottinghamshire.gov.uk/planning-and-environment/minerals-local-plan/adopted-minerals-local-plan
[11] The adopted (saved) policies of the Nottinghamshire and Nottingham Waste Local Plan available online at:http://www.nottinghamshire.gov.uk/media/109140/wastelocalplan.pdf
[12] The Nottinghamshire and Nottingham Replacement Waste Core Strategy Part 1 available online at: http://www.nottinghamshire.gov.uk/media/109118/waste-core-strategy-1.pdf
[13] The Nottinghamshire Local Transport Plan available online at: http://www.nottinghamshire.gov.uk/media/123040/local-transport-plan-strategy.pdf
[14] The Selston Neighbourhood Plan available online at: https://www.ashfield.gov.uk/media/3756/jus-t-np-referendum-version-sept.pdf

Ongoing design development

2.1.29 Design development continues on this section of route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing consultation and stakeholder engagement. Any further changes resulting from this will be reported in the formal ES. The main areas of design development being considered include:

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes, access to balancing ponds, and other infrastructure;
- additional, and refinement of, environmental features required to mitigate likely significant environmental effects;
- access roads or tracks to land or property and crossings of the Proposed Scheme for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station and auto-transformer feeder station locations, which form part of the electrical infrastructure to power the Proposed Scheme.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Hucknall to Selston area, including the proposed environmental mitigation measures that have been identified to date. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9.

2.2.2 Land required for operation of the Proposed Scheme is described in this section and is shown on Volume 2: Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: Map Series CT-05.

Overview

2.2.3 The Proposed Scheme through the Hucknall to Selston area would be approximately 11.1km long and would lie within the local authority areas of BBC and ADC. The route of the Proposed Scheme would extend from Nuthall in the south towards Hucknall and continuing north towards Selston.

2.2.4 This section of route is illustrated in the Volume 2: LA07 Map Book, CT-06-441b to CT-06-447a.

2.2.5 All dimensions in the sections below are approximate.

2.2.6 In the Hucknall to Selston area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 0.9km (Audrey Wood, Erewash and Mineral Railway and part of Maghole Brook viaduct which continues into the Pinxton to Newton and Huthwaite area (LA08);
- cuttings for a total length of 3.5km (Misk Hill and Park Forest, The Dumbles, Butler Wood, A608 Mansfield Road, Annesley Lane, Park Lane and B6019 Kirkby Lane cuttings);
- embankments for a total length of 6.1km (Westville, Park Forest, Audrey Wood south, Audrey Wood north, Salmon Lane, Annesley Lane, River Erewash south, River Erewash north, Kirkby Park and B6019 Kirkby Lane and Maghole Brook embankments); and
- section of the route running at ground level for a total length of 0.6km.

2.2.7 Embankments and cuttings have been labelled according to their predominant physical characteristics. It is important to note that embankments and cuttings may vary as to their depth of cutting or height of embankment, as a result of the topography through which the railway passes. In the Hucknall to Selston area, there would be two sections of cutting which would be above ground level. This applies to the Misk Hill and Park Forest cutting and to the A608 Mansfield Road cutting, which would have a short section of embankment, which would be up to 2m above existing ground level. At the B6019 Kirkby Lane and Maghole Brook embankment there would also be a short section of cutting which would be up to 1m below ground level within the overall length of the embankment.

2.2.8 The Proposed Scheme is described in five separate sections below.

2.2.9 In general, features are described along the route of the Proposed Scheme from south to north and west to east of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA07 Map Book.

Westville embankment to Misk Hill and Park Forest cutting

2.2.10 The route of the Proposed Scheme would continue from the Stapleford to Nuthall area (LA06), heading north-west on the Westville embankment towards Misk Hill and Park Forest cutting.

2.2.11 This section of route is illustrated in Volume 2: LA07 Map Book, maps CT-06-441b to CT-06-443.

2.2.12 Key features of this 3.1km section would include:

- Bulwell Wood drop inlet culvert, 80m north of Greasley Footpath 18 realignment, for land drainage (see Volume 2: LA07 Map Book, map CT-06-441b, B5-6);

- Westville embankment, 3.1km in length and up to 19m in height, with landscape earthworks and landscape mitigation planting along the eastern side to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, maps CT-06-441b, A5-6 and CT-06-442,I6-7);
- three ecological mitigation ponds to the east of the route of the Proposed Scheme with surrounding terrestrial habitat to provide replacement habitat and ecological connectivity south of the B6009 Long Lane (see Volume 2: LA07 Map Book, map CT-06-441b, C7 to E6);
- B6009 Long Lane underbridge, 24m in length with a height clearance of 6m, to carry the B6009 Long Lane on its existing alignment under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-441b, E5-6);
- diversion realignment of Greasley Bridleway 15, which forms part of the Robin Hood Way, 30m east of its current alignment for 430m, crossing the route of the Proposed Scheme via the B6009 Long Lane underbridge (see Volume 2: LA07 Map Book, map CT-06-441b, C6 to E6);
- B6009 Long Lane culvert, 62m in length, to the north of B6009 Long Lane underbridge for land drainage (see Volume 2: LA07 Map Book, map CT-06-441b, E5-E6);
- realignment of Greasley Bridleway 19 west of its current alignment for 550m (see Volume 2: LA07 Map Book, map CT-06-441b, G4 to I5);
- a balancing pond for railway drainage on the east side of the route of the Proposed Scheme, near Eel Hole Farm, with access from B6009 Long Lane (see Volume 2: LA07 Map Book, map CT-06-441b, E7);
- closure of Greasley Footpath 22. Users would be diverted to the west of its existing alignment for 1.4km, to connect with the Greasley Bridleway 19, crossing under the route of the Proposed Scheme via the B6009 Long Lane underbridge (see Volume 2: LA07 Map Book, map CT-06-441b, D7 to I5);
- two areas of grassland habitat creation on the west side of the Proposed Scheme, north of the B6009 Long Lane and continuing to the end of the Westville embankment, to provide habitat replacement (see Volume 2: LA07 Map Book, maps CT-06-441b, E5 to J5 and CT-06-442, C5 to E6);
- area of woodland habitat creation on the east side of the Proposed Scheme, between Starth Wood and Eelhole Wood, to provide habitat replacement and ecological connectivity (see Volume 2: LA07 Map Book, map CT-06-441b, H9 to I10);
- a balancing pond for railway drainage on the east side of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-441b, I6-7);
- Westville embankment south culvert, 71m in length, for an existing unnamed watercourse to pass under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-442, D6-7);

- realignment of the Watnall Coppice underbridge, 63m in length and with a height clearance up to 4m and the Coppice Farm access, 300m to the south of its existing alignment to carry Greasley Footpath 20 and Greasley Bridleway 21 under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-442, F6-7);
- realignment of Greasley Bridleway 21, which forms part of the Broxtowe Country Trail, north of its existing alignment for 150m and cross under the Proposed Scheme via the Watnall Coppice underbridge (see Volume 2: LA07 Map Book, map CT-06-442, E7 to F6);
- diversion of Greasley Footpath 20 to the north of its existing alignment for 700m to connect with Greasley Bridleway 21, which forms part of the Broxtowe Country Trail. The realignment would cross under the route of the Proposed Scheme via the Watnall Coppice underbridge (see Volume 2: LA07 Map Book, map CT-06-442, D6 to F5);
- a noise fence barrier, 530m in length and up to 3m in height, extending from Greasley Footpath 20 to Watnall Coppice, to provide acoustic screening for properties in Westville (see Volume 2: LA07 Map Book, map CT-06-442, E6-7 to G6-7);
- Westville embankment culvert, 91m in length for an existing unnamed watercourse to pass under the Proposed Scheme at Watnall Coppice (see Volume 2: LA07 Map Book, map CT-06-442, H6-7);
- two balancing ponds for railway drainage to the east of the Proposed Scheme with access from the south via Misk Farm access track (see Volume 2: LA07 Map Book, map CT-06-442, G7 to H8);
- realignment of the Misk Farm underbridge and access track, 300m to the south of its existing alignment. The realigned Misk Farm underbridge would be 43m in length and with a height clearance up to 6m (see Volume 2: LA07 Map Book, map CT-06-442, I6);
- an access track to the covered reservoir to the east of the Proposed Scheme with access from the south via Misk Farm access track (see Volume 2: LA07 Map Book, map CT-06-442, H7 to I7);
- Hucknall Reservoir retaining wall, 65m in length and up to 15m in height, of which up to 5m would be above existing ground level, located to the west of the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-442, J7);
- an area of woodland habitat creation on the west side of the M1, to provide habitat replacement (see Volume 2: LA07 Map Book, maps CT-06-442,I3 toJ3, and CT-06-443, A2 to C3); and

- areas of woodland habitat creation on both sides of the Proposed Scheme, extending from the Watnall Coppice underbridge to the Misk Hill and Park Forest cutting, to provide habitat replacement (see Volume 2, LA07 Map Book, map CT-06-442, E7 to I8).

2.2.13 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.14 Construction of this section would be managed from the B6009 Long Lane and Westville satellite compounds, which are described in Section 2.3, and shown in Volume 2: LA07 Map Book, map CT-05-441b, C4 to E5 and map CT-05-442, H8 to I8.

Misk Hill and Park Forest cutting to The Dumbles cutting

2.2.15 The route of the Proposed Scheme would continue north through the Misk Hill and Park Forest cutting, before passing onto the Park Forest embankment and heading north into The Dumbles cutting.

2.2.16 This section of route is illustrated in the Volume 2: LA07 Map Book, maps CT-06-442 and CT-06-443.

2.2.17 Key features of this 1.3km section would include:

- Misk Hill and Park Forest cutting, 1.1km in length, up to 22m in depth and up to 170m in width. This cutting would include a short section of embankment, 130m long and up to 2m high, with associated landscape earthworks on both sides (see Volume 2: LA07 Map Book, map CT-06-443, B5 to D5 and C6), to help integrate the route of the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, maps CT-06-442, I6-7, and CT-06-443, C6-7 to G6-7);
- areas of woodland habitat creation on both sides of the Proposed Scheme, extending from the Misk Hill and Park Forest cutting to The Dumbles cutting, to provide habitat replacement (see Volume 2: LA07 Map Book, maps CT-06-442, H6 to J7 and CT-06-443, A5-6 to F5-6);
- realignment of Hucknall Footpath 35, south of its existing alignment for 310m. The realigned footpath would cross the route of the Proposed Scheme on the Hucknall Footpath 35 overbridge, which would be 69m in length and up to 8m (see Volume 2: LA07 Map Book, map CT-06-443, B5 to B6);
- Misk Farm auto-transformer station, on the east side of the Proposed Scheme, 260m north-north-east of Misk Farm, with associated grassed areas. Access would be provided via Hucknall covered reservoir access track (see Volume 2: LA07 Map Book, map CT-06-443, C5-6);
- at the Misk Hill and Park Forest cutting, a drop inlet culvert would to be provided for land drainage (see Volume 2: LA07 Map Book, map CT-06-443, C5-C6);

- Park Forest embankment, 210m in length and up to 7m in height, with landscape earthworks and landscape mitigation planting on east side of the embankment to help integrate the route of the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-443, F6 to G6); and
- Park Forest embankment drop inlet culvert, which would allow an unnamed watercourse to pass under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-443, G5).

2.2.18 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.19 Construction of this section would be managed from the B6009 Long Lane and the Westville satellite compounds, which are described in Section 2.3, and shown in the Volume 2: LA07 Map Book, map CT-05-441b, C4 to E5 and map CT-05-442, H8 to I8.

The Dumbles cutting to A608 Mansfield Road cutting

2.2.20 The route of the Proposed Scheme would continue northwards in The Dumbles cutting to the Audrey Wood south embankment before passing onto the Audrey Wood viaduct and then the Audrey Wood north embankment. At the northern end of this section, the route of the Proposed Scheme would terminate at the A608 Mansfield Road cutting.

2.2.21 This section of route is illustrated in the Volume 2: LA07 Map Book on CT-06-443 to CT-06-444.

2.2.22 Key features of this 1.3km section would include:

- The Dumbles cutting, 235m in length, up to 3m in depth and up to 33m in width, with landscape mitigation earthworks to the east and landscape mitigation planting along the eastern side of the route to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-443, H5-I5);
- areas of woodland habitat creation on both sides of the Proposed Scheme, extending from The Dumbles cutting to A608 Mansfield Road cutting (and embankment), to provide habitat replacement (see Volume 2: LA07 Map Book, map CT-06-443, I6 to H5 to I6);
- a balancing pond for railway drainage on the east side of Kennel Lane and to the west of the route of the Proposed Scheme, (see Volume 2: LA07 Map Book, map CT-06-443, G5);
- a balancing pond for highway drainage on the east side of Kennel Lane and to the west of the route of the Proposed Scheme, to provide drainage for Kennel Lane (see Volume 2: LA07 Map Book, map CT-06-443, H5);

- realignment of Annesley Footpath 2 south of its existing alignment for 460m. The realigned footpath would cross the route of the Proposed Scheme on the Kennel Lane overbridge, which would be 54m in length and up to 8m, (see Volume 2: LA07 Map Book, map CT-06-443, H5 to I6);
- an area of grassland habitat creation to the east of the route of the Proposed Scheme, to provide replacement habitat (see Volume 2: LA07 Map Book, maps CT-06-443, H6 to J8 and CT-06-444, A6 to C10);
- Audrey Wood south embankment, 370m in length and up to 10m in height. There would be landscape earthworks and landscape mitigation planting on the eastern side of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, maps CT-06-443, H5 to J5, and CT-06-444, A5 to C6);
- a balancing pond for highway drainage on the west side of Kennel Lane and to the east of the route of the Proposed Scheme, to provide drainage for Kennel Lane (see Volume 2: LA07 Map Book, map CT-06-444, B6);
- Audrey Wood viaduct, 420m in length and up to 24m in height above ground level (see Volume 2: LA07 Map Book, maps CT-06-444, C6 to E6);
- a balancing pond for railway drainage to the east side of the Proposed Scheme with access from Weaver's Lane (see Volume 2: LA07 Map Book, map CT-06-444, E7 to E8);
- an area of grassland habitat creation to the north and east of the railway balancing pond, to provide replacement habitat (see Volume 2: LA07 Map Book, map CT-06-444, E7 to F8); and
- Audrey Wood north embankment, 275m in length and at a height of up to 10m. There would be landscape earthworks and landscape mitigation planting on the eastern side of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-444, F6 to G6).

2.2.23 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.24 Construction of this section would be managed from the Kennel Lane satellite compound and the A608 Mansfield Road main compound, which are described in Section 2.3, and in the Volume 2: LA07 Map Book, maps CT-05-443, I6 and CT-05-444, G7 to I9.

A608 Mansfield Road cutting to Butler Wood cutting

2.2.25 The route of the Proposed Scheme would continue north-west to the A608 Mansfield Road cutting, before running at ground level for 568m until the Salmon Lane embankment and on to the Annesley Lane cutting and Annesley Lane End embankment. The route would then continue into the Butler Wood cutting.

2.2.26 This section of route is illustrated in the Volume 2: LA07 Map Book, maps CT-06-444 to CT-06-446.

2.2.27 Key features of this approximately 2.4km section would include:

- A608 Mansfield Road cutting, 910m in length, up to 11m in depth and up to 100m in width. This cutting would include a short section of embankment, 190m long and up to 2m high. Landscape earthworks and landscape mitigation planting would be provided at the southern and northern extent of the cutting, east of the Proposed Scheme, to provide landscape integration (see Volume 2: LA07 Map Book, maps CT-06-444, G6 and J5-J6 to CT-06-445, C6);
- extension of the eastern side of the roundabout at junction 27 of the M1. This would be supported on the A608 Mansfield Road overbridges, comprising two box structures, 22m in length and up to 8m in height, crossing the route of the Proposed Scheme (see Volume 2: LA07 Map Book, maps CT-06-444, I5 to J6 and CT-06-445, A5 to B6);
- relocation of the A608 Mansfield Road eastbound lay-by 150m to the east of its existing location (see Volume 2: LA07 Map Book, maps CT-06-444, I7-I8 and CT-06-445, A7-A8);
- a balancing pond for highway drainage on the east side of the route of the Proposed Scheme, with access from the A608 Mansfield Road (see Volume 2: LA07 Map Book, map CT-06-445, B6);
- an area of grassland habitat creation to the west of the route of the Proposed Scheme, to provide habitat replacement (see Volume 2: LA07 Map Book, map CT-06-445, B5-B6 to H5);
- a series of shallow cuttings and low embankments, 568m in length comprising, all less than 2m deep or high, with landscape earthworks on the east side. This would help integrate the route of the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-445, B6 to H6);
- diversion of Annesley Footpath 8 to the east of its existing alignment for 1.1km to connect with the northern end of Salmon Lane, to the south of Boggs Farm (see Volume 2: LA07 Map Book, map CT-06-445, D6 to H8);
- Salmon Lane embankment, 480m in length and up to 9m in height, with landscape earthworks on the east side to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-445, G5-6 to H5-6);
- a balancing pond for railway drainage on the east side of the route of the Proposed Scheme, with access provided from Salmon Lane (see Volume 2: LA07 Map Book, map CT-06-445, G6 to H7);
- an area of grassland habitat creation to the north and west of the railway balancing pond, to provide habitat replacement (see Volume 2: LA07 Map Book, map CT-06-445, G6 to H8);

- realignment of Salmon Lane, to the south of its existing alignment on an embankment 700m long and up to 8m in height. The realigned Salmon Lane would cross the route of the Proposed Scheme on the Salmon Lane HS2 overbridge that would be 49m in length and up to 8m in height (see Volume 2: LA07 Map Book, map CT-06-445, I3 to H8);
- Salmon Lane M1 overbridge, would be 53m in length and up to 11m in height and cross the M1. The Salmon Lane HS2 overbridge would be 49m in length and up to 8m in height (see Volume 2: LA07 Map Book, map CT-06-445, I4 to H6);
- Annesley Lane cutting, 206m in length, up to 5m in depth and up to 53m in width, with landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape and a noise fence barrier, 2m in height, to provide acoustic screening for properties in Selston (see Volume 2: LA07 Map Book, map CT-06-445, I5-6 to CT-06-446, B5);
- three ecological mitigation ponds to the east of the route of the Proposed Scheme with surrounding terrestrial habitat to provide replacement habitat and ecological connectivity to the east of the Annesley Lane cutting (see Volume 2: LA07 Map Book, map CT-06-446, B6);
- Annesley Lane End embankment, 247m in length up to 3m in height, with landscape mitigation planting to the west to help the integrate the Proposed Scheme into the surrounding landscape and a noise fence barrier, 2m in height, to provide acoustic screening for properties in Selston (see Volume 2: LA07 Map Book, map CT-06-446, B5 to C5);
- Annesley Lane End embankment drop inlet culvert to convey an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-446, B5); and
- eight ecological mitigation ponds to the east of the route of the Proposed Scheme with surrounding terrestrial habitat to provide replacement habitat and ecological connectivity to the east of the Proposed Scheme, extending from the Annesley Lane End embankment to the Butler Wood cutting (see Volume 2: LA07 Map Book, map CT-06-446, C5-6 to E5-6).

2.2.28 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.29 Construction of this section would be managed from the A608 Mansfield Road main compound, the Salmon Lane satellite compound and the Erewash and Mineral Railway south satellite compound, which are described in Section 2.3, and shown in Volume 2: LA07 Map Book, maps CT-05-444, G7-I9, CT-05-445, H7-I7 and CT-05-447a, A4 to B4).

Butler Wood cutting to Maghole Brook viaduct

2.2.30 The Proposed Scheme would continue north-west through Butler Wood cutting, over the River Erewash south embankment, Erewash and Mineral Railway viaduct, River Erewash north embankment and Kirkby Lane cutting. North of the B6019 Kirkby Lane the route would continue along the Kirkby Lane and Maghole Brook embankment before passing across the Maghole Brook viaduct, into the Pinxton to Newton and Huthwaite (LA08) area.

2.2.31 This section of route is illustrated in the Volume 2: LA07 Map Book, maps CT-06-446 to CT-06-447a.

2.2.32 Key features of this 3km section would include:

- Butler Wood cutting, 310m in length up to 2m in depth and up to 30m in width, with landscape mitigation planting to the west to help integrate the Proposed Scheme into the surrounding landscape, and a noise fence barrier, 2m in height, to provide acoustic screening for properties in Selston (see Volume 2: LA07 Map Book, map CT-06-446, C5 to E5);
- a balancing pond for railway drainage to the west of the Proposed Scheme with access provided under the M1 via an existing underbridge and access track (see Volume 2: LA07 Map Book, map CT-06-446, D5 to E5);
- Kirkby Park embankment, 155m in length and up to 5m in height, with landscape mitigation planting on the west side to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-446, E5-6);
- Kirkby Park embankment culvert to convey an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-446, E5-6);
- B6018 Park Lane cutting, 570m in length and up to 13m in depth and up to 118m in width. There would be landscape earthworks and landscape mitigation planting on both sides of the route, north of the B6018 Park Lane, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-446, E5-6 to H5-6);
- thirteen ecological mitigation ponds to the east of the route of the Proposed Scheme with surrounding terrestrial habitat to provide replacement habitat and ecological connectivity to the east of Park Lane cutting (see Volume 2: LA07 Map Book, map CT-06-446, E5 to G8);
- B6018 Park Lane auto transformer station, on the west side of the route of the Proposed Scheme. Access would be provided via an access road from B6018 Park Lane to the north (see Volume 2: LA07 Map Book, map CT-06-446, F5);
- a balancing pond for highway drainage on the east of the route of the Proposed Scheme, south of the B6018 Park Lane (see Volume 2: LA07 Map Book, map CT-06-446, G6-G7);

- B6018 Park Lane overbridge, 88m in length and up to 12m in height, to carry the B6018 Park Lane over the route of the Proposed Scheme, 20m north of its current alignment for 340m, crossing the route of the Proposed Scheme via the (see Volume 2: LA07 Map Book, map CT-06-446, G4 to G6);
- diversion of Kirkby Footpath 20 to the west of its existing alignment for 1km to connect with the B6018 Park Lane and cross the route of the Proposed Scheme on the B6018 Park Lane overbridge (see Volume 2: LA07 Map Book, map CT-06-446, E5 to G4);
- an area of grassland habitat creation to the west of the Proposed Scheme, north of the B6018 Park Lane, to provide replacement habitat (see Volume 2: LA07 Map Book, maps CT-06-446, G4 to J4, and CT-06-447a, A5 to C4);
- River Erewash south embankment, 500m in length, up to 20m in height, with landscape earthworks and landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, maps CT-06-446, I5-6 to CT-06-447a, C5-6);
- a balancing pond for railway drainage and a balancing pond for land drainage on the west side of the Proposed Scheme, with access from the east by an access track passing under the Erewash and Minerals Railway viaduct (see Volume 2: LA07 Map Book, map CT-06-447a, B4 to C5);
- Erewash and Mineral Railway viaduct, 305m in length and up to 18 m in height above ground level, to carry the Proposed Scheme over the Sutton Junction to Pye Bridge Railway (and out of use spur), River Erewash and Kirkby Footpath 17 (see Volume 2: LA07 Map Book, map CT-06-447a, C5 to E5).
- a replacement floodplain storage area and wetland habitat creation on the east of the route of the Proposed Scheme, adjacent to the River Erewash (see Volume 2: LA07 Map Book, map CT-06-447a, C5 to D8);
- River Erewash north embankment, 137m in length, up to 22m in height, with landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-447a, D5 to F5);
- B6019 Kirkby Lane cutting, 123m in length, up to 6m in depth and up to 65m in width. There would be landscape earthworks and landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-447a, E5 to F5);
- a balancing pond for railway drainage on the west side of the route of the Proposed Scheme and south of B6019 Kirkby Lane, with access provided from Pinxton Green (see Volume 2: LA07 Map Book, map CT-06-447a, F3 to F4);

- B6019 Kirkby Lane underbridge, 29m in length with a height clearance of up to 6m, to carry the B6019 Kirkby Lane under the route of the Proposed Scheme on its existing alignment (see Volume 2: LA07 Map Book, map CT-06-447a, F5-F6);
- B6019 Kirkby Lane culvert to convey an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: LA07 Map Book, map CT-06-447a, F5);
- B6019 Kirkby Lane and Maghole Brook embankment, 670m in length, up to 10m in height. There would be a section of the route, 80m length, which would be up to 1m below ground level within the overall length of this embankment. There would be landscape earthworks and landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA07 Map Book, map CT-06-447a, F5 to I5);
- a balancing pond for railway drainage on the west of the Proposed Scheme and north of B6019 Kirkby Lane, with access from the B6019 Kirkby Lane (see Volume 2: LA07 Map Book, map CT-06-447a, H4);
- realignment of Kirkby Footpath 13 to the north of its existing alignment for 210m, passing under the Maghole Brook viaduct (see Volume 2: LA07 Map Book, map CT-06-447a, I5 to I6);
- Maghole Brook viaduct, 395m in length, and up to 18m in height, of which a 225m section would be in the Hucknall to Selston area and 170m section located in the Pinxton to Newton and Huthwaite (LA08) area (see Volume 2: Map CT-06-447a, I5 to J5); and
- a replacement floodplain storage area on the east of the route of the Proposed Scheme, adjacent to the Maghole Brook (see Volume 2: LA07 Map Book, map CT-06-447a, J6 to J7).

2.2.33 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.34 Construction of this section would be managed from the Erewash and Mineral Railway south satellite compound, the B6019 Kirkby Lane satellite compound and the Maghole Brooke satellite compound, which are described in Section 2.3, and shown on Volume 2: LA07 Map Book, maps CT-05-447a,A4-B5, CT-05-447b, F5-G6 and CT-05-448a, D6-7.

Demolitions

2.2.35 As set out in Volume 1, as the design develops, it is likely that not all the properties reported within the assessment would need to be demolished, for example where not all of the land is required for permanent works.

2.2.36 At this stage of the design development, it is anticipated that demolition of 10 existing residential properties, two commercial/ business properties (including outbuildings)

and four other structures would be required to construct the Proposed Scheme in the Hucknall to Selston area. These could be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Hucknall to Selston area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.

2.3.2 Land used only for construction purposes would be restored as agreed with the owner of the land and the relevant local authority once the construction works in that area are complete.

2.3.3 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2.

2.3.4 During the construction phase, public roads and PRoW routes would remain open for public use wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRoW crossing the Proposed Scheme would be constructed prior to any closure of existing roads or PRoW wherever reasonably practicable. Where they would cross the Proposed Scheme in proximity to their existing alignment, a temporary alternative alignment may be required. In some instances, diverted or realigned roads or PRoW may need to pass through areas required for construction of the Proposed Scheme. Routes through these areas would be provided where it is safe and reasonably practicable to do so.

2.3.5 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

2.3.6 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced insofar as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process. The LEMPs will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework[15] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

- to set out how HS2 Ltd and its contractors would undertake community engagement during the construction of the project;
- to provide clarity and reassurance to HS2 Ltd's stakeholders about how community engagement activity would be managed; and
- to help HS2 Ltd be a good neighbour to local communities, including by providing accurate and timely information about construction works and offering opportunities to influence them, where appropriate.

2.3.9 A draft CoCP has been prepared and is published alongside this document, in Supporting document: Draft Code of Construction Practice. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

2.3.10 Building and preparing the Proposed Scheme for operation will comprise the following general stages:

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; haul routes, site preparation and enabling works; main earthworks and structure works; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

2.3.11 General information about the construction process is set out in more detail in Volume 1, Section 6, and the draft CoCP including:

[15] HS2 Ltd (2017) Community Engagement Framework. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625971/hs2_community_engagement_framework.pdf

- the approach to environmental management during construction and the role of the CoCP (Section 2);
- working hours (Section 5);
- management of construction traffic (Section 14); and
- handling of construction materials (Section 15).

Advance works

2.3.12 General information about advance works can be found in Volume 1, Section 6. Advance works will be required before the main construction works commence and typically include:

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

2.3.13 Construction of the Proposed Scheme would require the following broad types of engineering works along the entire length of the route, and within land adjacent to the route:

- civil engineering works, including earthworks such as embankments and cuttings and erection of bridges and viaducts; and
- works to install, test and commission railway systems, including track, overhead line equipment, communications and signalling equipment and traction power supply.

2.3.14 The construction of track and railway systems works in open areas would include the installation of track form, rails, infill material, minor drainage works, and installation of electrification, signalling and communication equipment.

2.3.15 The construction of the Proposed Scheme would be divided into sections, each of which would be managed from compounds. The compounds would act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds would either be main

compounds or satellite compounds. Satellite compounds are generally smaller than main compounds. Compounds would either be used for civil engineering works, for railway installation works, or for both.

General overview of construction compounds

2.3.16 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:

- space for the storage of bulk materials;
- space for the receipt, storage and loading and unloading of excavated material;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage including plant maintenance facilities; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

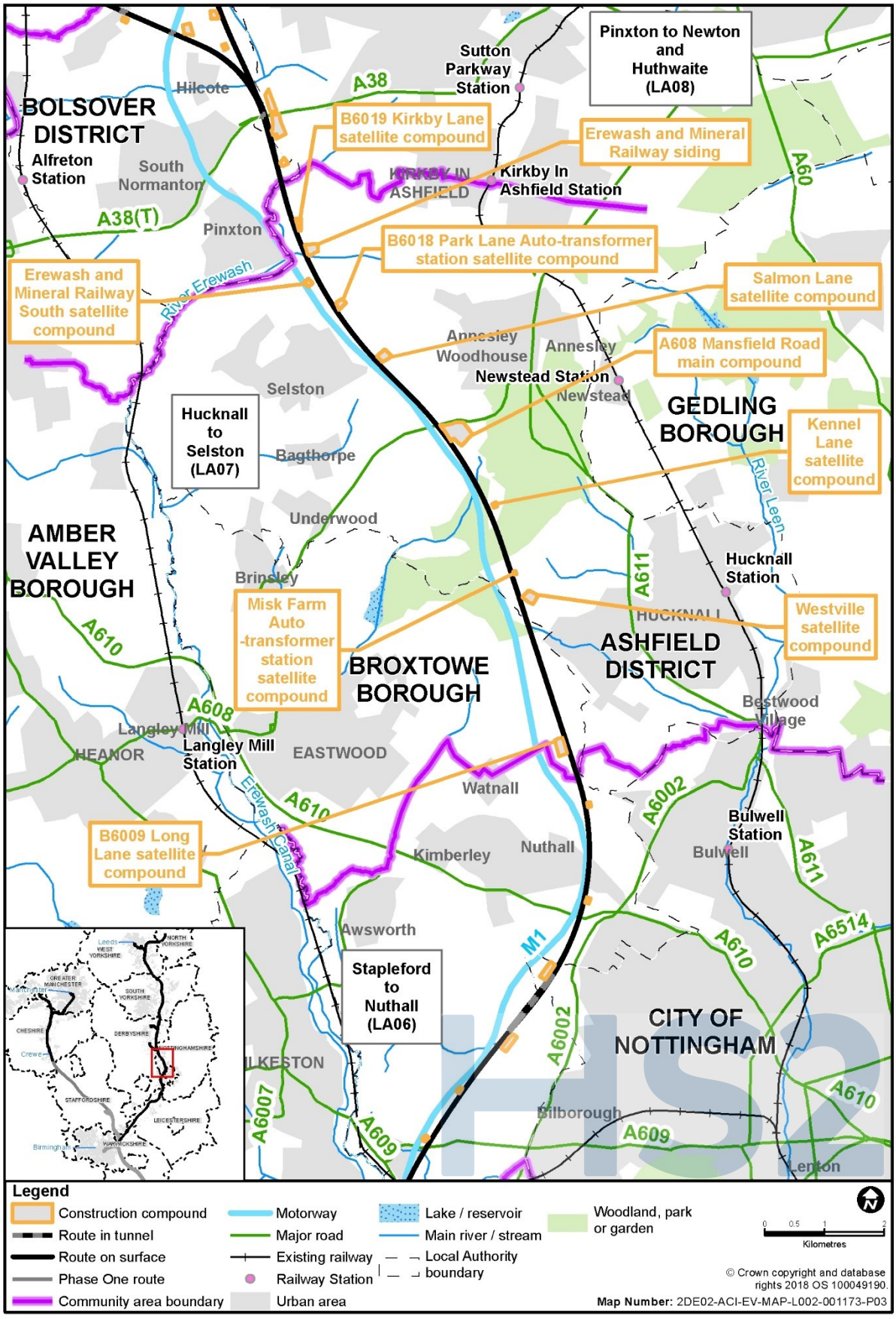
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff and site operatives, and welfare facilities.

2.3.18 One main compound, the A608 Mansfield Road main compound, would be located in the Hucknall to Selston area. This would support seven civil engineering satellite compounds and two satellite compounds for railway installation works. Post completion of civil engineering works the B6009 Long Lane Satellite Compound satellite compound would continue to manage railway installation works.

2.3.19 The A608 Mansfield Road main compound would also manage the Maghole Brook satellite compound within the Pinxton to Newton and Huthwaite area (LA08).

2.3.20 The location of construction compounds in the Hucknall to Selston area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA07 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Hucknall to Selston area



2.3.21 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.22 In the Hucknall to Selston area there would be worker accommodation at the A608 Mansfield Road main compound for the construction workforce. Details of the location and duration of worker accommodation are provided in the description of the compound.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-441b to CT-05-447a, in the Volume 2: LA07 Map Book.

2.3.24 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes, site haul routes and transfer nodes

2.3.25 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, would take place within the construction compounds, on public roads and between the compounds and working areas. Where reasonably practicable, movements between the construction compounds and the working areas would be on designated haul routes within the construction site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.26 The construction compounds would provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Hucknall to Selston area are described in the subsequent sections of this report.

2.3.27 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that would be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works will be reported in the formal ES.

2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on CT-05-441b to CT-05-447a in the Volume 2: L07 Map Book.

Construction compounds

2.3.29 This section provides a summary of the works to be managed from the construction compounds in the Hucknall to Selston area, as illustrated in Figure 5 and Figure 6. All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works

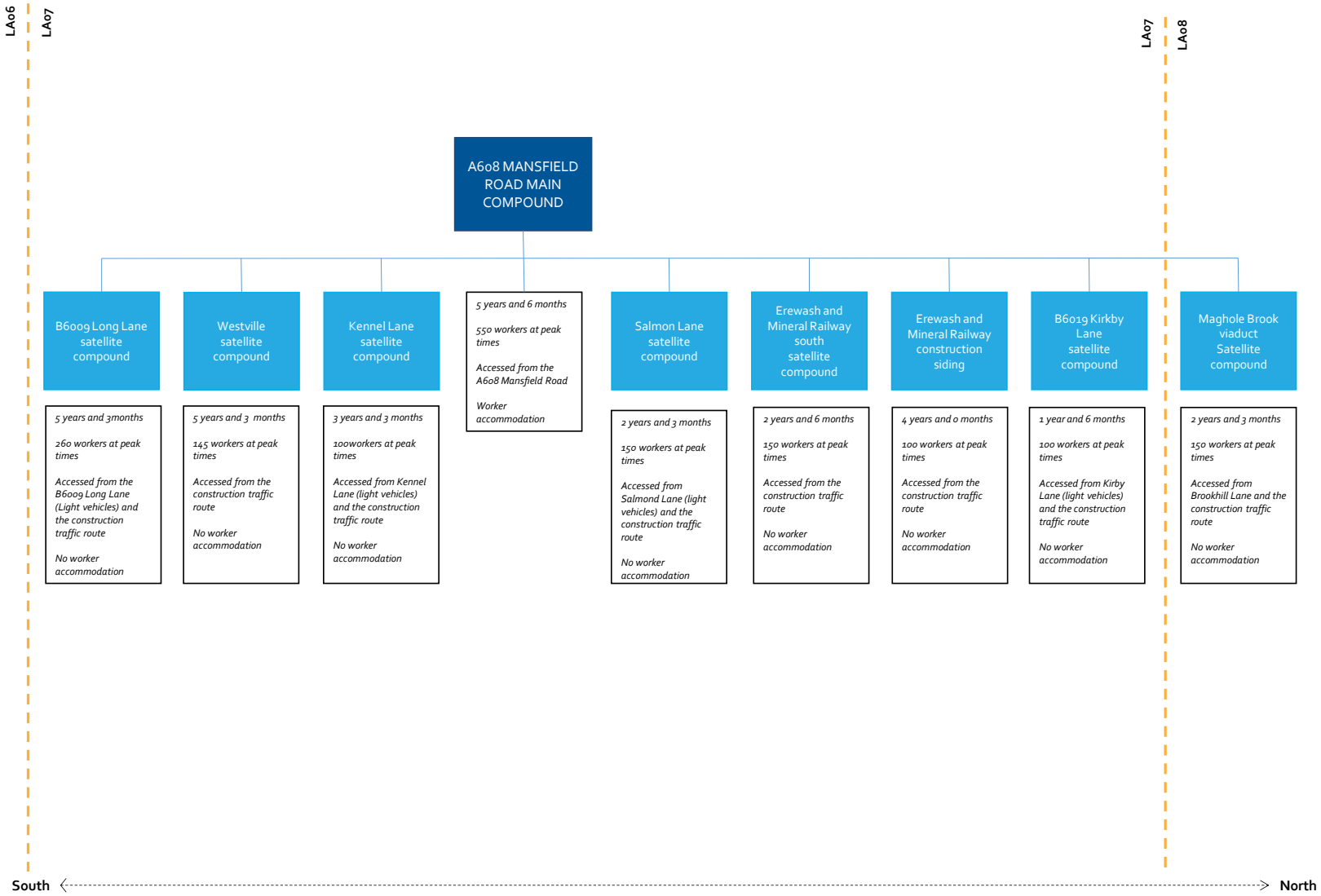
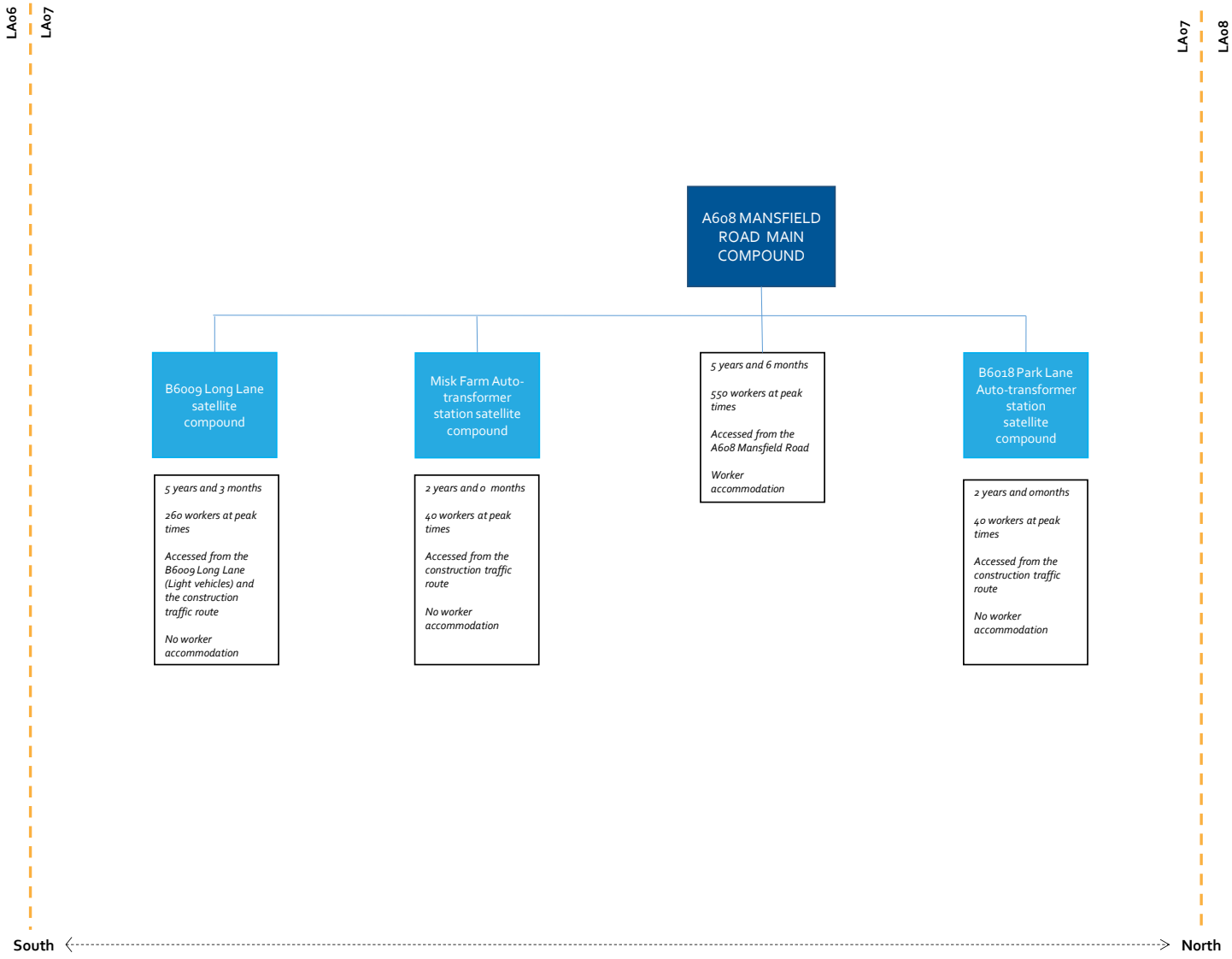


Figure 6: Construction compounds for railway systems works



B6009 Long Lane satellite compound

2.3.30 This compound (see Volume 2: LA07 Map Book, Map CT-05-441b, C4 to E5) would be used to manage civil engineering work/rail systems works in the Hucknall to Selston area, as illustrated in Figure 5, for a period of five years and three months. During this time, the satellite compound would also be used to support railway systems installation works for the same period of five years and three months, as illustrated in and Figure 6.

2.3.31 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the B6009 Long Lane satellite compound

Description	Location	Feature resulting in the demolition
Other		
Industrial hoppers	Eelwood Road, Hucknall	Westville embankment

2.3.32 The compound would be used to manage the construction of the B6009 Long Lane underbridge, which would take one year to complete.

2.3.33 The compound would be used to manage the construction of the Westville embankment, which would take three years to complete. Material for the Westville embankment would be received from cuttings elsewhere along the Proposed Scheme.

2.3.34 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would occupy land immediately west of, and adjacent to the compound area, and would be accessed from the B6009 Long Lane using the site haul routes (Volume 2: LA07 Map Book, map CT-05-441b, C3 to E5).The transfer node would be operational from 2025 for approximately five years and three months.

2.3.35 During construction of the B6009 Long Lane underbridge, temporary measures including traffic management and intermittent passing places would be implemented along the B6009 Long Lane. This could include a number of weekend closures and temporary overnight road closures during the construction of the overbridge.

2.3.36 The works to be managed from this compound would require the following works to PRoW:

- temporary diversion of the Greasley Bridleway 15, which forms part of the Robin Hood Way, for a period of one year, with users diverted to the north during construction of Westville embankment until completion of B6009 Long Lane underbridge. On completion of construction, Greasley Bridleway 15 would be permanently diverted for 430m to the east of its existing alignment to connect with the realigned B6009 Long Lane and cross the route of the Proposed Scheme via the B6009 Long Lane underbridge;
- permanent diversion of the Greasley Bridleway 19 to the west of its existing alignment for 550m to avoid the Westville embankment. During construction,

alternatives routes would be provided for a period of one year;

- permanent closure of Greasley Footpath 22. Users would be diverted to the west of its existing alignment for 1.4km, to connect with the Greasley Bridleway 19, crossing under the route of the Proposed Scheme via the B6009 Long Lane underbridge; and
- temporary diversion of the Greasley Footpath 20 for a period of one year, during construction of Westville embankment until completion of the Watnall Coppice underbridge, with users diverted to the east of the Proposed Scheme to connect with Greasley Bridleway 21, which forms part of the Broxtowe Country Trail. On completion of construction, Greasley Footpath 20 would be permanently diverted for 700m to the north of its existing alignment to connect with Greasley Bridleway 21 and cross the route of the Proposed Scheme via the Watnall Coppice underbridge.

2.3.37 The works to be managed from this compound would require the following works to watercourses:

- Bulwell Wood culvert to convey surface water under the route of the Proposed Scheme, which would take nine months to complete; and
- B6009 Long Lane culvert to convey surface water under the route of the Proposed Scheme, which would take nine months to complete.

2.3.38 Key railway systems works to be managed from this compound would include track installation.

2.3.39 There would also be utilities works managed from this compound.

Westville satellite compound

2.3.40 This compound (see Volume 2: LA07 Map Book, map CT-05-442, H8 to I8) would be used to manage civil engineering work in the Hucknall to Selston area for a period of five years and three months, as illustrated in Figure 5.

2.3.41 No demolitions would be required as a result of the works to be managed from this compound.

2.3.42 The compound would be used to manage the construction of the following bridges and viaducts:

- Watnall Coppice underbridge, which would take one year to complete;
- Misk Farm underbridge, which would take one year to complete; and
- Hucknall FP35 overbridge, which would take nine months to complete.

2.3.43 The compound would be used to manage the construction of the Misk Hill and Park Forest cutting, which would take three years and six months to complete. Material from the Misk Hill and Park Forest cutting would be used as engineering material in neighbouring areas and locally where possible.

2.3.44 The works to be managed from this compound would require the following works to public roads:

- permanent realignment of the Coppice Farm accommodation track 300m to the south of its existing alignment which would take one year to complete. Temporary traffic control would be required to tie in the existing track alignment over a period of two weeks; and
- permanent realignment of the Misk Farm accommodation track which would take one year to complete. Temporary traffic control would be required to tie in the existing track alignment over a period of two weeks.

2.3.45 The works to be managed from this compound would require the following works to PRoW:

- temporary diversion of Greasley Bridleway 21 for a period of one year during construction of Westville embankment and Watnall Coppice underbridge, with users diverted to the south to join temporary diversion of Hucknall FP20. On completion of construction, Greasley Bridleway 21 would be permanent realigned 150m to the north of its existing alignment to connect with the Watnall Coppice underbridge;
- temporary diversion of Greasley Footpath 20 for a period of one year , with users diverted to the east to join Greasley Bridleway 21. On completion of construction, Greasley Footpath 20 would be permanent realigned 700m to the north of its existing alignment to connect with the Watnall Coppice underbridge; and
- temporary diversion of the Hucknall Footpath 35 for a period of two years during the construction of Misk Hill and Park Forest cutting and Hucknall FP35 overbridge, with users diverted to the north, around the land required for the Proposed Scheme. On completion of construction, Hucknall Footpath 35 would be permanently realigned 310m to the north of its existing alignment to align with the Hucknall FP35 overbridge.

2.3.46 The works to be managed from this compound would require the following works to water courses:

- Westville embankment south culvert to convey surface water under the route of the Proposed Scheme, which would take nine months to complete; and
- Westville embankment culvert to convey surface water under the route of the Proposed Scheme, which would take nine months to complete.

2.3.47 There would also be utilities works managed from this compound.

Misk Farm auto-transformer station satellite compound

2.3.48 This compound (see Volume 2: LA07 Map Book, Map CT-05-443, C6) would be used to manage railway systems works for a period of two years in the Hucknall to Selston area, as illustrated in Figure 6.

2.3.49 No demolitions would be required as a result of the works to be managed from this compound.

2.3.50 Key railway systems works to be managed from this compound would include construction and installation of the Misk Farm auto-transformer station, located 300m north-east of Misk Farm. The construction of the Misk Farm auto-transformer station would take one year and six months to complete. The installation of the Misk Farm auto-transformer station railway systems equipment would take one year to complete. Construction works for the Misk Farm auto-transformer station would be accessed via Whyburn Lane.

Kennel Lane satellite compound

2.3.51 This compound (see Volume 2: LA07 Map Book, Map CT-05-443, I6) would be used to manage civil engineering works in the Hucknall to Selston area for a period of three years and three months, as illustrated in Figure 5.

2.3.52 No demolitions would be required as a result of the works to be managed from this compound.

2.3.53 The compound would be used to manage the construction of the Kennel Lane overbridge, which would take one year and three months to complete.

2.3.54 The compound would be used to manage the construction of the following earthworks:

- Park Forest embankment, which would take one year and three months to complete;
- The Dumbles cutting, which would take three years and three months to complete; and
- Audrey Wood south embankment, which would take nine months to complete.

2.3.55 The works to be managed from this compound would require the permanent realignment of Kennel Lane for 240m to accommodate the offline[16] construction of the Kennel Lane overbridge to form a square crossing over the Proposed Scheme. Temporary traffic control would be required to tie in the existing highway alignment.

2.3.56 The works to be managed from this compound would require the temporary diversion of the Annesley Footpath 2, coincident with Kennel Lane, for a period of one year, with users diverted to the west during the construction of the Kennel Lane overbridge. On completion of construction, Annesley footpath 2 would be permanently diverted for 100m to the south of its existing alignment to connect with the Kennel Lane overbridge.

2.3.57 The works to be managed from this compound would require the following works to watercourses:

[16] Offline works are works which are generally constructed along or nearby existing routes, which will remain open during construction.

- Misk Hill and Park Forest cutting culvert to convey surface water under the route of the Proposed Scheme, which would take six months to construct; and
- Park Forest embankment culvert to convey surface water under the route of the Proposed Scheme, which would take nine months to construct.

2.3.58 There would also be utilities works managed from this compound.

A608 Mansfield Road main compound

2.3.59 This compound (see Volume 2: LA07 Map Book, Map CT-05-444, G7 to I9) would be used for a period of five years and six months to manage both, civil engineering and railway systems works and provide main compound support to eight satellite compounds, seven in the Hucknall to Selston area and one in the Pinxton to Newton and Huthwaite area (LA08), as illustrated in Figure 5 and Figure 6.

2.3.60 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 2.

Table 2: Demolitions to be managed from the A608 Mansfield Road main compound

Description	Location	Feature resulting in the demolition
Other		
Telecommunications mast	A608 Mansfield Road, Annesley	A608 Mansfield Road cutting

2.3.61 The compound would be used to manage the construction of the following bridges and viaducts:

- Audrey Wood viaduct, which would take two years to complete; and
- A608 Mansfield Road overbridges, which would take three years and six months to complete.

2.3.62 The compound would be used to manage the construction of the following earthworks:

- Audrey Wood north embankment, which would take two years and three months to complete;
- A608 Mansfield Road cutting, which would take three years and six months to complete; and
- a series of shallow cuttings and low embankments, 568m in length comprising, all less than 2m deep or high, which would take one year and three months to complete.

2.3.63 A pre-cast yard and pre-cast laydown area to manufacture and store concrete elements, such as viaduct beams, and facilitate the construction of the Audrey Wood viaduct, would be located at this compound for a period of three years and six months, accessed from the A608 Mansfield Road.

2.3.64 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from public

roads. The transfer node would be accessed from the A608 Mansfield Road, using the via site haul route (Volume 2: LA07 Map Book, Map CT-05-444, F7 to G9). The transfer node would be operational from 2025 for approximately three years and nine months.

2.3.65 The works to be managed from this compound would require the permanent realignment of the eastern side of the junction 27 of M1/A608 Mansfield Road roundabout for 450m including the realignment of the southbound on and off ramps to accommodate the construction for the A608 Mansfield Road overbridges. Construction of A608 Mansfield Road overbridges will require a number of temporary realignments during construction which would take three years and six months to complete.

2.3.66 The works to be managed from this compound would require the following works to PRoW:

- temporary diversion of Annesley Bridleway 1, coincident with Weaver's Lane, for a period of one month during the construction of the Audrey Wood viaduct, with users diverted 100m to the south between two of the viaduct piers on either of the adjacent spans. On completion of construction, Annesley Bridleway 11 would be reinstated to its existing alignment; and
- temporary diversion of Annesley Footpath 8 for a period of 3 months, with users diverted to the north. On completion of construction, Annesley footpath 8 would be permanently diverted 1.1 Km to the east to connect with Salmon Lane.

2.3.67 There would also be utilities works managed from this compound.

Salmon Lane satellite compound

2.3.68 This compound (see Volume 2: LA07 Map Book, map CT-05-445, H7 to J7) would be used to manage civil engineering works in the Hucknall to Selston area for a period of two years and three months, as illustrated in Figure 5.

2.3.69 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 3.

Table 3: Demolitions to be managed from the Salmon Lane satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Two Dales Farm, Salmon Lane, Kirkby-in-Ashfield	Salmon Lane embankment
Six residential properties and outbuildings on Annesley Lane	Annesley Lane, Selston	Salmon Lane embankment
Residential property and outbuildings	Sulva Bay, Salmon Lane, Kirkby-In-Ashfield	Salmon Lane embankment
Residential property	Boggs Farm, Salmon Lane, Kirkby-in-Ashfield	Salmon Lane embankment

Commercial		
Commercial business at Boggs Farm	Salmon Lane, Kirkby-In-Ashfield	Salmon Lane overbridge
Commercial business at Two Dales Farm	Salmon Lane, Kirkby-In-Ashfield	Salmon Lane overbridge
Other		
Tanks	Salmon Lane, Annesley Woodhouse,	Salmon Lane embankment
Compressor station	Salmon Lane, Kirkby-In-Ashfield	Salmon Lane embankment

2.3.70 The compound would be used to manage the construction of the following bridges and viaducts:

- Salmon Lane HS2 overbridge, which would take one year and nine months to construct; and
- Salmon Lane M1 overbridge, which would take one year and nine months to construct.

2.3.71 The compound would be used to manage the construction of the following earthworks Salmon Lane embankment, which would take two years to complete.

2.3.72 The works to public roads to be managed from this compound would require the permanent realignment of the Salmon Lane for 750m to accommodate the offline construction of the Salmon Lane M1 overbridge and Salmon Lane HS2 overbridge. In order to construct the M1 overbridge the outside lanes of the M1 would be temporarily closed for eight months to construct the central overbridge pier. The northbound carriageway would be restricted from four to three lanes and the southbound carriageway would be diverted onto the hard shoulder to maintain four lanes. Upon completion of the offline overbridge structures Salmon Lane would be temporarily closed for a period of ten weeks to construct the approach embankments and tie into the existing highways alignment.

2.3.73 The works to be managed from this compound would require the following works to PRoW:

- temporary local diversion of the Annesley Footpath 8 or a period of 3 months, with users diverted to the west at A608 Mansfield Road for relocation of lay-by and upgrade of maintenance track. On completion of construction, Annesley footpath 8 would be permanently diverted 1.1 Km to the east to connect with Salmon Lane;
- maintenance of Annesley Footpath 8 alignment for a period of 1 year and 6 months until completion of Salmon Lane overbridge. On completion of construction, Annesley Footpath 8 would be permanently diverted 1.1 Km to the east to connect with Salmon Lane; and
- temporary local diversion of the Annesley Footpath 8 or a period of three months, with users diverted to the west for construction of accommodation track diversion to Salmon Lane. On completion of construction, Annesley Footpath 8 would be permanently diverted 1.1 Km to the east to connect with Salmon Lane.

2.3.74 There would also be utilities works managed from this compound.

B6018 Park Lane auto-transformer station satellite compound

2.3.75 This compound (see Volume 2: LA07 Map Book, map CT-05-446, F5 to G7) would be used to manage railway systems works in the Hucknall to Selston area for a period of two years, as illustrated in Figure 6.

2.3.76 Key railway systems works to be managed from this compound would include construction and installation of the B6018 Park Lane auto-transformer station, located 200m south of B6018 Park Lane. The construction of the B6018 Park Lane auto-transformer station foundations and buildings would take one year and six months to complete. Construction works for the B6018 Park Lane auto-transformer station would be accessed via the site haul route.

Erewash and Mineral Railway south satellite compound

2.3.77 This compound (see Volume 2: LA07 Map Book, map CT-05-47a, A4 to B5) would be used to manage civil engineering works in the Hucknall to Selston area for a period of two years and six months, as illustrated in Figure 5.

2.3.78 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 4.

Table 4: Demolitions to be managed from the Erewash and Mineral Railway satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property and farm buildings	Leedale, Salmon Lane, Kirkby-in-Ashfield	Annesley Lane cutting

2.3.79 The compound would be used to manage the construction of the following bridges and viaducts:

- B6018 Park Lane overbridge which would take one year and six months to construct; and
- Erewash and Mineral Railway viaduct which would take one year and nine months to complete.

2.3.80 The compound would be used to manage the construction of the following earthworks:

- Annesley Lane cutting, which would take one year and six months to complete. Material from the Annesley Lane cutting would be used as engineering material in neighbouring areas and locally where possible;
- Annesley Lane End embankment, which would take one year and six months to complete. Material for the Annesley Lane End embankment would be received from cuttings elsewhere along the Proposed Scheme;
- Butler Wood cutting, which would take one year and six months to complete. Material from the Butler Wood cutting would be used as engineering material

in neighbouring areas and locally where possible;

- Kirkby Park embankment, which would take one year and six months to complete. Material for the Kirkby Park embankment would be received from cuttings elsewhere along the Proposed Scheme;
- B6018 Park Lane cutting, which would take two years to complete. Material from the B6018 Park Lane cutting would be used as engineering material in neighbouring areas and locally where possible; and
- River Erewash south embankment, which would take one year and nine months to complete. Material for the River Erewash south embankment would be received from cuttings elsewhere along the Proposed Scheme.

2.3.81 A pre-cast yard and pre-cast laydown area to manufacture and store concrete elements, such as viaduct beams, and facilitate the construction of the Erewash and Mineral Railway viaduct, would be located at this compound for a period of one year and nine months, accessed from the A608 Mansfield Road via the site haul route (see Volume 2: LA07 Map Book, map CT-05-447a, A4 to B5).

2.3.82 The works to the public roads to be managed from this compound would require the permanent realignment of B6018 Park Lane for 350m to accommodate the offline construction of the B6018 Park Lane overbridge. Following the offline construction of the B6018 Park Lane overbridge park lane would be temporarily closed for three months to tie the new approach embankments into the existing highway alignment.

2.3.83 The works to be managed from this compound would require the following works to PRoW:

- temporary diversion of Kirkby Footpath 20 for a period of two years, with users diverted to the west of its existing alignment for construction of the Park lane cutting and completion of the B6018 overbridge. On completion of construction, Kirkby Footpath 20 would permanently diverted 600m to the north of its existing alignment to connect with B6018 Park Lane;
- permanent realignment of Kirkby Footpath 18 at the start of construction, with users diverted for 350m to the west, around the perimeter of a field boundary to connect with its existing alignment at Sutton Junction to Pye Bridge Railway; and
- temporary diversion of Kirkby Footpath 17 for a period of one month, with users diverted to the north 150m during the construction of the Erewash and Mineral Railway viaduct .The temporary realignment would be local, between two of the viaduct piers on either of the adjacent spans.

2.3.84 The works to be managed from this compound would require the following works to watercourses:

- Annesley Lane End culvert to convey surface water under the route of the Proposed Scheme, which would take six months to construct; and
- Kirkby Park embankment culvert to convey surface water under the route of

the Proposed Scheme, which would take nine months to construct.

2.3.85 There would also be utilities works managed from this compound.

Erewash and Mineral Railway siding

2.3.86 This compound (see Volume 2: LA07 Map Book, map CT-05-447a, D5 to E7) would be used for a period of four years to manage civil engineering works associated with the movement of excavated material of surplus cutting and deficit embankment material from neighbouring areas of the scheme. The Erewash and Mineral Railway construction siding would be connected by rail to temporary construction sidings along the route of the Proposed Scheme via the Sutton Junction to Pye Bridge Railway (and out of use spur). The Erewash and Mineral Railway construction siding would be accessed via site haul routes within.

2.3.87 The compound would be capable of receiving and dispatching trains to/from the existing railway network via purpose built sidings adjacent to the Sutton Junction to Pye Bridge Railway (an out of use spur). Deliveries into the temporary construction siding would be undertaken during day and night-time hours and at weekends, though unloading would be undertaken during standard working hours, where reasonably practicable.

B6019 Kirkby Lane satellite compound

2.3.88 This compound (see Volume 2: LA07 Map Book, map CT-05-447a, F5 to G6) would be used to manage civil engineering works in the Hucknall to Selston area for a period of one year and six months, as illustrated in Figure 5.

2.3.89 No demolitions would be required as a result of the works to be managed from this compound.

2.3.90 The compound would be used to manage the construction of the B6019 Kirkby Lane underbridge, which would take one year to complete.

2.3.91 The compound would be used to manage the construction of the following earthworks:

- River Erewash north embankment, which would take two years to complete;
- B6019 Kirkby Lane cutting, which would take one year and nine months to complete; and
- B6019 Kirkby Lane and Maghole Brook embankment, which would take three years and three months to complete.

2.3.92 The works to public roads to be managed from this compound would require temporary traffic management on the B6019 Kirkby Lane during the construction of the on line B6019 Kirkby Lane overbridge, which would take one year. A temporary weekend closure and a number of overnight closures would be required to construct the bridge deck over a period of two weeks.

2.3.93 There would also be utilities works managed from this compound.

Construction waste and material resources

2.3.94 Excavated material generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable, either with or without treatment.

2.3.95 Forecasts of the amount of construction, demolition and excavation waste (CDEW) that would be produced during construction of the Proposed Scheme are reported in Volume 3: Route-wide effects.

2.3.96 Local excess or shortfall of excavated material within the Hucknall to Selston area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

Commissioning of the railway

2.3.97 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It would be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

Construction programme

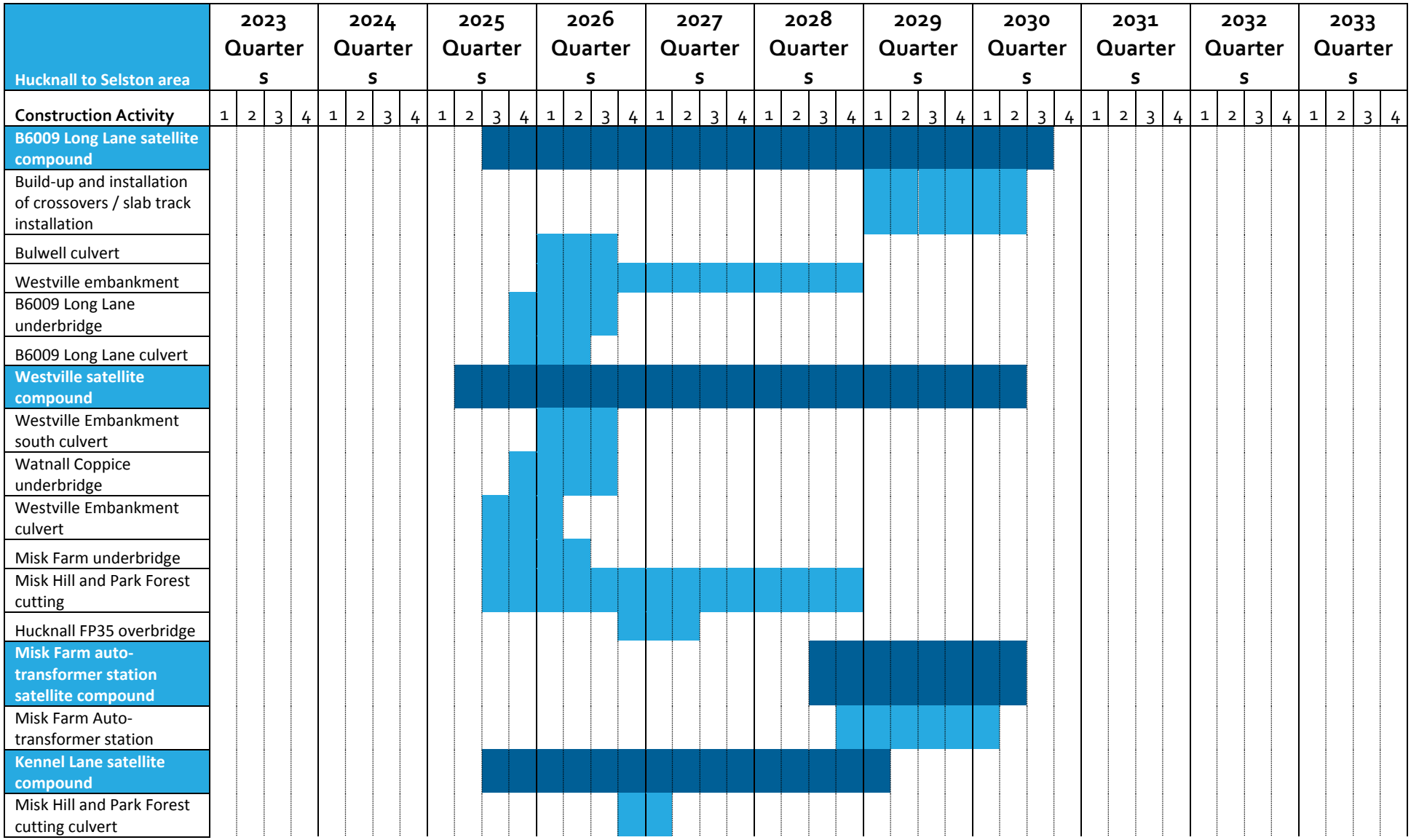
2.3.98 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7 Construction durations referred to in the following sections of this report are based on this indicative programme.

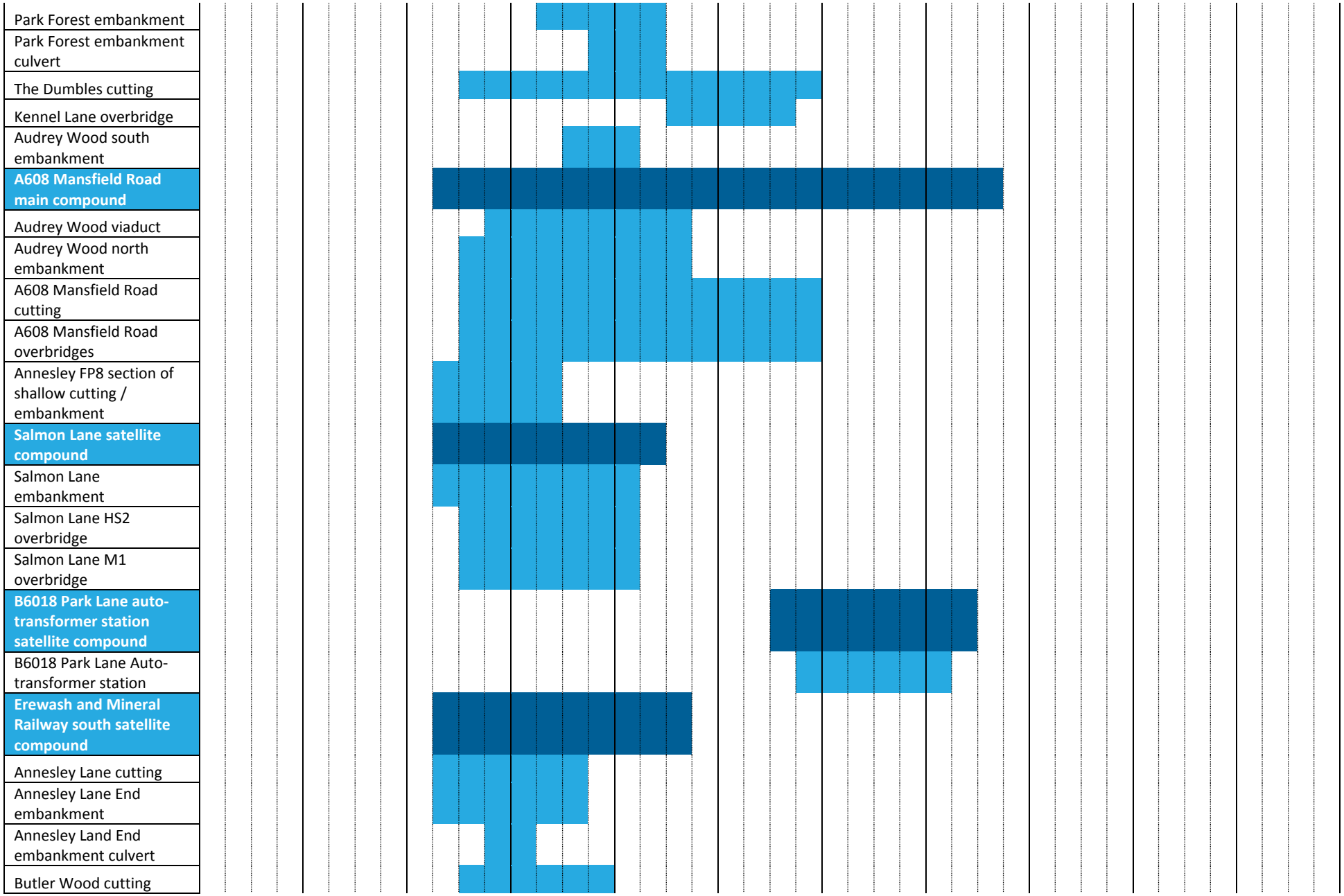
Monitoring during construction

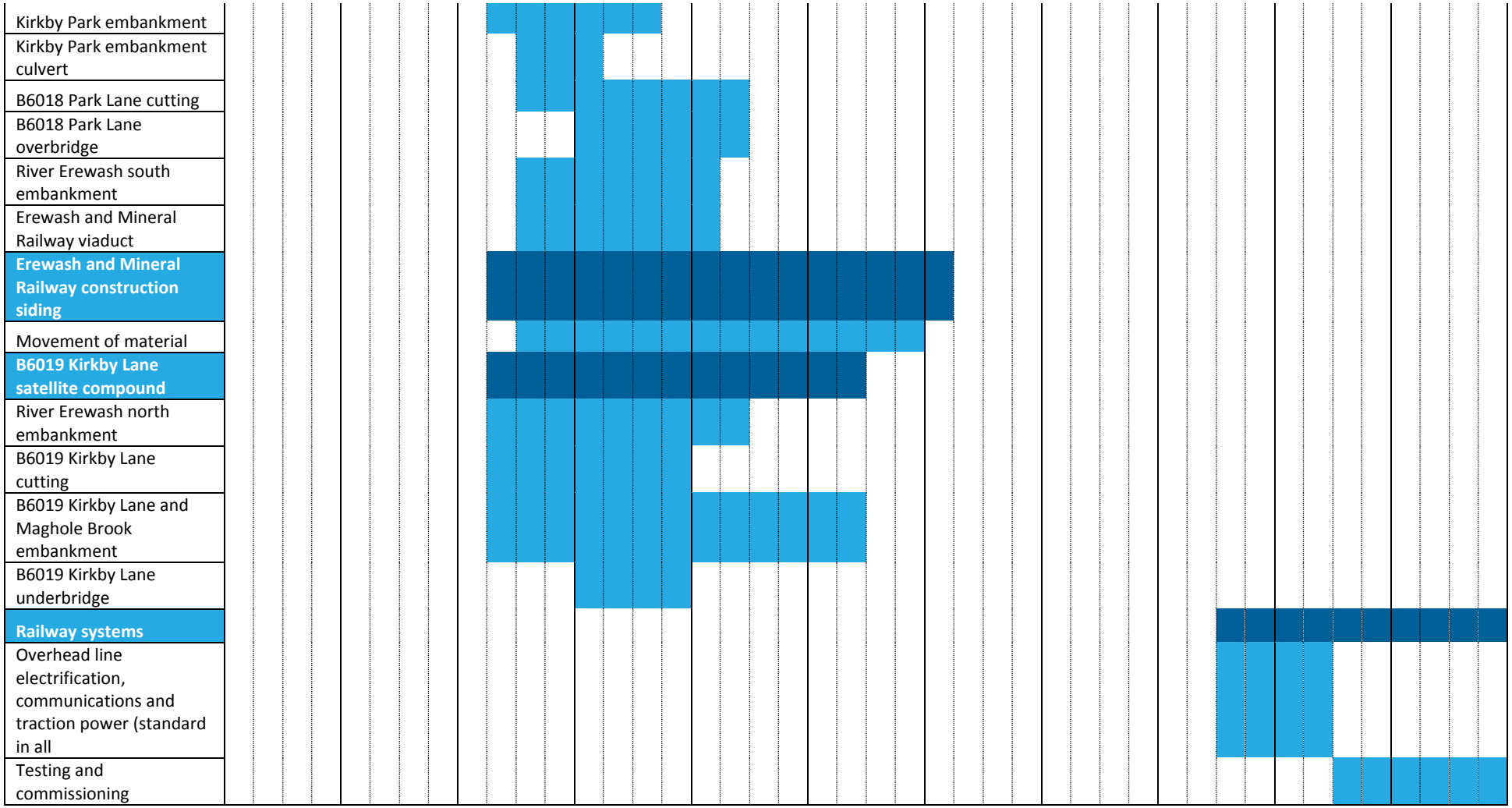
2.3.99 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated undertaker and remedial action identified.

2.3.100 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on the monitoring procedures to be implemented prior to construction commencement.

Figure 7: Indicative construction programme between 2023 and 2033




Park Forest embankment
Park Forest embankment culvert
The Dumbles cutting
Kennel Lane overbridge
Audrey Wood south embankment
A608 Mansfield Road main compound
Audrey Wood viaduct
Audrey Wood north embankment
A608 Mansfield Road cutting
A608 Mansfield Road overbridges
Annesley FP8 section of shallow cutting / embankment
Salmon Lane satellite compound
Salmon Lane embankment
Salmon Lane HS2 overbridge
Salmon Lane M1 overbridge
B6018 Park Lane auto-transformer station satellite compound
B6018 Park Lane Auto-transformer station
Erewash and Mineral Railway south satellite compound
Annesley Lane cutting
Annesley Lane End embankment
Annesley Land End embankment culvert
Butler Wood cutting


Kirkby Park embankment
Kirkby Park embankment culvert
B6018 Park Lane cutting
B6018 Park Lane overbridge
River Erewash south embankment
Erewash and Mineral Railway viaduct
Erewash and Mineral Railway construction siding
Movement of material
B6019 Kirkby Lane satellite compound
River Erewash north embankment
B6019 Kirkby Lane cutting
B6019 Kirkby Lane and Maghole Brook embankment
B6019 Kirkby Lane underbridge
Railway systems
Overhead line electrification, communications and traction power (standard in all
Testing and commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Hucknall to Selston area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to 11 trains per hour each way passing through the Hucknall to Selston area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

2.4.3 In this area, trains would run at speeds of up to 225mph (360kph). The trains would be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.

2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.

2.4.6 Provision for railway maintenance vehicles along the eastern leg of the route of the Proposed Scheme would be made at the Staveley depot in the Staveley to Aston area (LA11). Further information on the Staveley depot can be found in Volume 2: Community area LA11, Staveley to Aston area.

Operational waste and material resources

2.4.7 The assessment of the likely significant environmental effects associated with the disposal of operational waste will be undertaken for the Proposed Scheme as a whole and reported in Volume 3: Route-wide effects of the formal ES.

2.4.8 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects will also be reported in the formal ES.

Monitoring during operation

2.4.9 The nominated undertaker would be responsible for monitoring during operation of the Proposed Scheme. Proposed indicative area-specific monitoring measures for each environmental topic area are presented in Sections 4 to 15 of this report based on the current level of assessment.

2.4.10 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented during operation prior to construction commencement.

2.5 Route section alternatives

Audrey Wood

2.5.1 During the design development process since the announcement of the preferred route in July 2017, further consideration has been given to the route where it would pass through a deep valley containing tributary 2 of the Beauvale Brook and over an area of woodland known as The Dumbles, which is adjacent to the M1, and south of the A608 Mansfield Road. Alternative options for crossing the valley in this location have been considered and opportunities to reduce impacts on the surrounding area and maintain the historic alignment of Weavers Lane have been considered.

2.5.2 The following seven options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option 0: the route would pass on an embankment (known as the Audrey Wood embankment) that would be 850m long and up to 26m high. On the west side, a 180m long retaining wall up to 15m high would be required to prevent the embankment encroaching onto the M1. This option would require an underbridge for the realignment of Weavers Lane and a culvert for tributary 2 of Beauvale Brook;
- Option A: the route would pass on a 220m long viaduct (known as the Audrey Wood viaduct) with 15m high full height abutments[17], with diversion and underbridge for the realignment of Weavers Lane;
- Option B: the route would pass on a 450m long viaduct (known as the Audrey Wood viaduct) with 10m high full height abutments;
- Option C: the route would pass on a 630m long viaduct (known as the Audrey Wood viaduct) with 6m high full height abutments;
- Option D: the route would pass on a 450m long viaduct (known as the Audrey Wood viaduct) with bank seat abutments[18];
- Option E: the route would pass on a 515m long viaduct (known as the Audrey Wood viaduct) with a 15m high abutment at the southern end and a 6m high abutment at the northern end; and
- Option F: the route would pass on a 420m long viaduct (known as the Audrey Wood viaduct) with a 15m high abutment at the southern end and a 10m high abutment at the northern end.

2.5.3 Table 5 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

[17] A full height abutment is a structural element providing transition from an embankment to a structure which additionally forms a vertical wall retaining the approach embankment from track level to existing ground. Taller abutments allow approach embankments to be extended further thus reducing the overall length of a bridge or viaduct.
[18] A structural element providing transition from an embankment to a structure. A bank seat is positioned at the top of the approach embankment which slopes down towards the centre of the bridge or viaduct.

Table 5: Consideration of local alternatives for route of the Proposed Scheme through Audrey Wood

Option	Outcome of analysis	Further action/considerations
Option 0	Greater loss of agricultural land and area of deciduous woodland, designated as priority habitat compared to the Proposed Scheme. Greater impacts on the setting of the Grade II* Annesley Hall Registered Park and Garden and the realignment of the historic route of Weavers Lane, compared to the Proposed Scheme. Greater impacts on landscape compared to the Proposed Scheme due to the increase land requirements and woodland lost. Greater hydrological impacts and flood risk compared to the Proposed Scheme due to culverting of the tributary 2 of Beauvale Brook and infilling of a fishpond. The presence of the embankment would interrupt ecological connectivity within Audrey Wood II Local Wildlife Site, along tributary 2 of Beauvale Brook and within Audrey Wood, compared to the Proposed Scheme, which would allow connectivity to be maintained underneath the viaduct. Greater land requirement compared to the Proposed Scheme due to the greater width of the embankment compared to the viaduct structure. Greater quantities of materials compared to the Proposed Scheme, and as such, would have greater adverse impacts on local air quality, traffic, noise during construction. Lower operational noise levels compared to the Proposed Scheme, with a reduction in noise levels along embankments. Shorter construction period compared to the Proposed Scheme. Construction of an embankment up to 26m high would be more complex and would require ground stabilisation due to the gradient of the valley slopes, which would create more stress on the culvert. Would require a 180m long retaining wall along the western side of the embankment to prevent encroachment onto the M1. Lowest health and safety risk compared to alternatives considered, as no working at height. Higher cost compared to the Proposed Scheme.	This option will not be subject to further consideration.
Option A	Greater impact on agricultural land compared to the Proposed Scheme, with a greater area of agricultural land required for the approach embankments. Greater impacts on the historic environment compared to the Proposed Scheme due to the realignment of Weavers Lane, which provides a historical routeway into the Grade II* Annesley Hall Registered Park and Garden. Slightly greater landscape impacts compared to the Proposed Scheme, with a shorter viaduct resulting in greater woodland loss. Similar hydrological impacts to the Proposed Scheme, with no requirement to construct a culvert on tributary 2 of Beauvale Brook or infill the fishpond.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Slightly greater ecological impacts compared to the Proposed Scheme due to a slight increase in woodland lost. However, this option would still allow ecological connectivity to be maintained within Audrey Wood II Local Wildlife Site and along tributary 2 of Beauvale Brook underneath the viaduct. Similar noise impacts compared to the Proposed Scheme. Greater land requirement compared to the Proposed Scheme, with a shorter structure requiring longer approach embankments. Requires the import of larger quantities of material compared to the Proposed Scheme, and as such, would have greater adverse impacts on local air quality, traffic and noise during construction. Shorter construction period compared to the Proposed Scheme. Similar technical, engineering complexities and similar health and safety risks during construction when compared to the Proposed Scheme. Lower cost compared to the Proposed Scheme.	
Option B	Similar impact on agricultural land compared to the Proposed Scheme, with the approach embankments resulting in a similar loss of agricultural land. Similar impacts on historic environment as the Proposed Scheme, with no requirement to alter the historic alignment of Weavers Lane, which is a historic routeway into the Annesley Hall Grade II* Registered Park and Garden. Similar landscape impacts compared to the Proposed Scheme, with the two viaducts resulting in a similar amount of woodland loss. Similar hydrological impacts as the Proposed Scheme, with no requirement to construct the culvert on tributary 2 of Beauvale Brook or infill the fishpond. Similar ecological impacts to the Proposed Scheme as it would result in a similar amount of woodland loss and would allow ecological connectivity to be maintained within Audrey Wood II Local Wildlife Site and along tributary 2 of Beauvale Brook, underneath the viaduct. Similar noise impacts compared to the Proposed Scheme. Similar land requirement compared to the Proposed Scheme, with a similar sized structure having a similar length of approach embankments. Similar volume of material required for approach embankments compared to the Proposed Scheme. Slight increase in construction period compared to the Proposed Scheme, increasing the duration of temporary impacts during construction. Similar technical and engineering complexities and similar health and safety risks during construction to the Proposed Scheme. Same costs as the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
Option C	Less impact on agricultural land compared to the Proposed Scheme, with the longer viaduct reducing the length of approach embankments on agricultural land. Similar impacts on historic environment as the Proposed Scheme, with no requirement to alter the historic alignment of Weavers Lane, which is a historic routeway into the Annesley Hall Grade II* Registered Park and Garden. Slightly lower landscape impacts compared to the Proposed Scheme, with a longer viaduct reducing the amount of woodland loss. Similar hydrological impacts as the Proposed Scheme, with no requirement to construct a culvert on tributary 2 of Beauvale Brook or infill the fishpond. Similar ecological impacts as the Proposed Scheme as it would allow ecological connectivity to be maintained within Audrey Wood II Local Wildlife Site and along tributary 2 of Beauvale Brook, underneath the viaduct. Similar noise impacts to the Proposed Scheme. Slightly less land required compared to the Proposed Scheme, with a longer structure having a reduced length of approach embankments. Smaller volume of material required for approach embankments compared to the Proposed Scheme. Greatest reductions in permanent land required for the viaduct structure compared to the Proposed Scheme. Longest construction period compared to all other alternative options, increasing the duration of temporary impacts during construction. Similar technical and engineering complexities and similar health and safety risks during construction to the Proposed Scheme. Higher costs compared to all other alternative options.	This option will not be subject to further consideration.
Option D	Similar impact on agricultural land compared to the Proposed Scheme with the approach embankments resulting in a similar loss of agricultural land. Similar impacts on historic environment as the Proposed Scheme, with no requirement to alter the historic alignment of Weavers Lane, which is a historic routeway into the Annesley Hall Grade II* Registered Park and Garden. Lower visual impacts compared with the Proposed Scheme due to bank seat, which would provide more screening of the abutments. Similar hydrological impacts to the Proposed Scheme, with no requirement to construct a culvert on tributary 2 of Beauvale Brook or infill the fishpond. Similar woodland loss compared to the Proposed Scheme and ecological connectivity would be maintained within Audrey Wood II Local Wildlife Site and along tributary 2 of Beauvale Brook underneath the viaduct. Similar noise impacts to the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Similar land requirement compared to the Proposed Scheme, with a similar sized structure having a similar length of approach embankments. Requires the import of slightly larger quantities of material compared to the Proposed Scheme, and as such, would have greater adverse impacts on local air quality, traffic and noise during construction. Slightly longer construction period compared to the Proposed Scheme, increasing the duration of temporary impacts during construction. Similar technical and engineering complexities and similar health and safety risks during construction to the Proposed Scheme. Slightly higher costs compared to the Proposed Scheme.	
Option E	Less impact on agricultural land compared to the Proposed Scheme, with the longer viaduct reducing the length of approach embankments on agricultural land. Similar impacts on historic environment as the Proposed Scheme, with no requirement to alter the historic alignment of Weavers Lane, which is a historic routeway into the Annesley Hall Grade II* Registered Park and Garden. Slightly lower landscape impacts compared to the Proposed Scheme, with a longer viaduct reducing the amount of woodland loss. Similar hydrological impacts as the Proposed Scheme, with no requirement to construct a culvert on tributary 2 of Beauvale Brook or infill the fishpond. Similar ecological impacts as the Proposed Scheme as it would allow ecological connectivity to be maintained within Audrey Wood II Local Wildlife Site and along tributary 2 of Beauvale Brook, underneath the viaduct. Similar sound, noise and vibration impacts to the Proposed Scheme. Smaller volume of material required for approach embankments, compared to the Proposed Scheme. Longer construction period compared to the Proposed Scheme, increasing the duration of temporary impacts during construction. Similar technical and engineering complexities and similar health and safety risks during construction to the Proposed Scheme. Higher costs compared to the Proposed Scheme.	This option will not be subject to further consideration.
Option F (the Proposed Scheme)	Less impacts on agricultural land compared to Options 0 and A and similar impacts to Options B and D. The Proposed Scheme would have greater impacts on agricultural land compared to Options C and E. Lower impacts on historic environment compared to Option 0 and A, as there would be no requirement to alter the historic alignment of Weavers Lane, which is a historic routeway into the Annesley Hall Grade II* Registered Park and Garden. Similar impacts to Options B, C, D and E. Greater visual permeability and less visually intrusive within the landscape compared to Option 0. Greater landscape impacts compared to Option 0 and A due to increased woodland loss, but reduced	This is the selected option taken forward into the Proposed Scheme.

Option	Outcome of analysis	Further action/considerations
	woodland loss compared to Option C and E. However, similar landscape impacts to Options B and D. Less hydrological impacts on tributary 2 of Beauvale Brook compared to Option 0, however, similar impacts to Options A, B, C, D and E. Less ecological impacts compared to Option 0 as the viaduct would allow ecological connectivity to be maintained underneath the structure. Similar impact on ecological connectively within Audrey Wood II Local Wildlife Site and along tributary 2 of Beauvale Brook as Options A, B, C, D and E. There would be less woodland loss compared to Option 0 and Option A, but greater woodland loss for Options C and E. Similar woodland loss for Options B and D. Greater noise levels during operation compared to Option 0. Similar impacts as Options A, B, C, D and E. Longer construction period compared to Option 0 and Option A increasing the duration of temporary impacts during construction, however, a reduction over Options B, C, D and E. Similar technical and engineering complexities compared to Options A, B, C, D and E and a reduction in complexities compared to Option 0. Greater health and safety risk during construction compared to Option 0 due to working at height, but similar to Options A, B, C, D and E. Lower cost compared to Option 0, C, D and E, but a higher than for Option A. Same cost as for Option B.	

2.5.4 Option F was taken forward into the Proposed Scheme. This option would maintain the historic alignment of Weavers Lane, avoid the requirement to construct a culvert on tributary 2 of Beauvale Brook, require less land overall and smaller loss of deciduous woodland priority habitat, as well as maintaining ecological connectivity compared to Option 0 and Option A and would be similar to Options B, C, D and E.

2.5.5 Although Option A would provide an overall cost saving and would have a shorter construction programme, it would require diversion of the existing route of Weavers Lane, which is a historical routeway into the Grade II* Annesley Hall Registered Park and Garden. Option F when compared to Options B, C, D and E was considered the most cost-effective viaduct solution to cross over Weavers Lane.

Erewash and mineral railway viaduct

2.5.6 During the design development process since the announcement of the preferred route in July 2017, further consideration has been given to the route of the Proposed Scheme where it would pass through the relatively deep Erewash Valley, through which the River Erewash and the Sutton Junction to Pye Bridge Railway (and the out of use spur) pass. There would be a viaduct crossing the valley in this location and opportunities to reduce potential adverse impacts from the crossing were considered.

2.5.7 The following four options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option 0: the route would pass on a 440m long viaduct (known as the Erewash and mineral railway viaduct), with a 14m high abutment at the southern end and a 22m high abutment at the northern end, spanning the River Erewash, the Sutton Junction to Pye Bridge Railway (and the out of use spur) and Kirkby Footpath 17. The main spans would be 42m;
- Option A: the route would pass on a 950m long and a 30m high embankment with an underbridge provided for the Sutton Junction to Pye Bridge Railway (and out of use spur) and an underbridge spanning the River Erewash and Kirkby Footpath 17;
- Option B: the route would pass on a 510m long viaduct (known as the Erewash and mineral railway viaduct) with a 14m high abutment at the southern end and a 10m high abutment at the northern end. It would span the Sutton Junction to Pye Bridge Railway (and out of use spur), the River Erewash and Kirkby Footpath 17. The main spans would be 40m long; and
- Option C: the route would pass on a 305m long viaduct (known as the Erewash and Mineral Railway viaduct) with a 20m high abutment at the southern end and a 22m high abutment at the northern end. It would span the Sutton Junction to Pye Bridge Railway (and out of use spur), the River Erewash and Kirkby Footpath 17. The span would be 40m long.

2.5.8 Table 6 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 6: Consideration of local alternatives for route of the Proposed Scheme through Erewash River and Mineral Railway

Option	Outcome of analysis	Further action/considerations
Option 0	Similar impact on two areas of priority habitat compared to the Proposed Scheme with viaduct piers located within an area of deciduous woodland habitat and semi-improved grassland. Slightly greater landscape impacts compared to Proposed Scheme, with the viaduct not centred over the valley and largest difference between abutments heights of all options. Additionally, the difference between the heights of either end of the embankment would be less noticeable than that Proposed Scheme. Similar hydrological impacts compared to the Proposed Scheme, however, greater impacts on groundwater due to a larger number of viaduct piers. Similar earthworks and traffic impacts compared to the Proposed Scheme. Greater area of land required for the viaduct structure compared to the Proposed Scheme. Similar technical and engineering complexities to the Proposed Scheme. Similar health and safety risks during construction, compared to the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Longer construction duration which would, increase the duration of temporary impacts during construction.	
Option A	Larger area lost overall from two areas of priority habitat (an area of deciduous woodland habitat and semi-improved grassland), compared to the Proposed Scheme, with the embankment requiring a larger area of land. Greater impacts on landscape due to removal of trees and loss of views for nearby receptors, including nearby residential properties, rural businesses, and users of Kirkby Footpath 17 and the M1 compared to the Proposed Scheme. Greater hydrological impacts due to an increased overall flood risk and Water Framework Directive impacts compared to the Proposed Scheme due to the culverting of the River Erewash. More earthworks and traffic movements and Kirkby Footpath 17 would need to be temporarily diverted or closed, compared to the Proposed Scheme. Greater area of land required for the embankment structure compared to the Proposed Scheme due to the width of the embankment. Slightly more complexity in design due to the need for the structure to carry the River Erewash and potential for settlement issues associated with the high embankment in a steep sided valley compared to the Proposed Scheme. Shorter construction duration compared to the Proposed Scheme, reducing the duration of temporary impacts during construction. Slightly lower health and safety risks due to the removal of working at height, compared to the Proposed Scheme. Greater costs compared to the Proposed Scheme.	This option will not be subject to further consideration.
Option B	Similar habitat loss overall from two areas of priority habitat compared to the Proposed Scheme, due to the location of viaduct piers within an area of deciduous woodland habitat and semi-improved grassland. Less visual impact to landscape topography compared to the Proposed Scheme .However, the structure would be visible to nearby receptors including nearby residential properties, rural businesses and users of Kirkby Footpath 17 m and the M1, compared to the Proposed Scheme. Similar hydrological impacts compared to the Proposed Scheme, however, greater impacts on groundwater due to a greater number of viaduct piers. Less earthworks and lower traffic impacts compared to the Proposed Scheme due to a reduction of material required for the approach embankments, which would require fewer traffic movements. Slightly less land required for the viaduct structure due to a reduction in the length of the approach embankments compared to the Proposed Scheme. Similar technical and engineering complexities to the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Longest construction period compared to the Proposed Scheme, increasing the duration of temporary impacts during construction. Similar health and safety risks during construction, compared to the Proposed Scheme. Greater cost compared to the Proposed Scheme.	
Option C (the Proposed Scheme)	Similar impacts at two areas of priority habitat; with viaduct piers located within an area of deciduous woodland habitat and semi-improved grassland compared to the Option 0 and Option B. Smaller overall area of priority habitats lost compared to Option A. Slightly lower landscape and visual impacts from nearby receptors, including residential properties, rural businesses, and users of Kirkby Footpath 17 and the M1 compared to the alternative options. The Proposed Scheme would provide a less noticeable structure, with similar abutment heights on both sides and the structure centred over the valley. Fewer potential impacts on groundwater during construction due to fewer viaduct piers and reduced long term impact to the floodplain of the River Erewash, compared to the alternative options. Greater earthworks and lower traffic impacts compared to Option 0 and Option B, however, an improvement over Option A. Less land required for the viaduct structure compared to Option A, with the viaduct having a reduced width compared to the embankment. Slightly greater land requirement compared to Option 0 and Option B, with the Proposed Scheme having longer approach embankments. Similar technical and engineering complexities to the Option 0 and Option B, and a slightly less technical and engineering complexities compared to Option A. Longer construction period compared to Option A, however, a shorter construction period compared to Option 0 and Option B. Increased health and safety risks during construction compared to Option A due to the need for working at height, but similar to Option 0 and Option B. Lower cost compared to other alternative options.	This is the selected option taken forward into the Proposed Scheme.

2.5.9 Option C was taken forward into the Proposed Scheme. Option C would require less land from the two areas of priority habitat and would maintain ecological connectivity along the Erewash Valley, and have less impacts on groundwater and flood risk, compared to the other alternatives considered. Option C would also provide a similar design to Option 0 but with reduced cost and less visual impact than the Proposed Scheme.

3 Stakeholder engagement and consultation

3.1 Introduction

3.1.1 HS2 Ltd's approach to stakeholder engagement and consultation on the Proposed Scheme is set out in Volume 1, Section 3.

3.1.2 Since the initial preferred route announcement in November 2016, HS2 Ltd has carried out a programme of informal stakeholder engagement and formal consultation with a broad range of stakeholders.

3.1.3 A variety of mechanisms have been used to enable an open and inclusive approach to engagement and consultation, reflecting the differing requirements and expectations of stakeholders.

3.1.4 While stakeholders have informed the design and assessment of the Proposed Scheme to-date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft ES and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal ES. There will be further consultation undertaken on the formal ES by Parliament following deposit of the hybrid Bill.

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016, is provided in Table 7.

Table 7: Mechanisms and timeline of stakeholder engagement since route announcement

Engagement and consultation activity and mechanisms	Date
Phase 2b initial preferred route announcement	15 November 2016
Phase 2b route refinement and property consultations	15 November 2016 – 9 March 2017
Phase 2b information events to support the route refinement and property consultations	January -February 2017
Confirmation of Phase 2b route announcement	17 July 2017
Start date of engagement with local communities and stakeholders on the confirmed Phase 2b route	July 2017
Consultation on the draft EIA and Equality Impact Assessment (EQIA) Scope and Methodology Report (SMR) to inform the EIA and EQIA and the proposed relocation of the Eastern Leg Rolling Stock Depot	17 July 2017 – 29 September 2017
Phase 2b information events to support SMR and Eastern Leg Rolling Stock Depot consultations	September 2017

Phase 2b information events to provide update on design development	June-July 2018
Phase 2b consultation on the working draft ES and working draft EQIA	October – December 2018

Draft EIA SMR consultation

3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES, and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

3.2.3 As set out in Volume 1, the working draft ES is being formally consulted upon. The consultation is taking place during October 2018 to December 2018. A parallel consultation on the working draft equality impact assessment (EQIA) is also being undertaken during this period. As part of the process of consultation, stakeholders are invited to comment on the Proposed Scheme and the working draft ES and EQIA Reports which inform it.

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Hucknall to Selston area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

3.3.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to initial preferred route announcement in November 2016.

3.3.2 The main themes to emerge from stakeholder engagement in the Hucknall to Selston area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- temporary and permanent land requirements during construction and operation;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;
- retention or realignment of public rights of way (PRoW);
- temporary or permanent changes to road access including impacts to the B6009 Long Lane/Watnall Road and the A608 Mansfield Road;

- traffic impacts on local roads during construction including the A608 Mansfield Road which connects to the M1 junction 27 and the A611 which runs between Nottingham and Mansfield;
- the maintenance of access between the villages and settlements within the Hucknall to Selston area;
- temporary and permanent noise impacts;
- impacts on access to community facilities including recreational areas and open spaces such as that within and around Park Forest;
- impacts to local businesses/business parks and industrial estates including Sherwood Business Park and the former Hucknall Airfield site; and
- impacts to local, national and internationally important sensitive environmental receptors.

3.3.3 Stakeholder feedback will continue to be considered as part of the ongoing design of the Proposed Scheme and will be reported in the formal ES.

3.4 Engagement and consultation with stakeholder groups

Communities

3.4.1 Community stakeholders in the Hucknall to Selston area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.

3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, while also informing the separate EQIA being undertaken in parallel to the EIA.

3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the community area and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

3.4.5 Table 8 summarises key engagement undertaken with community stakeholders to date, including the focus of the engagement and how this has informed the design of the Proposed Scheme.

Table 8: Engagement to date with community stakeholders

Stakeholder	Area of focus
Ashfield Area Councillors	Presentation provided on how the Proposed Scheme is progressing and to gather any concerns about likely impacts or questions.
Nottinghamshire Resilience Forum	Meeting to discuss the likely impacts to the road network in the Nottinghamshire area arising from the construction of the Proposed Scheme.
Nottinghamshire Local Access Forum	Meeting to discuss the likely impacts to use and/or access to open spaces and footpaths.
Autism East Midlands	Meeting to discuss the progress of the Proposed Scheme and potential impacts and to gain awareness of any related groups they support across the route.
Nottinghamshire Ramblers	Meeting to discuss the progress of the Proposed Scheme, gather any concerns and determine the best way of meeting in future to discuss likely impacts to PRoW as a result of the Proposed Scheme.
Nottinghamshire Cycling Development Group	Engagement with the cycling community regarding the progress of Proposed Scheme and potential impacts and gather any feedback and concerns.
St Helen's Church, Selston	Meeting to discuss the progress of Proposed Scheme and potential impacts and gather any feedback and concerns and discuss ways to strengthen community engagement.
Tin Hat Centre, Selston	Meeting to discuss the progress of Proposed Scheme and potential impacts and gather any feedback and concerns and discuss ways to strengthen community engagement.

Local authorities and parish councils

3.4.6 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Hucknall to Selston area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

3.4.7 Engagement has focused on the technical areas which inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst other topics.

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 9.

Table 9: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Nottinghamshire County Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and WDES.
	Meeting to discuss likely impacts to highways, including local roads, trunk roads and highway assets.

	Meeting to discuss sensitive ecological receptors, plans for mitigation and gather information to assist the ecological assessment within the working draft Environmental Statement.
	Engagement around the landscape and visual assessment and to discuss representative viewpoint and photomontage locations.
East Midlands Councils	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and WDES.
	Meeting to discuss likely impacts to highways, including local roads, trunk roads and highway assets.
	Meeting to discuss the Traffic and Transport assessment and local constraints.
	Meeting to discuss development of the East Midlands Hub station.
	Meeting to discuss participation in the East Midlands Councils' HS2 mitigation group.
Broxtowe Borough Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and WDES.
	Engagement around the landscape and visual assessment and to discuss representative viewpoint and photomontage locations.
Ashfield District Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and WDES.
Selston Parish Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and WDES.

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[19].

Expert, technical and specialist groups

3.4.10 Engagement has also been undertaken with expert, technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged to date include:

- Animal and Plant Health Agency;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- Fera Science Ltd;

[19] Supporting document: Draft Code of Construction Practice

- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts /The Wildlife Trusts;
- Woodland Trust; and
- Nottinghamshire Wildlife Trust.

3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme.

3.4.12 Further information about topic-specific engagement is provided in Sections 4 to 15, where relevant.

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders such as Network Rail, Severn Trent Water, Cadent and the Oil and Pipelines Agency to establish what infrastructure exists in the Hucknall to Selston area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Hucknall to Selston area.

3.4.15 Engagement is ongoing with farmers and growers whose land or property would be directly affected by the Proposed Scheme whether permanently or temporarily. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. For example, the location of environmental mitigation will seek to

reduce the loss of agricultural land and the location of accommodation overbridges across the route will be considered to better reflect the needs of farmers.

3.4.16 Information gathered from six farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

3.4.17 Engagement is also continuing with key representatives for the farmers and growers industry, in particular with the National Farmers Union and Country Land and Business Association.

3.4.18 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Hucknall to Selston area, an information event was held at Newton Methodist Church on 6 and 7 June and 6 July 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.19 HS2 Ltd is continuing to engage with directly affected individuals, major asset owners and businesses, as the design and assessment develops

4 Agriculture, forestry and soils

4.1 Introduction

4.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and the likely impacts and significant effects of the construction and operation of the Proposed Scheme within the Hucknall to Selston area. Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[20].

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[21].

4.2.2 The study area for the agriculture, forestry and soils assessment covers all land required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme.

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[22] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of

[20] To be prepared for Phase 2b in due course, as per previous Phases found here: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers
[21] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[22] 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.

the impacts on agricultural land is the extent to which land of BMV agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts have been calculated quantitatively in terms of the physical extent of forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.2.5 The primary functions provided by soils other than for food and biomass production, such as flood water attenuation, carbon storage or the support of ecological habitats, are identified in this section and the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme is assessed. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk.

4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Where any part of a farm or rural holding is required for the construction and operation of the Proposed Scheme, the whole land holding is part of the study area for impacts on this receptor.

4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1, Section 8. These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that buildings and other farm infrastructure on the land holding will not be replaced as this would ultimately be at the discretion of the landowner. For this reason, financial compensation is not a consideration in the assessment of effects on farm holdings, as set out under Impacts on holdings below. In the majority of cases, the details of land use have been obtained from face-to-face interviews. Where this has not been possible, holding data have been obtained from publicly available sources.

4.3 Environmental baseline

Existing baseline

4.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Hucknall to Selston area. These include the underlying soil resources that are used for food and biomass production, as well as providing other services and functions for society, and the associated pattern of agricultural and other rural land uses.

Soil and land resources

Geology and soil parent materials

4.3.2 A full description of the geological characteristics of the Hucknall to Selston area is provided in Section 10, Land quality and Section 15, Water resources and flood risk.

4.3.3 The underlying geology of the study area is mapped by the British Geological Survey (BGS)[23]. Throughout much of the study area, the higher ground is overlain by extensive sheets of glacial till. These deposits comprise unsorted material ranging in size from clay to boulders, deposited by glaciers.

4.3.4 Glaciofluvial deposits of sand and gravel overlie the Pennine Middle Coal Measures to the east of Selston. Superficial deposits of alluvium are associated with the River Erewash in the north of the study area.

4.3.5 The bedrock geology in the south of the study area is of Permian-age dolostone (carbonate rock) of the Cadeby Formation; mudstone and sandstone of the Edlington Formation; and sandstone of the Lenton Sandstone Formation.

4.3.6 In the north of the study area, the bedrock geology is dominated by Carboniferous-age mudstone, siltstone and sandstone of the Pennine Middle Coal Measures Formation, interspersed with bands of sandstone.

4.3.7 The Cadeby Formation is mapped across shallower slopes and comprises grey dolostone with subordinate mudstone, siltstone or sandstone. The Edlington Formation is typically present on steeper slopes, adjacent to the Cadeby Formation and includes red-brown mudstone, with subordinate siltstone and sandstone. Dolostone and gypsum are also commonly found within the formation.

4.3.8 Very fine to medium grained sandstone of the Lenton Sandstone Formation is present across the higher ground and the steepest slopes in the south of the study area. The sandstone is red-brown and includes subordinate beds of mudstone and conglomerate.

4.3.9 North of Selston, the Pennine Middle Coal Measures Formation comprises interbedded mudstone, siltstone and sandstone, with common coal seams and frequent occurrences of marine fossils.

Topography and drainage

4.3.10 Topography in this study area is complex and forms a series of undulating features, with slopes ranging from fairly shallow and regular at less than 7 degrees, for example to the south-west of Hucknall, to steep (more than 7 degrees) and highly irregular, to the west of Hucknall, east of Selston and at Kirby Park. The valley of the River Erewash lies to the south and south-east of Pinxton.

4.3.11 Altitudes across the higher ground are approximately 170m to 175m Above Ordnance Datum (AOD), whilst the lowest altitudes, found to the south and north of the study area, fall to around 100m to 105m AOD.

4.3.12 Land at risk of flooding by rivers is confined to the floodplains of the River Erewash and Maghole Brook in the north of the study area. This land is classed as Flood Zones 2 and 3, on the Environment Agency's Flood map[24], in which there is between a 1 in

[23] British Geological Survey (2018). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[24] Environment Agency (undated), Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/

100 and 1 in 1000, or a 1 in 100 or greater annual probability of flooding respectively. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.13 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[25] and their general distribution is shown on the National Soil Map[26]. Soils possessing similar characteristics are amalgamated into associations.

4.3.14 There are three groups of mapped soil associations in this study area, the presence of which has been partially confirmed by detailed soil survey data obtained from published survey records. The most prevalent group includes the Brockhurst 2 and Dunkeswick associations. Topsoil is typically of clay loam, though sandy clay loam and clay may also be present, and overlies subsoil of clay or silty clay. Profiles are poorly drained, of Wetness Class[27] (WC) IV but can be improved to WC III with drainage.

4.3.15 The next most prevalent group of the Aberford association is characterised by profiles of clay loam overlying limestone and occurs in the south of the study area. The soil profiles, of WC I, can be shallow and brashy and are well drained.

4.3.16 The least prevalent group, Cuckney 1 association, has developed over sandstone and comprises loamy sand topsoils over loamy sand or sand, with sandstone commonly at depth. The profiles are freely draining, though are moderately droughty. Soils of this group have been identified in a detailed survey undertaken to the west of Hucknall Airfield[28].

Soil and land use interactions

Agricultural land quality

4.3.17 The principal soil/land use interaction is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate, topography and drainage.

4.3.18 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility.

4.3.19 The combination of rainfall and accumulated temperature limits all agricultural land in the study area to no higher than Grade 2, irrespective of soil and site properties. The interactions of climate with soil characteristics are also important in determining the wetness and droughtiness limitations of the land.

[25] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden.
[26] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.
[27] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained.
[28] MAFF (1993) Agricultural Land Classification; M1 Junction 26, Nottingham, Site 8, ref 15/96.

4.3.20 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[29] for three points within the study area. The data show climate in the area to be cold to cool and moderately moist. The number of Field Capacity Days[30] (FCDs), when the moisture deficit[31] is zero, ranges from 161 to 174 days per annum which is higher than average for lowland England (150 days). Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately small.

4.3.21 Site factors include gradient and microrelief[32] which are limiting to agricultural land quality within this study area, with limitations at Hucknall, Selston and Kirby Park to Subgrade 3b and Grade 4. Flood risk is also likely to affect agricultural land quality within the River Erewash and Maghole Brook valleys, limiting agricultural land quality to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk.

4.3.22 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and a localised susceptibility to erosion (where topsoil textures are coarse and not as cohesive). For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits.

4.3.23 The main soils, of the Brockhurst 2 and Dunkeswick associations, typically comprising clay loam topsoils overlying slowly permeable clay, are limited by wetness and workability. Profiles of WC III with medium loam topsoils are limited to Subgrade 3a whilst those with heavy loam or clayey topsoils, and all profiles of WC IV, are limited to Subgrade 3b.

4.3.24 Well drained clay loam profiles over limestone of the Aberford association may be shallow and brashy, which reduces the capacity for water storage within the soil profile. The moisture deficits in the study area are moderate to moderately small resulting in a slight droughtiness limitation to Grade 2.

4.3.25 Coarse loamy and sandy textures of the Cuckney 1 association are freely draining and are affected mostly by droughtiness. Survey data in the south of the study area at Hucknall[28] show the limitation to be variable. The data confirm that sandy clay loam over similar or sandy loam subsoils are of very good quality Grade 2. Where a lower subsoil of loamy sand or medium sand, each containing weathered sandstone fragments and overlying fissured sandstone at 70-90cm depth, is identified, there is a moderate droughtiness limitation to Subgrade 3a. Where profiles comprise sandy clay

[29] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[30] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.
[31] The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.
[32] Microrelief is the complex change of slope angle and direction over short distances, or the presence of boulders or rock outcrops, which can severely limit the use of agricultural machinery.

loam topsoil overlying loamy medium sand containing abundant weathered sandstone fragments, with fissured sandstone at 45-50cm depth, there is a greater droughtiness limitation to Subgrade 3b.

4.3.26 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[33] shows that there is a moderate likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of medium sensitivity in this study area.

4.3.27 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will be the detailed distribution of soil types and land in the various grades of the ALC. The results will be reported in the formal ES.

Other soil interactions

4.3.28 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[34] and the Government's White Paper, The Natural Choice: securing the value of nature[35,] and include:

- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
- the support of ecological habitats, biodiversity and gene pools;
- support for the landscape;
- the protection of cultural heritage;
- the provision of raw materials; and
- the provision of a platform for human activities, such as construction and recreation.

4.3.29 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. An assessment of the value and sensitivity of woodland resources is reported in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.3.30 The floodplains of the River Erewash and Maghole Brook occupy land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. The soils and floodplains in this study area function as water stores for flood attenuation, as well as providing ecological habitat.

[33] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.
[34] Defra (2009), *Soil Strategy for England.*
[35] HM Government (2011), *The Natural Choice: securing the value of nature.*

Land use

Land use description

4.3.31 Agricultural land in this study area is used predominantly for arable cropping on medium to large sized holdings. At the northern end of the study area, on land to the west of Annesley Woodhouse, there are two arable farms that also support beef cattle herds alongside some private equestrian uses.

4.3.32 There is an extensive area of woodland and forestry in the centre of the study area at Park Forest, which is commercially managed by the Forestry Commission. To the south of Park Forest, there are a number of smaller, broadleaved woodlands, including Watnall Coppice, Brier Plantation, The Dumbles and Audrey Wood which were planted under the England Woodland Grant Scheme (WGS[36]). Butler Wood, which forms part of Bogs Farm Quarry SSSI, is amongst the woodlands to the north of Park Forest.

4.3.33 A number of environmental designations influence land use within the Hucknall study area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

4.3.34 Some agricultural land is also subject to agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (the Entry Level Scheme (ELS) or Higher Level Scheme (HLS)), or the Countryside Stewardship Scheme (CSS), which has been the main agri-environment scheme in England since 2015. The CSS incorporates elements of Environmental Stewardship, the England Woodland Grant Scheme and Catchment Sensitive Farming grants.

4.3.35 Most Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The higher tier and mid-tier options in the CSS are more focussed than Environmental Stewardship. However, four new simpler, non-competitive offers have been introduced in 2018 to complement the higher tier and mid-tier options and open up this scheme to more farmers and land managers. Holdings that have land entered into an agri-environment scheme are identified in Table 10 and cover a high proportion of land within the study area, particularly on land to the south-west of Hucknall and south of Annesley Woodhouse.

Number, type and size of holdings

4.3.36 Table 10 sets out the current understanding of main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Publicly available sources have been used to obtain information about farm holdings where it has not yet been possible to arrange interviews, and this information will be validated as survey work continues. Other

[36] The Woodland Grant Scheme (WGS) was replaced in 2005 with the England Woodland Grant Scheme (EWGS)

farm holdings may be identified as survey work continues and the design develops. Effects on these farm holdings will be reported in the formal ES.

4.3.37 Table 10 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 10: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land north of Long Lane*	Arable	50	Not known	None	Medium
Greasley Castle Farm	Arable and equestrian	345	Fishing lakes; livery; shooting	ELS	Medium
Misk Farm	Arable, grassland and beef cattle	52	Turf business	None	Medium
Greasley Estate*	Arable and forestry	450	Fishing; camping	ELS and HLS	Medium
Barracks Farm*	Arable	184	Not known	CSS	Medium
Two Dales Farm	Arable and beef cattle	135	None	None	Medium
Leedale*	Equestrian	4	None	None	Low
Kirkby Lane Farm*	Grassland	32	Not known	None	Low
Lower Portland Farm	Grazing and equestrian	36	Livery	None	Low
Cliff Farm	Arable	24	Livery	None	Medium
Kirkby Cliff Farm	Arable and beef cattle	93	Livery	None	Medium
Land north of Kirkby Lane*	Grassland	10	Not known	None	Low

* It has not yet been possible to arrange farm impact assessment interviews with these holdings. Publicly available sources have been used to obtain the information presented.

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 In addition to design features that would be included in the Proposed Scheme to mitigate the impacts on farm holdings, there is a need to avoid or reduce environmental impacts to soils during construction. Soil resources from the areas

required temporarily and permanently for the Proposed Scheme would be stripped and stored. This would enable agricultural land that is required temporarily for construction to be returned to agricultural use. It would also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they would be able to fulfil the identified function.

4.4.2 Compliance with the Code of Construction Practice (CoCP)[37] will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement within the farm pack for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This would include any remediation measures necessary following the completion of works (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

[37] Supporting document: Draft Code of Construction Practice

4.4.3 As part of the ongoing development of the design, the following measures have been incorporated at this stage to avoid or mitigate adverse impacts on agriculture, forestry or soils:

- Greasley Castle Farm would retain access to land severed by the Proposed Scheme via the B6009 Long Lane underbridge and Watnall Coppice underbridge to the north of the farm holding;
- access to Misk Farm would be retained via a new underbridge crossing the Proposed Scheme (Misk Farm underbridge) and the continuation of the reservoir access road; and
- on the Greasley Estate, access to land severed by the Proposed Scheme would be provided by the construction of a new bridge crossing the Proposed Scheme, known as the Kennel Lane overbridge.

4.4.4 As the design develops, it will be necessary to continue to assess the requirement for access to severed parcels of agricultural land.

4.4.5 Upon completion of construction, it is currently anticipated that soils replaced for agricultural, forestry or landscape uses would be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period.

4.4.6 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. Some poorly drained land or land with heavier textured soils (such as the Brockhurst 2 and Dunkeswick association soils) may also require particularly careful management, such as the timing of cultivation and livestock grazing, during the aftercare period to ensure this outcome.

Assessment of impacts and effects

4.4.7 The acquisition and use of land for the Proposed Scheme would interfere with existing uses of that land and, in some locations, preclude existing land uses or sever and fragment individual fields and operational units of agricultural and forestry land. This could result in potential effects associated with the ability of affected agricultural and forestry interests to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure such as drainage. The Proposed Scheme seeks to reduce this disruption and, where appropriate and reasonably practicable, incorporate residual parcels of land no longer effective for agricultural use due to their size and/or shape as part of environmental mitigation works, such as ecological habitat creation.

4.4.8 Land used to construct the Proposed Scheme would fall into the following main categories when work is complete:

- part of the operational railway or associated infrastructure and kept under the control of the operator;

- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure);
- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation.

Temporary effects during construction

Impacts on agricultural land

4.4.9 Interpretation of publicly available data show that the Proposed Scheme is likely to require approximately 360ha of agricultural land within the Hucknall to Selston area during the construction phase, of which approximately 110ha (31%) is likely to be classified as BMV land (Grades 2 and 3a). This is a medium magnitude of impact on BMV land.

4.4.10 As BMV land in this local area is a receptor of medium sensitivity, it is currently expected that the effect of the Proposed Scheme on BMV land during the construction phase would be moderate adverse, which would be significant.

4.4.11 Following completion of construction, temporary facilities would be removed and the topsoil and subsoil reinstated in accordance with the agreed end use for the land. Some permanently displaced soils may be used to restore land to agriculture or other uses with slightly deeper topsoil and subsoil layers, where appropriate.

Nature of the soil to be disturbed

4.4.12 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local FCDs, as set out in the SMR. In areas with the highest number of FCDs, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction and the re-instatement of land; whereas soils with a high sand fraction in areas with the fewest number of FCDs and during the driest times of the year are the least susceptible.

4.4.13 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[38]. These principles would be followed throughout the construction period.

4.4.14 Clayey and seasonally waterlogged soils (including the Brockhurst 2 and Dunkeswick associations) are least able to remain structurally stable if moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.15 Implementation of the measures set out in the draft CoCP would reduce the magnitude of impact on soil. The detailed soil survey data will define the sensitivity of

[38] Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.*

soil, and the assessment of the effects on soils to be disturbed will be reported in the formal ES.

Impacts on holdings

4.4.16 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement would occur simultaneously at the start of the construction period and it is the combined effect of both that would have the most impact on the holding. During the construction period, some agricultural land would be restored and the impact on individual holdings would reduce.

4.4.17 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be reported in the formal ES. The formal ES will present the total area of land required on a particular holding during the construction period in absolute terms and as a percentage of the total area farmed. It will also show the area of land that would be returned to the holding following the construction period. The disruptive effects, principally of construction noise and dust, will be reported in the formal ES and assessed according to their effects on land uses and enterprises.

4.4.18 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 11 for those holdings currently identified. The scale of the impact of land required to construct the Proposed Scheme is based on the likely proportion of land required from the holding during construction. The effects of severance will be judged on the ease and availability of access to severed land. With the implementation of the measures set out in the draft CoCP, these would generally be the same during and post construction.

4.4.19 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 11: Summary of temporary effects on holdings from construction

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Land north of Long Lane Medium sensitivity	High	Medium	Major/moderate adverse
Greasley Castle Farm Medium sensitivity	High	Medium	Major/moderate adverse
Misk Farm Medium sensitivity	High	Medium	Major/moderate adverse
Greasley Estate Medium sensitivity	Low	Low	Minor adverse
Barracks Farm Medium sensitivity	High	Negligible	Major/moderate adverse

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Two Dales Farm Medium sensitivity	High	Medium	Major/moderate adverse
Leedale Low sensitivity	High	Negligible	Moderate adverse
Kirkby Lane Farm Low sensitivity	High	Medium	Moderate adverse
Lower Portland Farm Low sensitivity	High	Negligible	Moderate adverse
Cliff Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Kirkby Cliff Farm Medium sensitivity	Negligible	Negligible	Negligible
Land north of Kirkby Lane Low sensitivity	High	Negligible	Moderate adverse

4.4.20 Overall, the construction of the Proposed Scheme is currently expected to affect 12 holdings in the Hucknall to Selston area temporarily. On the basis of information currently available, 10 holdings are currently expected to experience moderate or major/moderate adverse temporary effects from construction, which would be significant for each holding.

4.4.21 Six holdings are currently expected to experience major/moderate adverse effects during the construction of the Proposed Scheme, all due to the high proportion of the holding required from medium sensitivity holdings. Four holdings are currently expected to experience moderate adverse effects, due to high proportions of land required from low sensitivity holdings.

4.4.22 Although financial compensation would be available under existing statutory arrangements to offset these impacts, it is not a consideration in the assessment of effects on farm holdings.

Permanent effects of construction

Impacts on agricultural land

4.4.23 Interpretation of publicly available data show that the Proposed Scheme is likely to require approximately 210ha of agricultural land permanently within the Hucknall to Selston area, of which approximately 100ha (48%) are likely to be classified as BMV land (Grades 2 and 3a). This would be a medium magnitude of impact on BMV land.

4.4.24 As BMV land in this local area is a receptor of medium sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land following construction would be moderate adverse, which would be significant.

Impacts on forestry land

4.4.25 It is currently expected that woodland at Watnall Coppice, Park Forest, The Dumbles, Audrey Wood and William Wood Spinney would be required as a result of the Proposed Scheme. Park Forest is managed as commercial forestry land. The effects on forestry land will be reported in the formal ES. The qualitative assessment of loss of woodland is presented in Section 7, Ecology and biodiversity.

Impacts on holdings

4.4.26 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 12 for those holdings currently identified. The scale of the impact of land required to operate the Proposed Scheme is based on the likely proportion of land required from the holding. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

4.4.27 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 12: Summary of permanent effects on holdings from construction

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential impact on farm infrastructure**	**Potential scale of effect**
Land north of Long Lane Medium sensitivity	Medium	Medium	Low	Moderate adverse
Greasley Castle Farm Medium sensitivity	Medium	Medium	Low	Moderate adverse
Misk Farm Medium sensitivity	High	Low	Low	Major/moderate adverse
Greasley Estate Medium sensitivity	Negligible	Low	Low	Minor adverse
Barracks Farm Medium sensitivity	Medium	Negligible	Low	Moderate adverse
Two Dales Farm Medium sensitivity	Medium	Medium	High	Major/moderate adverse
Leedale Low sensitivity	High	Negligible	High	Moderate adverse
Kirkby Lane Farm Low sensitivity	High	Medium	Low	Moderate adverse
Lower Portland Farm	Medium	Negligible	Negligible	Minor adverse

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Low sensitivity				
Cliff Farm Medium sensitivity	High	Negligible	Low	Major/moderate adverse
Kirkby Cliff Farm Medium sensitivity	Negligible	Negligible	Low	Negligible
Land north of Kirkby Lane Low sensitivity	High	Negligible	Low	Moderate adverse

4.4.28 Overall, the construction of the Proposed Scheme could potentially affect 12 holdings in the Hucknall to Selston area permanently. On the basis of information currently available, nine holdings would experience moderate or major/moderate adverse permanent effects from construction, which would be significant for each holding.

4.4.29 Three holdings are likely to experience major/moderate adverse permanent effects. In the case of Two Dales Farm, the scale of effect is due to a high impact on farm infrastructure, including the loss of residential property and all farm buildings. In the cases of Misk Farm and Cliff Farm, the scale of effect is due to the proportion of land required permanently.

4.4.30 Six holdings are likely to experience moderate adverse effects. In three cases, the scale of effect is due to the relatively high proportion of land required on small land holdings. At Leedale there is also a high impact due to loss of infrastructure, including the dwelling and non-commercial equestrian buildings. The scale of effect on the other three holdings results from medium impacts on medium sensitivity land holdings.

4.4.31 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

4.4.32 Other mitigation would incorporate climate change adaptation and resilience measures, insofar as reasonably practicable. For example, restored soils in areas that could be prone to drought with climate change could potentially be replaced at greater depths than at present to make them resilient to drought.

4.4.33 A farm pack within the Phase 2b Farmers and Growers Guide would be provided to all farmers and landowners, setting out baseline conditions on the farm and the assurances and obligations that HS2 Ltd would accept upon entering the land. This would include advice and appropriate assistance where there is a need for the

landowner to relocate or re-provide agricultural buildings displaced by the Proposed Scheme.

Summary of likely residual significant effects

4.4.34 Although the extent of land required permanently by ALC grade is not yet known in the Hucknall to Selston area, current indications based on publicly available information are that the temporary and permanent effects on BMV agricultural land during and following construction would be moderate adverse, which would be significant. The area of land required by ALC grade will be assessed and reported in the formal ES.

4.4.35 Of the 12 farm holdings identified, 10 are expected to experience moderate or major/moderate adverse temporary effects during construction; and nine are anticipated to experience moderate or major/moderate adverse permanent effects of construction, which would be significant for each holding.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No measures are currently anticipated to be required to mitigate the operational effects of the Proposed Scheme on agriculture, forestry and soils.

Assessment of impacts and effects

4.5.2 Potential impacts arising from the operation of the Proposed Scheme would include:

- noise emanating from moving trains; and
- the propensity of operational land to harbour noxious weeds.

4.5.3 The farm buildings at Two Dales Farm and Leedale lie within approximately 100m of the route of the Proposed Scheme. However all would be demolished such that there would be no operational farm buildings that would remain after construction of the Proposed Scheme within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

4.5.4 The propensity of linear transport infrastructure to harbour and spread noxious weeds is a consequence of:

- the management of the highway and railway land; and
- the propensity of the weeds to spread onto such land from adjoining land, which could be exacerbated by the effects of climate change.

4.5.5 The presence of noxious weeds (particularly ragwort) would be controlled using an appropriate management regime that identifies and remedies areas of weed growth that might threaten adjoining agricultural interests.

Other mitigation measures

4.5.6 No other mitigation measures have been identified at this stage.

Summary of likely residual significant effects

4.5.7 No residual significant effects on agriculture, forestry and soils have been identified at this stage as a result of the operation of the Proposed Scheme.

Monitoring

4.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Hucknall to Selston area.

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality identified to date arising from the construction and operation of the Proposed Scheme within the Hucknall to Selston area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[39] (PM10, PM2.5) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Broxtowe Borough Council (BBC) and Ashfield District Council (ADC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[40].

5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur[41]:

- from construction;
- from changes in the nature of traffic during construction and operation; for example, increases in traffic flows during construction or where road closures or restrictions cause diversions and heavier traffic on adjacent roads;
- where road alignments have changed; or
- from the operation of combustion plant at buildings.

5.2.3 The assessment of construction traffic will be reported in the formal ES. The assessment will incorporate HS2 Ltd's policies on vehicle emissions. These include the use of Euro VI heavy goods vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.

5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period

[39] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.
[40] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[41] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

(2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from 2023. As both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Hucknall to Selston area are emissions from road vehicles and agricultural activities. The main roads within the area are the M1, the A608 Mansfield Road, the A611 Annesley Road/Derby Road, the B6009 Long Lane/Watnall Road, the B6018 Park Lane, the B6019 Kirkby Lane; Wood Lane/Common Lane/Whyburn Lane and Forest Road/Salmon Lane.

5.3.2 There is one industrial installation (regulated by the Environment Agency) with permits for emissions to air, namely Autofil Yarns, a coating, printing and textiles process. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from the Department for Food, Environment and Rural Affairs (Defra)[42] for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Hucknall to Selston area.

Local monitoring data

5.3.4 There are currently 10 local authority diffusion tube sites located within the Hucknall to Selston area for monitoring NO2 concentrations. Measured concentrations in 2016 were within the air quality standard[43].

Air quality management areas

5.3.5 There are no air quality management areas (AQMA) within the Hucknall to Selston area.

Receptors

5.3.6 Several locations have been identified in the area as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust generating activities or traffic routes during construction or operation of the Proposed Scheme.

5.3.7 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include various schools and businesses.

[42] Department for Environment, Food and Rural Affairs (Defra) Defra Background Pollutant Concentration Maps. Available online at: http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015
[43] At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data.

5.3.8 There are six statutory designated ecological sites identified within the Hucknall to Selston area, namely Seller's Wood Site of Special Scientific Interest (SSSI), Bulwell Wood SSSI, Friezeland Grassland SSSI, Bagthorpe Meadows SSSI, Annesley Woodhouse Quarries SSSI and Bogs Farm Quarry SSSI. There are 19 non-statutory sensitive ecological sites identified in the Proposed Scheme. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP)[44]. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down fugitive dust;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

5.4.3 The draft CoCP includes the requirement for site-specific traffic management measures, such as the use of site haul routes for construction vehicles to minimise the need to use public roads.

[44] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

5.4.4 Impacts from construction of the Proposed Scheme could arise from dust generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO2, PM10 and PM2.5 concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[45] have been assessed for their effect on dust soiling, human health[46] and ecological sites. There are residential and ecological receptors located within the Hucknall to Selston area.

5.4.6 It has been identified that for demolition, the risk of dust effects would range from negligible to medium within this area, depending on the location of sensitive receptors and the magnitude of the demolition activities. There would also be a negligible risk of human health effects from demolition. For earthworks and construction, there would be a medium to high risk of dust effects and a low risk of human health effects. For trackout, the risk of dust effects would range from negligible to high within this area, depending on the location of sensitive receptors and the magnitude of the activities. There would also be a negligible to medium risk of human health effects from trackout. There would also be a negligible to medium risk of ecological effects from all dust generating activities.

5.4.7 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with the dust generating activities.

Construction traffic effects

5.4.8 Construction activity could also affect local air quality through the additional traffic generated on local roads as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments.

5.4.9 The M1, the A608 Mansfield Road, the A611 Annesley Road/Derby Road, the B6009 Long Lane/Watnall Road, the B6018 Sutton Road/Church Street/Church Hill/Park Lane, the B6019 Kirkby Lane, Wood Lane/Whyburn Lane/Common Lane and Forest Road/Salmon Lane would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on these roads. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

5.4.10 Direct and indirect effects from changes in air quality, such as those arising from increased levels of construction traffic, will be considered for all sensitive receptors within 200m of construction routes. These will include human receptors and those

[45] Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.
[46] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

Permanent effects

5.4.11 No permanent effects on local air quality are likely to arise during construction of the Proposed Scheme.

Other mitigation measures

5.4.12 No other mitigation measures are proposed at this stage in relation to air quality during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

5.4.13 The methods outlined within the draft CoCP are considered effective at reducing dust emissions and, therefore, no significant residual effects would be anticipated. Any significant residual effects from construction traffic emissions will be reported in the formal ES.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 No specific mitigation measures for air quality are proposed during operation of the Proposed Scheme.

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition and/or speed of road traffic and changes in road alignment.

5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

Operational traffic effects

5.5.4 Direct and indirect effects from changes in air quality, such as those arising from increased levels of traffic, will be considered for all receptors within 200m of affected roads. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. Any effects will be reported in the formal ES.

Other mitigation measures

5.5.5 No other mitigation measures are proposed at this stage in relation to air quality in this area during operation of the Proposed Scheme.

Summary of likely residual significant effects

5.5.6 Any significant residual effects for air quality from the operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

5.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

5.5.8 Any area specific requirements for monitoring air quality effects during operation of the Proposed Scheme in this area will be reported in the formal ES.

6 Community

6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Hucknall to Selston area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of facilities including East Midlands Councils (EMC), Regional Local Access Forum Chairs in the East Midlands, Nottinghamshire Local Access Forum, Nottinghamshire Local Resilience Forum, Nottinghamshire County Council (NCC), Ashfield District Council (ADC), Broxtowe Borough Council (BBC), Pinxton Parish Council and Selston Parish Council. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information and inform the design development of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.

6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in the SMR[47] and Volume 1.

6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination and isolation effects on community facilities and resources will be reported in the formal ES.

6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the Traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreation resource, they will be considered within the community assessment. Where impacts on open space and PRoW are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.

6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. Alternative temporary routes have not been defined in all cases due to the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

[47] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure then this will be discussed with the relevant local authority and local groups and reported in the formal ES.

6.2.6 The assessment in the working draft ES is based on the design information including demolitions as set out in Section 2 available at the time of assessment. This is subject to change as a result of design changes confirmed in advance of the submission of the hybrid Bill.

6.2.7 The construction of the Proposed Scheme could lead to isolation effects in one or more communities in this area. These will be assessed in the formal ES.

6.2.8 Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme. The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects arising from, for example, noise, vibration, poor air quality, HGV traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.

6.2.9 For the working draft ES, the full details of construction traffic routes and geographical scope of likely in-combination (amenity) effects are not yet known. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.

6.2.10 At this stage it has not been possible to complete surveys of public open spaces in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Hucknall to Selston area would be approximately 11.1km in length and lie within the BBC and ADC areas. It would extend from Hucknall, in the south, passing close to the settlements of Annesley Woodhouse and Selston and Pinxton in the north.

6.3.2 The Hucknall to Selston area is predominantly rural in nature. In general, the main concentrations of community facilities are located in the town centre of Hucknall, which is located outside the study area. The villages of Annesley Woodhouse and Selston provide fewer local services.

Hucknall

6.3.3 The town of Hucknall is located approximately 1km north of the urban area of Nottingham and approximately 400m east of the M1. The town comprises approximately 14,000 residential properties. The nearest residential properties would

be approximately 150m east of the route of the Proposed Scheme at the residential areas of Westville and Hawkers Place.

6.3.4 Hucknall has a range of community resources including shops, post offices, public houses and restaurants. Notable community facilities within the study area include Nabbs Lane Pharmacy, Heathcotes (Moorgreen) Nursing Home, Edgewood Leisure Centre, and Edgewood Primary and Nursery School. There are also places of worship within the study area, including West Hucknall Baptist Church and St. Peter and St. Paul's Church, which has a church hall facility.

6.3.5 Hucknall has a number of open space resources including several sports fields, bridleways, PRoW and formal and informal recreational play spaces. To the north-west of Hucknall is the publicly accessible woodland of Park Forest, which offers opportunities for recreation. Park Forest is a local wildlife site (LWS) and comprises a large area (approximately 123ha) of woodland that lies to the east of the M1. Park Forest is managed by the Forestry Commission and connects with Morning Springs LWS and High Park Wood LWS via Annesley Footpath FP2 and M1 underbridge to the west. Park Forest is accessible by a number of PRoW, two of which provide access across the M1.

6.3.6 Surrounding Hucknall, there are two promoted PRoW within the study area which would cross the route of the Proposed Scheme: the Robin Hood (Greasley Bridleway 15) Way and the Broxtowe Country Trail (Greasley Bridleway 21). The Robin Hood Way is a 172km promoted recreational route for walkers and cyclists between Nottingham and Edwinstowe. The Broxtowe Country Trail (Greasley Bridleway 21) is a 44km promoted recreational route for walkers and cyclists. The Broxtowe Country Trail is a circular route which connects with the Erewash Valley Trail, providing the ability to circumnavigate the Borough of Broxtowe.

Annesley Woodhouse

6.3.7 The village of Annesley Woodhouse is located approximately 3km north of Hucknall and approximately 1km east of the M1. The village has approximately 3,200 residential properties. The nearest residential properties would be approximately 1.2km east of the route of the Proposed Scheme. Along Salmon Lane to the west of Annesley Woodhouse there are individual dwellings and farms; some of these residential properties would be on the route of the Proposed Scheme.

6.3.8 Annesley Woodhouse provides several community resources, though many of these are outside the study area, including schools, healthcare facilities, shops, restaurants, a post office, places of worship, sports pitches, outdoor play areas, allotments, and public houses.

6.3.9 Annesley Woodhouse Quarries Site of Special Scientific Interest (SSSI) is an area of open space that is publicly accessible and is located on Salmon Lane, approximately 600m to the east of the route of Proposed Scheme.

Selston and Pinxton

6.3.10 The village of Selston is located approximately 1.5 km west of Annesley Woodhouse, and west of the M1. The village comprises approximately 2,900 residential properties.

The nearest residential properties would be approximately 140m west of the route of the Proposed Scheme. There are several community resources within Selston including a post office, restaurants, and public houses. Health facilities within the study area comprise Milington Springs Nursing Home and a pharmacy. Further community facilities within the study area include Selston Church of Christ, Selston Primitive Methodist Church and the Holly Hill Primary and Nursery School. Selston has a number of open space facilities including, bridleways, PRoW and formal and informal recreational play spaces.

6.3.11 The village of Pinxton is located approximately 2km to the north of Selston. Pinxton has approximately 1,950 residential properties. The nearest residential properties would be approximately 30m west of the route of the Proposed Scheme. Pinxton is predominantly within the Pinxton to Newton and Huthwaite area (LA08); however some of the surroundings including scattered residential properties are within the Hucknall to Selston area. There are no community facilities within the part of Pinxton in the Hucknall to Selston area.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[48] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of public rights of way (PRoW) during construction where reasonably practicable (Section 14);
- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16);
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and
- where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick up periods (Section 14).

[48] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.2 No temporary effects on residential properties have been identified as a result of the land required for construction of the Proposed Scheme.

Community facilities

6.4.3 No temporary effects on community facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Recreational facilities

6.4.4 No temporary effects on recreational facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Open space and recreational PRoW

6.4.5 Land required for the construction of the Westville embankment would result in temporary diversion of the Robin Hood Way, a long distance promoted recreational walking route, coincident with Greasley Bridleway 15. The duration of the temporary diversion would be 11 months. The temporary diversion of the Greasley Bridleway 15/Robin Hood Way, 150m to the north, is not likely to deter users. Therefore, the temporary diversion of the Robin Hood Way would have a negligible effect, which would not be significant.

6.4.6 Land required for the construction of the Westville embankment would result in temporary diversion of the Broxtowe Country Trail, which is a promoted long distance walking and cycling route, coincident with Greasley Bridleway 21. A local temporary diversion of the bridleway, 250m to the south would be provided during construction of the Westville embankment prior to the permanent diversion to the Watnall Coppice underbridge. The duration of the temporary diversion would be 11 months. The temporary diversion of the Broxtowe Country Trail (Bridleway 21) is not considered likely to deter users. The temporary diversion of Broxtowe Country Trail would have a negligible effect, which would not be significant.

6.4.7 Land required for the Misk Hill and Park Forest cutting and Park Forest embankment would result in the temporary direct loss of approximately 16.8ha of Park Forest. This would represent a temporary loss of approximately 15% of Park Forest, which has a total area of 123ha. The temporarily lost area potentially includes a network of used footpaths and trails. The Misk Hill and Park Forest cutting would take 3 years and 5 months to construct while the Park Forest Embankment would take 1 year to construct. Alternative connected woodland facilities are located at Morning Springs LWS and High Park Wood LWS which connects to Park Forest via Annesley Lane Footpath FP2 which passes under the M1 to the west. However, neither Morning Springs LWS nor High Park Wood LWS are as easily accessible from Hucknall or Annesley Woodhouse as Park Forest. The temporary loss of part of Park Forest would result in a moderate adverse effect, which would be significant.

Permanent effects

Residential properties

6.4.8 The construction of the Annesley Lane cutting would result in the demolition of one residential property on Salmon Lane in Annesley Woodhouse. This residential property would be permanently lost.

6.4.9 The construction of the Salmon Lane embankment would result in the demolition of six residential properties on Annesley Lane in Selston and three residential properties on Salmon Lane in Selston. The permanent loss of these residential properties would result in a moderate adverse effect, which would be significant.

Community facilities

6.4.10 No permanent effects on community facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Recreational facilities

6.4.11 No permanent effects on recreational facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Open space and recreational PRoW

6.4.12 The construction of the Westville embankment would result in a permanent diversion of the Robin Hood Way/Greasley Bridleway 15. The diversion would reduce the length of the existing route by 80m. This permanent diversion of the Robin Hood Way (Greasley Bridleway 15) is not considered likely to deter users. The permanent diversion of Robin Hood Way would result in a negligible effect, which would not be significant.

6.4.13 The construction of the Westville embankment would result in the permanent realignment of the Broxtowe Country Trail (Bridleway 21) via the Watnall Coppice underbridge for 150m. The permanent diversion of Broxtowe Country Way (Greasley Bridleway 2) would run north for 40m and then divert west for 110m to align with the Watnall Coppice underbridge. This diversion is not expected to deter walkers and cyclists from using the Broxtowe Country Trail (Greasley Bridleway 21). The permanent realignment of the Broxtowe Country Way would result in a negligible effect, which would not be significant.

6.4.14 The construction of the Misk Hill and Park Forest cutting and Park Forest embankment would result in the permanent loss of approximately 7.2ha of Park Forest. This would represent a permanent loss of approximately 5% of Park Forest, which has a total area of 123ha. The area of direct loss potentially includes a network of used footpaths and trails. The Proposed Scheme would include the reinstatement of the Annesley Footpath FP2 which would maintain public access to the areas of the woodland that lies to the west of the route of the Proposed Scheme. The woodland would also be partially re-planted following construction. As a result, the open space would continue to function and be publicly accessible. The area of woodland permanently lost would result in a minor adverse effect, which would not be significant.

Other mitigation measures

6.4.15 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential significant effects identified in this assessment.

6.4.16 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.4.17 Land required for construction of the Proposed Scheme is likely to result in temporary residual significant effects on Park Forest near Hucknall.

6.4.18 Land required for the construction of the Proposed Scheme is likely to result in permanent residual significant adverse effects on residential properties on Annesley Lane and Salmon Lane in Selston.

Cumulative effects

6.4.19 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.4.20 No cumulative effects have been identified at this time. Any combined effects on a community during construction of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 Avoidance and mitigation measures for effects arising from operation will be reported in the formal ES.

Assessment of impacts and effects

6.5.2 Operation of the Proposed Scheme could lead to in-combination effects on the community in this area which will be reported in the formal ES.

Other mitigation measures

6.5.3 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.5.4 A summary of the likely residual significant effects will be reported in the formal ES.

Monitoring

6.5.5 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

6.5.6 There are no area-specific community monitoring requirements during operation of the Proposed Scheme. Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that would contribute to the in-combination assessments, will be described in the relevant topic sections of the formal ES.

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Hucknall to Selston area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement with stakeholders including Natural England, Environment Agency, The Forestry Commission, Nottinghamshire County Council (NCC), and Nottinghamshire Wildlife Trust has commenced and is ongoing. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme and inform the formal ES.

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA07 Map Book.

7.1.4 All distances and area measurements in this section are approximate.

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[49].

7.2.2 In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a realistic precautionary approach.

7.2.3 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. The surveys include (but are not limited to) broad habitat and detailed plant surveys, great crested newt surveys, wintering and breeding bird surveys, bat surveys, otter and water vole surveys. The findings from these ongoing surveys will be taken into account in the formal ES.

7.3 Environmental baseline

Existing baseline

Introduction

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area as known at this time.

7.3.2 Land required for the Proposed Scheme in this area consists mainly of agricultural land, woodland and farmsteads. The Proposed Scheme in the Hucknall to Selston area would run adjacent to the M1, to the east, and pass through gently undulating

[49] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

topography across predominantly open countryside, including woodland. The Proposed Scheme would cross the River Erewash and Maghole Brook, as well as a tributary of Beauvale Brook.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA07 Map Book.

Designated sites

7.3.4 Some of the commercial conifer plantation at Park Forest has been included in the wider Sherwood Forest geographic area that meets the Stage 1 selection criteria for a Special Protection Area (SPA). The wider Sherwood Forest geographic area comprises a number of core areas (including land at Park Forest) that together support more than 1% of the UK breeding population of both nightjar and woodlark. The conifer plantation at Park Forest is partially within the land required for the Proposed Scheme. There is currently no designated Site of Special Scientific Interest (SSSI) or SPA, and therefore there is no formal boundary to this possible SPA Whilst no formal statutory designation has been proposed by the Joint Nature Conservation Committee (JNCC) at this stage, it has been agreed with Natural England that the Proposed Scheme in the vicinity of Park Forest would be subject to a risk-based assessment of potential effects on breeding nightjar and woodlark in accordance with Natural England guidance[50]. The populations of breeding nightjar and woodlark across the wider Sherwood Forest geographic area are considered to be of up to international value.

7.3.5 There are six nationally important SSSI that are relevant to the assessment in the Hucknall to Selston area. For each of these sites the Proposed Scheme in this area is within the Impact Risk Zone[51] relevant to railway infrastructure as identified by Natural England. They are:

- Seller's Wood SSSI, covering an area of 14.6ha and designated for its regionally notable broadleaved, semi-natural woodland. The woodland supports a diverse flora, including a large number of plant species characteristic of lowland ancient semi-natural woodland. It also includes a number of well-vegetated ponds which contain a diverse aquatic fauna. The SSSI is located west of Bulwell, 860m from the land required for the Proposed Scheme in the Hucknall to Selston area, and adjacent to the land required for the Proposed Scheme in the Stapleford to Nuthall area to the south;
- Bulwell Wood SSSI, covering an area of 17ha and designated for its regionally notable, ancient semi-natural woodland and unpolluted open water habitats. The woodland supports a number of plant species characteristic of lowland ancient semi-natural woodland. The clean-water pool (Bulwell Wood Hall Pond) supports a well-developed aquatic plant and animal community. The latter includes white-clawed crayfish, although this species is not a reason for

[50] Natural England Advice Note to Local Planning Authorities regarding the consideration of likely effects on the breeding population of nightjar and woodlark in the Sherwood Forest region March 2014
[51] The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts. Those listed are where rail infrastructure triggers consultation with Natural England.

designation of the SSSI. This SSSI is located north-west of Bulwell, and is adjacent to the land required for the Proposed Scheme both within the Hucknall to Selston area and the Stapleford to Nuttall area to the south;

- Friezeland Grassland SSSI, covering an area of 4ha and designated because it contains one of the best sedge-rich marsh and bryophyte lawn plant communities in Nottinghamshire. The SSSI is west of the M1 (on the opposite side of the motorway from the land required for the Proposed Scheme), to the east of Underwood, 950m south of the land required for the Proposed Scheme;
- Bagthorpe Meadows SSSI, covering an area of 6ha, is designated as it comprises one of the few areas in the county which still retain plant communities' characteristic of unimproved neutral hay meadows of the English Midlands. The SSSI designation applies to three separate areas of land south of Selston. The closest of these areas is 1km west of the land required for the Proposed Scheme, to the west of the M1, while the other two are 2km further west from the land required for the Proposed Scheme. Middle Brook and its tributaries flow into the SSSI from the land required for the Proposed Scheme. Due to the site being west of the M1 the SSSI is already subject to a degree of isolation from the land required for the Proposed Scheme;
- Annesley Woodhouse Quarries SSSI, adjacent to Bogs Farm Quarry SSSI to the north and east, covering an area of 35ha. The site is designated for its unimproved dry calcareous grassland and marshy grassland vegetation communities[52] and an outstanding assemblage of native breeding amphibians, which includes a nationally important breeding population of great crested newt. In addition to the notified features, the SSSI supports important invertebrates such as the dingy skipper butterfly, and supports small resident populations of water vole, grass snake and common lizard. The SSSI is located west of Annesley Woodhouse, 65m east of the land required for the Proposed Scheme; and
- Bogs Farm Quarry SSSI, covering an area of 5ha and adjacent to Annesley Woodhouse Quarries SSSI, is designated for its unimproved acid-loam grassland and other features of interest including marsh, flushes, open water pools and a wooded dumble[53]. The SSSI is located east of Selston. The SSSI is partially within the land required for the Proposed Scheme.

7.3.6 There are no Local Nature Reserves (LNR) of potential relevance to the assessment in the Hucknall to Selston area.

7.3.7 There are 22 local wildlife sites (LWS) of potential relevance to the assessment in the Hucknall to Selston area, each of which is of county/metropolitan value. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information have been

[52] Ashfield District Council (2003) Nature Conservation Strategy
[53] Dumble is a term for a wooded valley frequently used in Nottinghamshire and the Midlands. Dumbles are often associated with steep valleys along small watercourses.

used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Bulwell Wood and Pond LWS, covering an area of 17ha and located north-west of Bulwell. This ancient deciduous woodland has a notable ground flora. The northern end of the LWS is within the land required for the Proposed Scheme in the Hucknall to Selston area, including a pond that feeds into Bulwell Wood SSSI;
- Hucknall Airfield LWS, covering an area of 92ha and located south of Westville. The site comprises a significant area of late-cut neutral grassland. The western end of the LWS is within the land required for the Proposed Scheme;
- Starth Wood LWS, also an ancient woodland inventory site (AWIS), covers an area of 6ha to the west of Westville. The LWS has species-rich deciduous coppice with standard trees and is adjacent to the land required for the Proposed Scheme;
- Watson's Wood LWS is a notable woodland covering an area of 0.8ha west of Westville. The LWS is 115m west of the land required for the Proposed Scheme, adjacent to the southbound carriageway of the M1;
- Watnall Brickyard LWS, covering an area of 15ha, with its western boundary running adjacent to the southbound carriageway of the M1. The site consists of a mosaic of grassland, woodland, scrub and ruderal communities with a diversity of native and alien species. The eastern half of the LWS is within the land required for the Proposed Scheme;
- Eelhole Wood LWS (also an AWIS), covering an area of 7ha to the west of Westville. This deciduous woodland has areas of open acidic grassland in an urban setting. The southern border of the LWS is adjacent to the land required for the Proposed Scheme;
- Watnall Coppice (West) LWS, covering an area of 8ha and located to the west of Hucknall adjacent to the western side of the M1. It was once a continuous block of woodland linking to the woodland within Watnall Coppice East LWS prior to the construction of the M1. In this location, the land required for the Proposed Scheme extends west of the M1, and the LWS is adjacent to the land required for the Proposed Scheme;
- Watnall Coppice East LWS, covering an area of 11ha to the north-west of Hucknall. This deciduous woodland has a notable ground flora. The eastern section of the LWS is within the land required for the Proposed Scheme;
- High Park Wood LWS covers a large area of 101ha north of Beauvale Abbey Farm, from the M1 west towards the B600 Willey Lane at Beauvale Lodge. The wood is predominantly coniferous plantation with deciduous portions and numerous species-rich pockets. Some of the eastern sections of the LWS close to the M1 are within the land required for the Proposed Scheme. The LWS also links into the Park Forest woodland to the east of the M1;

- Park Forest, Annesley LWS covers an area of 123ha north-west of Hucknall, to the east of the M1. It is a commercial forestry plantation managed by the Forestry Commission and is partially within the land required for the Proposed Scheme. The LWS includes land within the Park Forest core area which is part of the possible SPA for breeding woodlark and nightjar in the Sherwood Forest wider geographic area, described above;
- Annesley Track Verge LWS, covering an area of 0.4ha, south of Kennels Farm, sharing its southern border with Park Forest, Annesley LWS. The LWS extends north from Park Forest on Kennel Lane alongside The Dumbles woodland and is within the land required for the Proposed Scheme;
- Annesley Woodland II LWS covers an area of 6ha, west of Kennels Farm. The LWS has a mixed forestry plantation with a noteworthy and diverse flora and is partially within the land required for the Proposed Scheme;
- Weaver's Lane Grassland LWS is a neutral grassland site covering an area of 5ha north-west of Kennels Farm, and shares its southern boundary with Annesley Woodland II LWS. The LWS is within the land required for the Proposed Scheme;
- Annesley Woodhouse Quarry LWS, covering an area of 5ha west of Annesley Woodhouse, and wholly within the southern area of Annesley Woodhouse Quarries SSSI. It is designated for both biological and geological reasons as a disused quarry including excellent Magnesian Limestone grassland[52]. The LWS is 195m east of the land required the Proposed Scheme;
- Bogs Farm Quarry LWS, covering an area of 5ha west of Annesley Woodhouse and covering a similar area to the extent of Bogs Farm Quarry SSSI, with two additional small areas to the north and west of the SSSI. It is designated for species-rich pools, flushes and grassland developed in a former quarry[52]. The south and north-western corners of the LWS are within the land required for the Proposed Scheme;
- Bentinck Void LWS, covering an area of 106ha to the west of Annesley Woodhouse, and also covering the majority of Annesley Woodhouse Quarries SSSI. It is designated as a former open cast site with large re-colonising areas, relic stream and marsh communities, with botanical and zoological interest[52]. The western border of the LWS is adjacent to the land required for the Proposed Scheme and adjacent to Bogs Farm Quarry SSSI and LWS;
- Langton Marshy Grassland LWS, covering an area of 2ha west of Lower Portland Farm. It is designated for its interesting marsh, swamp and damp grasslands of both botanical and zoological interest[52]. The LWS is within the land required for the Proposed Scheme;
- Kirkby Bentinck Erewash Meadow LWS, covering an area of 2ha to the north-west of Lower Portland Farm and located north of Langton Marshy Grassland LWS. The meadow was once a limestone quarry before being infilled during the 1950's. The LWS is within the land required for the Proposed Scheme;

- Langton Meadow LWS covering an area of 3ha, the north of Lower Portland Farm and is located to the east of Kirkby Bentinck Erewash Meadow LWS and is a notable Coal Measures grassland[52]. The western half of the LWS is within the land required for the Proposed Scheme;
- Kirkby Bentinck Dismantled Railway Spoil LWS covers an area of 3ha to the south of Langton Hall and is located to the north of Langton Meadow LWS. This site has a naturally vegetated spoil heap and valuable dismantled railway habitat. The western border of the LWS is adjacent to the land required for the Proposed Scheme;
- Maghole Brook and Ashfield District Dumble LWS covering an area of 10ha, stretching from west of Pinxton towards Sutton-in-Ashfield for 3km. The site is a linear LWS on the border of the Hucknall to Selston area and Pinxton to Newton and Huthwaite area. It is designated for the stream and dumble with their associated woodland and sections of interesting ground flora[52]. The LWS is partially within the land required for the Proposed Scheme, east of Brookhill Hall; and
- Mawkin Lane Grassland LWS covering an area of 2ha north of Kirkby Cliff Farm, bordering a southern section of Maghole Brook and District Dumble LWS. This site supports neutral grassland habitat. The northern border of the LWS is adjacent to the land required for the Proposed Scheme.

7.3.8 There are five Ancient Woodland Inventory Sites (AWIS) relevant to the assessment in this area. Pending further survey, it is assumed that the habitats and species present mean that these sites are of up to county/metropolitan value. They are:

- Starth Wood AWIS, which covers 6ha, to the west of Westville. It comprises ancient semi-natural woodland and is adjacent to the land required for the Proposed Scheme. The AWIS is also designated as Starth Wood LWS, and has the same designated boundaries. An additional 9ha of Starth Wood is outside the AWIS and LWS;
- Eelhole Wood AWIS, covering an area of 6ha to the west of Westville. The site is ancient semi-natural woodland, with its southern boundary adjacent to the land required for the Proposed Scheme. The AWIS is 100m north of Starth Wood AWIS. The majority of the AWIS is also designated as Eelhole Wood LWS;
- The Coppice AWIS, covering an area of 9ha consisting of ancient semi-natural woodland. The site is adjacent to the land required for the Proposed Scheme, on the western side of the M1. Most of the AWIS is also designated as Watnall Coppice (West) LWS;
- Watnall Coppice AWIS, covering an area of 9ha, located west of Hucknall. The AWIS is ancient semi-natural woodland and is bisected by the land required for the Proposed Scheme. The AWIS is also designated as Watnall Coppice East LWS; and

- High Park Wood AWIS, covering a total area of 156ha, to the south-east of Underwood. The site comprises 109ha of Plantation on Ancient Woodland Sites (PAWS) with a 47ha area of ancient semi-natural woodland at the western end. The AWIS is adjacent to the land required for the Proposed Scheme to the west of the M1.

7.3.9 A review is being undertaken to identify any additional woodlands that are not currently listed on the AWI but that may nevertheless be ancient. These will be identified and assessed in the formal ES.

Habitats

7.3.10 The following habitat types which occur in this area are relevant to the assessment.

Woodland

7.3.11 In addition to the aforementioned woodlands, there are 10 other areas of deciduous woodland (likely to qualify as habitats of principal importance[54], and local Biodiversity Action Plan (BAP)[55] habitats), which would be within or partly within land required for the Proposed Scheme. These are:

- Two areas west of Starth Wood located on the western edge of Westville and adjacent to the eastern boundary of the land required for the Proposed Scheme;
- east of Misk Farm, within the land required for the Proposed Scheme.
- north of Misk Farm, within the land required for the Proposed Scheme.
- The Dumbles, located on both sides the M1 south of Weavers Lane and within the land required for the Proposed Scheme;
- Audrey Wood, located off Weavers lane east of the M1 and within the land required for the Proposed Scheme;
- William Wood Spinney (separate to William Wood LWS), located next to junction 27 of the M1 and within the land required for the Proposed Scheme;
- south of Two Dales Farm, partly located within the land required for the Proposed Scheme;
- south-west of Langton Hall partially within the land required for the Proposed Scheme; and
- an unnamed woodland east of York Lodge within the land required for the Proposed Scheme.

7.3.12 On a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to county/metropolitan value.

7.3.13 There are two areas of wood pasture and parkland habitat. The first is Park Forest and Annesley Park, south of Annesley Woodhouse and the second is Brookhill Farm,

[54] Section 41 of Natural Environment and Rural Communities Act 2006
[55] Nottinghamshire Biodiversity Action Group (1998) Local Biodiversity Action Plan for Nottinghamshire. Available online at: http://www.nottsbag.org.uk/projects.htm

north-east of Pinxton. Park Forest and Annesley Park is adjacent to the land required for the Proposed Scheme and Brookhill Farm is partly within the land required for the Proposed Scheme. The habitats at Brookhill Farm extend into the Pinxton to Newton and Huthwaite area to the north. Park Forest and Annesley Park has a Tudor inception date. On a precautionary basis, pending further field surveys, these habitats are considered to be of up to district/borough value.

Grassland

7.3.14 Other grasslands located outside of designated sites and within the land required for the Proposed Scheme may qualify as habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands) these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.15 Many hedgerows in the study area (including hedgerows within the land required for the Proposed Scheme) are likely to qualify as habitats of principal importance and local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[56]. In addition, they could also provide commuting corridors, nesting and feeding habitats for wildlife. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.16 The River Erewash, Maghole Brook and 14 smaller watercourses and tributaries of Beauvale Brook, would be crossed by the Proposed Scheme. Cuttail Brook is adjacent to the land required for the Proposed Scheme. Middle Brook, which rises within the land required for the Proposed Scheme and is culverted beneath the M1, flows into Bagthorpe Meadows SSSI.

7.3.17 The River Erewash and Maghole Brook may qualify as habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, the River Erewash and Maghole Brook are assumed to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value, pending confirmation through field surveys of their associated habitat context and water quality status.

Water bodies

7.3.18 There are eight ponds that are located within, or partly within, the land required for the Proposed Scheme. Five of these ponds are within LWS; it is not certain that the ponds are the reason for LWS designation and therefore the ponds have been included here. Some may qualify as habitats of principal importance, or local BAP habitats especially if they support flora or fauna species of conservation importance. On a precautionary basis, pending the findings of field surveys, these ponds are considered to be of up to county/metropolitan value.

[56] *"Statutory Instrument 1997 No. 1160"* Hedgerows Regulations 1997

Ancient and veteran trees

7.3.19 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present within the land required for the Proposed Scheme. Information on ancient and veteran trees will be confirmed upon further survey and reported in the formal ES. On a precautionary basis it is considered that ancient and veteran trees would be of district/borough value.

Protected and notable species

7.3.20 A summary of the likely value of faunal species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 13.

Table 13*:* Species potentially relevant to the assessment within the Hucknall to Selston area

Resource/feature	Value	Rationale
Bats	Up to regional	There are records of bats within the Hucknall to Selston area, including within the land required for the Proposed Scheme. There is a record for common pipistrelle within the land required for the Proposed Scheme in the east of Selston. There are records for unspecified pipistrelle species in Starth Wood to the east of the ancient woodland 100m from the land required for the Proposed Scheme. Common and soprano pipistrelle, brown long eared bat, *Myotis* species and noctule - have been recorded at Annesley Plantation, 1.3km east of the land required for the Proposed Scheme. There are also a number of historic records for bats associated with Bentinck Void including Daubenton's bat foraging over the lagoons and unspecified pipistrelle species, common pipistrelle and noctule. There are a number of bat records within the residential areas of Hucknall, 250m from the land required for the Proposed Scheme. There are two brown long-eared bat roost records in Hucknall, although the exact locations are not specified in the records. There are a number of records of foraging and commuting bat species along The Dumbles, and Maghole Brook as well as noctule and brown long eared bat in farmland near this area within 1 km of the Proposed Scheme. Other woodlands and hedgerows across the Hucknall to Selston area are likely to provide foraging and commuting routes for a range of bat species. Trees within these woodlands may also have features that could support bat roosts.
Otter	Up to county/metropolitan	Habitat suitable for otter is present along the watercourses and drainage ditches within the Proposed Scheme area, including the River Erewash and its tributaries, though there are no recent records in the available data. Terrestrial habitat suitable for otter including woodland, scrub and other dense vegetation

Resource/feature	Value	Rationale
		is also present within the land required for the Proposed Scheme.
Water vole	Up to county/metropolitan	Populations of water vole are rare in Nottinghamshire and are declining. Habitat suitable for water vole is present along the watercourses and drainage ditches. There are records for water vole within the catchment of the watercourses within the Proposed Scheme area and 2014 records along the River Erewash. This species is also included in the citation for Annesley Woodhouse Quarries SSSI and there are historic records of water vole at Bentinck Void and associated with Cuttail Brook at this site and Davis's Bottom.
Polecat	Up to county/metropolitan	Populations of polecat are rare in Nottinghamshire and Derbyshire. Habitat suitable for this species is present including hedgerows, farmland and woodland.
Great crested newt	Up to county/metropolitan	Ongoing surveys have identified positive results for great crested newts in a pond 100m east of the land required for the Proposed Scheme in Bentinck Void. There are eight ponds within the land required for the Proposed Scheme which may have habitat suitable to support great crested newt. There are an additional 25 ponds within 250m of the land required for the Proposed Scheme which may have habitat suitable to support amphibians.
Birds	Up to county/metropolitan	Farmland, woodland and water bodies in this area provide suitable habitat for both breeding and wintering birds. Wintering bird surveys in 2017/2018 recorded a total of 67 species within 250m of the land required for the Proposed Scheme including 15 red-listed Birds of Conservation Concern (BoCC) species. These included willow tit, a fast declining species in the UK, along the River Erewash at Pinxton and at the former Bentinck Colliery site. The surveys also recorded kingfisher and peregrine within 250m of the land required for the Proposed Scheme, near Annesley Woodhouse. Both are Schedule 1 species, although only kingfisher is likely to breed. Habitats across the Sherwood Forest area, which includes Park Forest, are known to support significant populations of breeding nightjar and woodlark and some may be present in areas outside the core areas considered as a possible SPA.
White-clawed crayfish	Up to county/metropolitan	Suitable habitat is likely to be present along the River Erewash, Maghole Brook and smaller watercourses. White-clawed crayfish are known to occur in the Bulwell Wood SSSI pond (records from 2014) and may be present in the watercourses feeding this pond. There is a record of white-clawed crayfish south of Wighay Wood, 1.4km east of land required for the Proposed

Resource/feature	Value	Rationale
		Scheme. There are also records within the catchment of Beauvale Brook, 2.5km to the west of land required for the Proposed Scheme. There is potential for white-clawed crayfish to be present in Cuttail Brook associated with Annesley Woodhouse Quarries SSSI.
Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates (other than white-clawed crayfish) is likely to be present in watercourses including the River Erewash, Maghole Brook, smaller watercourses, and in water bodies.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates is likely to occur in areas of woodland, scrub, hedgerows and grassland. Dingy skipper butterfly is included in the citation for Annesley Woodhouse Quarries SSSI.
Fish	Up to county/metropolitan	Suitable habitat for fish is present in watercourses including the River Erewash and Maghole Brook, as well as the smaller watercourses and water bodies. There are records of bullhead (Annex II species[57]), from 2013 in the river catchments affected by the Proposed Scheme and brown trout in the unnamed watercourse to be crossed by the Audrey Wood viaduct and the River Erewash.
Reptiles	Up to district/borough	Annesley Woodhouse Quarries SSSI is known to support small populations of grass snake and common lizard. Other suitable habitat is likely to be present for reptiles within the Proposed Scheme area.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigating the losses of habitat and effects on species:

- viaducts over the tributary of Beauvale Brook, Maghole Brook and the River Erewash would avoid direct effects to these watercourses and allow free passage for wildlife beneath them including along the rivers and their banks;
- provision of 5ha wetland habitat creation in the floodplain of the River Erewash;
- incorporation of a natural watercourse bed and mammal ledge in culverts where feasible;

[57] Annex II of the EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)

- a network of 129ha of new woodland planting (including habitat creation and landscape planting) would contribute towards compensating for the losses of woodland (e.g. Park Forest, The Dumbles and Audrey Wood), and to enhance connectivity between remaining woodlands;
- provision of 24 new ponds, which would form part of the measures to address loss of water bodies and effects on great crested newt and other species;
- provision of new species-rich hedgerows, using appropriate native species, to contribute towards compensating for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the route; and
- provision of 62ha of new grassland habitats, including species-rich grasslands to contribute towards compensating for the loss of grassland habitats as a result of the Proposed Scheme. Locations include south of B6009 Long Lane Underbridge and following the line of Greasley Bridleway 19, east of Kennel Lane, adjacent to Weaver's Lane, around Two Dales Farm, to the south and north of Bogs Farm Quarry SSSI, adjacent to the M1 north of Park Lane and north and south of the River Erewash.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[58], which includes translocation of protected species where appropriate.

7.4.3 Section 9 of the draft CoCP requires contractors to implement a range of measures to protect ecological receptors including the following:

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;
- restoration and replacement planting;
- implement management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for

[58] Supporting document: Draft Code of Construction Practice

protected and invasive species and designated sites.

Assessment of impacts and effects

7.4.4 The following section considers the impacts and effects on ecological features as a consequence of construction of the Proposed Scheme. All assessments have been undertaken on a precautionary basis, in the absence of survey information, and take account of the baseline value as presented in Section 7.3.

Designated sites

7.4.5 A study to inform a shadow Habitats Regulations Screening Assessment has been undertaken for Park Forest (HS2, 2016)[59]. It was informed by detailed survey work including radio-tracking of nightjars. The assessment was written on the basis that a number of areas in the wider Sherwood Forest geographic area may be designated as a SPA in future, and that conifer plantation habitats at Park Forest could form part of that designation. The Proposed Scheme will result in the loss of commercial forestry plantation, which is currently in a mature state and managed by the Forestry Commission on a 50-100 year rotation. In the screening assessment, the impacts on nightjar and woodlark as a result of the Proposed Scheme were considered to be negligible with the forest in its current state. Providing the management regime set out by the Forestry Commission is adhered to during the construction of the Proposed Scheme, it was considered that the works were not likely to result in any significant adverse effect on the populations of nightjar and woodlark. Natural England[60] advised that, as forestry operations could in the future result in the creation of suitable breeding habitat for nightjar and woodlark within land required for the Proposed Scheme, further assessment was required to assess the effect of the loss of conifer plantation.

7.4.6 HS2 Ltd will continue to consult with Natural England (and other relevant key stakeholders) as the design evolves develops to ensure that the submitted design in the hybrid Bill complies with the Habitats Regulations 2017. Further assessment of effects on woodlark and nightjar will be undertaken and an appropriate design will be developed through an iterative process. Any studies to inform the required assessments will be completed and the outcomes agreed with Natural England prior to submission of the hybrid Bill.

7.4.7 Construction of the Proposed Scheme in the Hucknall to Selston area will have no significant effects on the site integrity of Seller's Wood SSSI, as it is more than 800m from land required for the Proposed Scheme in the Hucknall to Selston area. There would be also be no significant effect on the integrity SSSI arising from construction in the Stapleford to Nuthall area to the south.

7.4.8 Construction of the Westville embankment in this area would not directly affect Bulwell Wood SSSI and there would be no additional significant effects on Bulwell Wood SSSI arising from construction in the Stapleford to Nuttall area to the south. Construction of a drainage channel running adjacent to the SSSI could result in

[59] HS2 (2016) *Park Forest Shadow Habitat Regulations Assessment Screening Report*
[60] Natural England (2017) *Park Forest Shadow Habitats Regulations Assessment (HRA) – Natural England's advice on the scope of the Appropriate Assessment (AA).*

indirect effects through disruption of the hydrological function of the SSSI, in particular the open water habitat of the clean water pond, a designated feature of interest for the SSSI. This may occur as a result of upstream construction works affecting the connected Bulwell Wood and Pond LWS and supply of water to the SSSI. The LWS pond is being retained during construction of the Proposed Scheme and it is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of potential indirect impacts to a level where there would be no significant effects. However, on a precautionary basis, and pending further information regarding drainage for the Proposed Scheme in relation to the upstream Bulwell Wood and Pond LWS, at this stage the assessment assumes there would be an adverse effect on the SSSI, which would be significant at national level. The Bulwell Wood AWIS would not be indirectly affected through impacts on ground and surface water.

7.4.9 The woodland planting included in the Proposed Scheme would be beneficial for the integrity of Bulwell Wood SSSI and AWIS. This includes an area of land immediately adjacent to this site in the Hucknall to Selston area, and a connected area of woodland planting in the adjacent Stapleford to Nuthall area. It is also likely that the woodland planting would reduce impacts arising from the management of adjacent agricultural land, by providing habitat buffers.

7.4.10 Friezeland Grassland SSSI would not be directly affected by construction of the Proposed Scheme. The closest point of construction would be 950m east of the land required for the Proposed Scheme. The SSSI is also subject to a degree of isolation from the Proposed Scheme due to the site being west of the M1. The potential use of the A608 Mansfield Road as a highway for construction access could lead to indirect effects; however, it is anticipated that these would be controlled by the implementation of measures within the draft CoCP. As such, there would be no significant effect on the integrity of the SSSI.

7.4.11 Construction of the Proposed Scheme would not directly affect Bagthorpe Meadows SSSI, due to the SSSI being 1km west of the Proposed Scheme, and already subject to a degree of isolation from the Proposed Scheme due to the presence of the M1. The construction of the Proposed Scheme could disrupt the hydrological function of the SSSI, as Middle Brook flows to the SSSI from the A608 Mansfield Road cutting. This cutting is unlikely to change water levels within the SSSI. Potential effects on the watercourse and SSSI would be controlled by the implementation of measures within the draft CoCP so that no significant effect on the integrity of the SSSI would occur.

7.4.12 Annesley Woodhouse Quarries SSSI would not be directly affected by construction of the Proposed Scheme. Construction of the Annesley Lane cutting and Annesley Lane End embankment could result in disruption of the groundwater hydrological function of the SSSI. An unnamed watercourse flows from the Annesley Lane End embankment through Bogs Farm Quarry SSSI and into Annesley Woodhouse Quarries SSSI and a change in regime of this stream could potentially adversely affect the SSSI assemblage of native breeding amphibians, including great crested newt, and marshy grassland vegetation communities. Changes in habitat and species composition of the SSSI could have a permanent adverse effect. The land required for the Proposed Scheme includes spoil areas adjacent to the SSSI and there is potential for

construction to adversely impact surface water runoff to the SSSI. It is anticipated that the implementation of measures in the draft CoCP would reduce the magnitude of indirect impacts to a level where there would be no significant effects. However, on a precautionary basis and in the absence of further information, at this stage the assessment assumes there would be an adverse effect in the integrity of the SSSI which would be significant at up to national level.

7.4.13 Construction of the Annesley Lane End embankment would result in the loss of 0.1ha (2%) of Bogs Farm Quarry SSSI. The loss may include some of the notified features that would result in a permanent adverse effect on the integrity of the SSSI. Construction of the Annesley Lane cutting and Annesley Lane End embankment could also result in indirect effects through the disruption of the hydrological function of Bogs Farm Quarry SSSI, which could adversely affect the SSSI flushes and open water pools. It is anticipated that the implementation of measures in the draft CoCP would reduce the magnitude of indirect impacts to a level where there would be no significant effects. However, on a precautionary basis and in the absence of further information relating to hydrological effects, at this stage the assessment assumes that the combined effect of direct habitat loss and indirect hydrological impacts would result in an adverse effect which would be significant at up to national level.

7.4.14 Construction of the Westville embankment would result in the loss of 0.5ha (3%) of Bulwell Wood and Pond LWS, with all impacts to this LWS resulting from construction within the Hucknall to Selston area. The pond within the LWS, which drains directly into a pond within Bulwell Wood SSSI), will be retained. Although it is anticipated with the retention of the pond that significant effects will be avoided through the measures in the Draft CoCP, on a precautionary basis the habitat loss and potential effects on hydrology would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.15 Construction of Westville embankment would result in the loss of 4ha (5%) of Hucknall Airfield LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.16 Construction of Westville embankment would result in the loss of 5ha (33%) of Watnall Brickyard LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.17 Construction of Westville embankment would result in the loss of 3ha (27%) of Watnall Coppice East LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.18 Construction of the Misk Hill and Park Forest cutting would result in the loss of 17ha (14%) of Park Forest, Annesley LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.19 Construction of The Dumbles cutting would result in the loss of 0.4ha (100%) of Annesley Track Verge LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.

7.4.20 Construction of the Audrey Wood South embankment, Audrey Wood viaduct and Audrey Wood north embankment would result in the loss of 3ha (54%) of Annesley

Woodland II LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.21 Construction of the Audrey Wood south embankment, Audrey Wood viaduct, Audrey Wood north embankment and an attenuation pond would result in the loss of 5ha (100%) of Weaver's Lane Grassland LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.

7.4.22 Construction of the Annesley Lane End embankment would result in the loss of approximately 0.1 ha (approximately 1.6%) of Bogs Farm Quarry LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.

7.4.23 Construction of Park Lane cutting could have an indirect permanent adverse effect on Bentinck Void LWS through disruption of hydrological function on the features of the LWS. An alteration in water supply could lead to habitat loss and alter the species composition and integrity of the LWS. This would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.24 Construction of the Erewash and Mineral Railway viaduct would result in the loss of 2ha (100%) of Langton Marshy Grassland LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.

7.4.25 Construction of the Erewash and Mineral Railway viaduct would result in the loss of 2ha (100%) of Kirkby Bentinck Erewash Meadow LWS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.

7.4.26 Construction of the Erewash and Mineral Railway viaduct would result in the loss of 1ha (52%) of Langton Meadow LWS. Habitat loss of such a large area of the LWS would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.27 Construction of a drainage channel from Kirkby Lane and Maghole Brook embankment (including cutting) to Maghole Brook could result in hydrological changes to the Maghole Brook and District Dumble LWS. In addition the effects of habitat loss (which could be up to 1ha, or 7% of the LWS across both Hucknall to Selston area (LA07) and Pinxton to Newton and Huthwaite area (LA08)) from viaduct construction would result in the permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

7.4.28 Construction of Westville embankment would result in direct adverse impacts through the loss of 3ha (33%) of Watnall Coppice AWIS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level. In response to this loss of irreplaceable ancient woodland, a network of woodland planting is included within the Proposed Scheme in this area.

Habitats

Woodland

7.4.29 As well as woodlands within designated sites, construction would result in the loss of 7ha[61] of broadleaved woodland within the land required for the Proposed Scheme. This includes construction of Audrey Wood north embankment which would result in woodland loss of part of Audrey Wood, construction of the A608 Mansfield Road cutting resulting in the loss of a section of William Wood Spinney, construction resulting in woodland loss alongside the M1 near Annesley Footpath 8 and construction of Erewash and Mineral Railway viaduct which would result in loss of the woodland north of the Sutton Junction to Pye Bridge Railway (and out of use spur). These losses would result in a permanent adverse effect that is significant at up to the county/metropolitan level. Construction would also result in the loss of wood pasture and parkland habitat at Brookhill Farm which would be significant at up to the district/borough level.

7.4.30 After establishment, the proposed planting of woodland would reduce these residual effects to a level that is not significant unless additional areas of ancient woodland are identified as a result of the ongoing review, in which case the residual adverse effect would be significant at up to county/metropolitan level.

Grassland

7.4.31 In the absence of field survey information, it is assumed that the grassland lost outside designated areas is not unimproved, and the loss would be significant at up to district/borough level. The Proposed Scheme design in the Hucknall to Selston area includes grassland habitat creation that would contribute toward compensation for grassland losses and is expected to result in a residual effect that is not significant.

Hedgerows

7.4.32 The Proposed Scheme would cross hedgerows in the Hucknall to Selston area, some of which may be habitats of principal importance or 'important' hedgerows. The land required for the Proposed Scheme would result in the permanent loss of 23km of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. Further hedgerow habitat creation would be proposed as part of the design development. In the absence of this additional mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to district/borough level.

Watercourses

7.4.33 The Proposed Scheme would cross a tributary of Beauvale Brook, the River Erewash and Maghole Brook on viaducts. Thirteen smaller watercourses are also within the land required for the Proposed Scheme, with Cuttail Brook adjacent to the land required for the Proposed Scheme. These watercourses would not be directly affected, and indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP. However, the Proposed

[61] Calculated using Natural England Priority Habitats Inventory

Scheme would result in the loss of sections of other smaller watercourses, such as a tributary of the River Leen and severance of river corridors due to culverts, such as tributaries of Beauvale Brook and the River Erewash which would result in a permanent effect that would be significant at up to district/borough level.

Water bodies

7.4.34 Eight ponds would be lost as a result of the Proposed Scheme and associated temporary works. These losses would be a permanent adverse effect that is significant at up to the county/metropolitan level. Replacement ponds are to be created, including to the south of B6009 Long Lane Underbridge, and around Bogs Farm Quarry SSSI, which would compensate for habitat losses. On a precautionary basis, pending further survey information and assessment, it is considered that the residual adverse effect would be significant at up to district/borough level, particularly if it is confirmed through field surveys that these ponds support species of high conservation importance.

Ancient and veteran trees

7.4.35 It is assumed that any ancient and veteran trees within the land required for the Proposed Scheme in the Hucknall to Selston area would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would result in a permanent adverse effect that is significant at up to district/borough level in each case.

Species

Bats

7.4.36 At least five bat species have been recorded within the Hucknall to Selston area. The permanent removal of vegetation may have adverse effects on bats. Habitat loss would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. The Proposed Scheme would result in the loss and/or severance of hedgerows and some large extents of woodland, including Watnall Coppice, Park Forest, High Park Wood and the Dumbles, potentially affecting foraging and commuting routes, though habitats are already severed to some extent by the existing M1. Other key areas are likely to include Maghole Brook, the River Erewash and the associated Langton Marshy Grassland LWS and adjacent woodland areas, all of which are crossed by viaduct. Habitat loss and fragmentation could affect breeding populations of bat species present within the Hucknall to Selston area. Bats may also be affected by the lighting associated with construction works, such as site lighting, although it is anticipated that this would be controlled through measures in the draft CoCP.

7.4.37 The proposed woodland, grassland and hedgerow planting will help to reduce impacts to bats and further mitigation will be identified following ongoing surveys and assessment. On a precautionary basis, in the absence of further survey information, it has been assumed that impacts would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to the regional level.

Otter

7.4.38 Aquatic and terrestrial habitat suitable for otter is present along the watercourses and drainage ditches in the Hucknall to Selston area. The proposed viaducts over the tributary of Beauvale Brook, River Erewash and Maghole Brook would avoid significant loss and fragmentation of habitat along the river corridors. While there is potential for otter to be disturbed and displaced by construction activities, it is likely that significant effects would be avoided through measures in the draft CoCP. Several smaller watercourses crossed by the Proposed Scheme would experience habitat loss. On a precautionary basis, in the absence of survey information, impacts to otter would result in an adverse effect on the conservation status of these species that would be significant at up to county/metropolitan level.

Water vole

7.4.39 Habitat suitable for water vole is present along the watercourses and drainage ditches in the Hucknall to Selston area. The proposed viaducts over the tributary of Beauvale Brook, River Erewash and Maghole Brook would avoid significant loss and fragmentation of habitat along the watercourse corridors. While there is potential for water vole to be disturbed and displaced by construction activities, it is likely that significant effects would be avoided through measures in the draft CoCP. Habitat loss would result to the smaller watercourses crossed by the Proposed Scheme. On a precautionary basis, in the absence of survey information, impacts to water vole would result in an adverse effect on the conservation status of this species that would be significant at up to county/metropolitan level.

Polecat

7.4.40 The loss of habitats such as woodland, grassland and arable land could affect polecat if surveys show this species to be present. Should polecat be discovered during surveys, the effects of permanent habitat loss on this species would be significant at up to county/metropolitan level.

Great crested newt

7.4.41 From ongoing surveys carried out to date, great crested newt is confirmed as present in a pond 100m east of the land required for the Proposed Scheme in Bentinck Void. On a precautionary basis and in the absence of survey results, it has been assumed that all ponds and surrounding terrestrial habitat within the land required for the Proposed Scheme may support amphibians, including great crested newt, and would be lost during construction. There are also an additional 25 ponds within 250m of the land required for the Proposed Scheme that may be affected by the Proposed Scheme. Annesley Woodhouse Quarries SSSI and Bogs Farm Quarry SSSI have large breeding populations of great crested newt, and loss of suitable terrestrial habitat close to these SSSI could affect great crested newt populations.

7.4.42 The loss of ponds supporting great crested newt and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newt across this area. On a precautionary basis, in the absence of further survey information, it has been assumed that all ponds which would be lost support great crested newt.

7.4.43 Where great crested newt is present, two new ponds would be created for every one lost to the permanent works, and this would contribute towards reducing the effects to 'not significant'. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would require further development. In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newt that would be significant at up to county/metropolitan level.

Birds

7.4.44 The Proposed Scheme would result in the loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland and woodland species. These are likely to include willow tit, which has been recorded along the River Erewash and at the Bentinck Colliery site, barn owl, and declining farmland species such as skylark and yellowhammer. On a precautionary basis, in the absence of additional survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

White-clawed crayfish

7.4.45 Suitable habitat for this species is likely to be present in the Hucknall to Selston area within both large and small watercourses. The Proposed Scheme would pass over the majority of these watercourses on viaducts, and indirect impacts to watercourses would be controlled through measures set out in the draft CoCP. Where the smaller and unnamed watercourses are impacted, particularly around the tributaries for Beauvale Brook and water bodies feeding Bulwell Wood SSSI, habitat loss and severance of connections especially where watercourses are placed into culverts are considered likely. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

Aquatic invertebrates

7.4.46 The land required for the Proposed Scheme would result in loss of habitat along the smaller watercourses suitable for aquatic invertebrates (including Section 41 species of principal importance[62]). On a precautionary basis, in the absence of survey information, it has been assumed that Proposed Scheme would result in permanent adverse effect that would be significant at up to district/borough level.

Terrestrial invertebrates

7.4.47 The land required for the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates (including Section 41 species of principal importance such as dingy skipper butterfly). On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to district/borough level.

[62] Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (England)

Fish

7.4.48 There are records of fish from the main watercourse catchments including species such as brown trout and bullhead (Annex II species[63]), although the Proposed Scheme would pass over these watercourses on viaducts, and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, other smaller watercourses would still be affected, for example through culverting, and may require assessment under the Water Framework Directive (WFD)[64]. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect to the minor watercourses that would be significant at up to district/borough level.

Reptiles

7.4.49 There are records of common reptiles (grass snake) within 2km of the land required for the Proposed Scheme and Annesley Woodhouse Quarries SSSI is known to support grass snake and common lizard. Suitable habitat is likely to be present for reptiles within the land required for the Proposed Scheme, including grassland scrub, hedgerows and field margins. Whilst new grassland and other habitats would contribute towards compensation for habitat loss, on a precautionary basis in the absence of survey information, it has been assumed that there would be a permanent adverse effect that would be significant at up to district/borough level.

7.4.50 Effects on other habitats and species that are significant at local/parish level will be reported in the formal ES.

7.4.51 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered where appropriate. These effects will be reported in the formal ES.

Other mitigation measures

7.4.52 Further measures currently being considered, but which are not yet part of the design and will be informed by the findings of the ongoing field surveys and engagement with relevant stakeholders, include:

- provision of additional broadleaved woodland (non-ancient) to replace those lost, and/or enhancement of remaining woodlands;
- options to modify construction areas and attenuation ponds locally to reduce direct impacts to LWSs, other sites and priority habitats;
- provision of additional hedgerows which would mitigate the losses and maintain the connectivity of the network;
- options to create new species-rich grasslands (including translocation where appropriate) to compensate for grassland losses including at Langton Marshy Grassland LWS, and to compensate for losses of good quality semi-improved grassland;

[63] Annex II of the EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)
[64] EU Water Framework Directive http://ec.europa.eu/environemt/water/water-framework/index_en.html

- considering the need for inclusion of structures to reduce severance effects on bats;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction; design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the permanent works but within the land required for construction of the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

7.4.53 Some of the above may also be achieved through strategic mitigation, which is currently being discussed with relevant stakeholders.

7.4.54 Ancient woodland is an irreplaceable resource and this loss is considered to be a permanent adverse residual effect. The loss of ancient woodland would be partly compensated through a package of measures bespoke to the woodland affected. Ancient woodland soil with its associated seed bank would be salvaged and translocated to receptor sites that have, wherever possible, been chosen because they link to and/or are adjacent to ancient woodland fragments. This would seek to increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and shrub species of local provenance, enhancement of retained woodland, and translocation of coppice stools and dead wood, would be undertaken as appropriate.

Summary of likely residual significant effects

7.4.55 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 14.

Table 14: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Bulwell Wood SSSI	Permanent adverse effect due to changes in hydrology arising from impacts to the connected Bulwell Wood and Pond LWS.	Up to national
Annesley Woodhouse Quarries SSSI	Permanent adverse effect due to changes in hydrology.	Up to national
Bogs Farm Quarry SSSI	Permanent adverse effect on site integrity due to loss of 2% of the	Up to national

Resource/feature	Residual effect	Level at which the effect would be significant
	SSSI and also changes in hydrology.	
Bulwell Wood and Pond LWS	Permanent adverse effect on site integrity due to loss of 0.6ha (3% of the LWS) of woodland with associated pond across the combined Hucknall to Selston and Stapleford to Nuthall areas.	Up to county/metropolitan
Hucknall Airfield LWS, Weaver's Lane Grassland LWS, Langton Marshy Grassland LWS, Kirkby Bentinck Erewash Meadow LWS, Langton Meadow LWS	Permanent adverse effect on site integrity due to loss of LWS grassland habitats and associated species.	Up to county/metropolitan (in each case)
Watnall Brickyard LWS, Watnall Coppice East LWS, Park Forest, Annesley LWS, Annesley Track Verge LWS, and Annesley Woodland II LWS, Bogs Farm Quarry LWS and Maghole Brook and Ashfield District Dumble LWS	Permanent adverse effect on site integrity due to loss of LWS woodland habitats and associated species	Up to county/metropolitan (in each case)
Park Forest, Annesley LWS, Bentinck Void LWS and Maghole Brook and Ashfield District Dumble LWS	Permanent adverse effect due to changes in hydrology.	Up to county/metropolitan (in each case)
Watnall Coppice AWIS	Permanent adverse effect on site integrity due to total or partial loss of ancient woodland.	Up to county/metropolitan
Woodland	Permanent loss of 7ha of broadleaved woodland, loss of wood pasture and parkland and potential adverse effect on unidentified ancient woodlands. New woodland planting is included in the Proposed Scheme.	Up to county/metropolitan.
Hedgerows	Permanent loss of 23km of hedgerows and fragmentation of hedgerow network.	Up to district/borough
Watercourses	Permanent adverse effect from loss and fragmentation of minor watercourses.	Up to district/borough

Resource/feature	Residual effect	Level at which the effect would be significant
Water bodies	Permanent loss of eight water bodies. New water bodies are included in scheme design to address losses	Up to district/borough
Ancient and veteran trees	Permanent adverse effect from potential loss of ancient and veteran trees.	Up to district/borough (in each case)
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Otter	Potential permanent adverse effect on conservation status due to loss and fragmentation of habitat along watercourses.	Up to county/metropolitan
Water vole	Potential adverse effect on conservation status due to loss and fragmentation of habitat along watercourses	Up to county/metropolitan
Polecat	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to county/metropolitan.
Great crested newt	Loss of eight ponds and surrounding terrestrial habitat which may support great crested newt.	Up to county/metropolitan.
Birds	Potential permanent adverse effect on conservation status due to loss, fragmentation and/or severance of habitat for nesting and feeding.	Up to county/metropolitan
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss of habitat and severance, including direct impacts to water bodies and watercourses feeding Bulwell Wood SSSI.	Up to county/metropolitan
Aquatic Invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough

Resource/feature	Residual effect	Level at which the effect would be significant
Terrestrial Invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough
Fish	Potential permanent adverse effect on conservation status due to loss of habitat along watercourses.	Up to district/borough
Reptiles	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough

7.5 Effects arising during operation

Avoidance and mitigation measures

7.5.1 There are no specific measures currently identified to avoid or mitigate ecological effects during operation of the Proposed Scheme within this section of the route.

Assessment of impacts and effects

7.5.2 This section considers the impacts and effects on ecological features during operation of the Proposed Scheme. All assessments are based on a precautionary basis, in the absence of survey information.

7.5.3 In relation to impacts on woodlark and nightjar, HS2 Ltd will continue to consult with Natural England (and other relevant key stakeholders) as the design develops to ensure that the submitted design in the Hybrid Bill complies with the Habitats Regulations 2017. Further assessment of operational effects on woodlark and nightjar will be undertaken and an appropriate design will be developed through an iterative process.

7.5.4 Bats are at risk of being struck by trains or possibly harmed by turbulence, particularly at frequently used commuting/foraging routes which cross the Proposed Scheme. This represents a potential permanent adverse effect on conservation status of the bat species concerned that would be significant at up to the county/metropolitan level.

7.5.5 Barn owls are at risk of colliding with trains, particularly near the River Erewash, where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

7.5.6 Effects on other habitats and species that are significant at the local/parish level during operation will be assessed and reported in the formal ES.

Other mitigation measures

7.5.7 Additional mitigation measures currently being considered include:

- updating the HS2 Ltd barn owl mitigation plan[65] which has been developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with landowners;
- where there is potential risk of nightjar collision with trains, the design will include mitigation measures such as dense planting on the cutting embankment to deter birds from nesting and foraging close to the route; and
- structures to reduce mortality to bats.

Summary of likely residual significant effects

7.5.8 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 15.

Table 15*:* Residual significant effects on ecological resources/features during operation

Resource/feature	Residual effect	Level at which the effect would be significant
Bats	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan

Monitoring

7.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

7.5.10 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Hucknall to Selston area.

[65] Currently in development for Phase One of HS2

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Hucknall to Selston area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.

8.1.2 Engagement with key public health bodies is underway, including with Public Health England (PHE), Directors of Public Health and Health and Wellbeing Boards. The purpose of the engagement has been to increase the understanding of health issues that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.

8.1.3 This section deals specifically with impacts and effects at a local level within the Hucknall to Selston area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3, Route-wide effects.

8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA07 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[66].

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which could result in adverse or beneficial effects on health and wellbeing.

8.2.4 The health determinants of relevance within the Hucknall to Selston area are:

- for impacts during construction (temporary and permanent):
  - neighbourhood quality;

[66] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

  - access to services, health and social care;
  - access to green space, recreation and physical activity; and
  - social capital[67].
- For impacts during operation (permanent)
  - neighbourhood quality

8.2.5 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur.

8.2.6 The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information will be presented in a concise review of the key literature and included in the formal ES. The evidence varies in its strength; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect, but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.

8.2.7 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

8.2.8 Potential health effects have been identified based on information that is available at this stage of the assessment. A full assessment of health effects, applying the assessment criteria set out in the SMR, will be provided in the formal ES.

8.3 Environmental baseline

Existing baseline

Description of communities in the Hucknall to Selston area

8.3.1 For the purposes of the health assessment, the study area is divided into the communities described below, including those settlements that are situated within 1km of the route of the Proposed Scheme. A description of community facilities is provided in Section 6, Community.

[67] The connections between the individuals within communities, and the inclination that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to tangibly support each other

8.3.2 The route of the Proposed Scheme would run through mainly rural areas, comprising agricultural land interspersed with woodland, villages and a number of isolated dwellings and farmsteads. The route of the Proposed Scheme would pass close to the settlements of Hucknall, Annesley Woodhouse, Selston and Pinxton.

Hucknall and surrounds

8.3.3 The town of Hucknall is located approximately 150m east of the route of the Proposed Scheme and there are a number of scattered residential properties, which lie between the town and the route of the Proposed Scheme. The town comprises approximately 14,000 residential properties.

8.3.4 There are a wide range of community resources in Hucknall, including shops (such as The Co-op and Nabbs Lane Pharmacy), post offices, public houses and restaurants, places of worship (including West Hucknall Baptist Church, St. Peter and St. Paul's Church) and education facilities (Edgewood Primary and Nursery School), Heathcotes (Moorgreen) Nursing Home and the Edgewood Leisure Centre.

8.3.5 Other facilities include parks, woodland, sports, and recreational facilities, including Park Forest, Morning Springs and High Park Wood Local Wildlife Sites (LWS) and play spaces, all of which provide opportunities for physical activity and recreation.

Annesley Woodhouse, Selston, Pinxton and surrounds

8.3.6 The village of Annesley Woodhouse comprises approximately 3,200 residential properties, the nearest of which would be approximately 1.2km east of the route of the Proposed Scheme. The A608 Mansfield Road connects Annesley Woodhouse to junction 27 of the M1, and Salmon Lane connects the village of Annesley Woodhouse with the neighbouring village of Selston, located approximately 140m west of the Proposed Scheme. Selston comprises approximately 2,900 residential properties. The village of Pinxton comprises approximately 1,950 residential properties and is located approximately 30m west of the Proposed Scheme and lies partly within the Pinxton to Newton and Huthwaite Community Area (LA08). There are no community facilities in the part of the town/village of Pinxton within the Hucknall to Selston area.

8.3.7 Community resources in Annesley Woodhouse include schools, places of worship, healthcare facilities, shops, restaurants, a post office and public houses.

8.3.8 Within Selston, community resources include a post office, restaurants, healthcare facilities, places of worship (including Selston Church of Christ and Selston Primitive Methodist Church), education facilities (Holly Hill Primary and Nursery School), a public house and Selston Football Club.

Demographic and health profile of the Hucknall to Selston area

8.3.9 The local communities potentially affected by the Proposed Scheme in the Hucknall to Selston area have a relatively low population density, commensurate with the predominantly rural nature of the area.

8.3.10 Data provided by the Office of National Statistics[68] show that this population has a broadly similar health status compared with the national (England) averages.

8.3.11 The population is less deprived than the national average with regard to the combined indices of multiple deprivation[69], and the health domain (a sub-set of the indices of multiple deprivation). The area as a whole is considered to be more resilient than the national average, with regard to changes in relevant health determinants, and with few vulnerabilities in terms of the health status of the population.

8.3.12 The available data provide detail down to ward level and enable a profile to be made of the population within the Hucknall to Selston area. The description of the whole population, and the populations within wards, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. As far as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse health effects. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:

- reducing the loss of property and community assets, insofar as reasonably practicable;
- reducing visual intrusion and noise, insofar as reasonably practicable;
- incorporating landscape design and screening into the design; and
- permanent realignment and diversion of some public rights of way (PRoW) and roads to maintain access (see Section 14, Traffic and transport for further detail).

8.4.2 The locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts insofar as reasonably practicable

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)[70], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

[68] The Office of National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are available by Lower Super Output area.
[69] Department for Communities and Local Government (2015) English Indices of Deprivation 2015. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015
[70] Supporting document: Draft Code of Construction Practice

8.4.4 The CoCP will be the means of controlling the construction works associated with the Proposed Scheme to ensure that the effects of the works upon people and the natural environment are reduced or avoided so far as reasonably practicable.

8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

8.4.6 In the event of any loss of a community facility, the options for mitigating significant community effects to be explored by HS2 Ltd would include:

- improving or altering the remaining portion of the community facility;
- improving other existing community facilities in the area that could reduce the effect;
- improving accessibility to other community facilities; and/or
- identifying land owned by the relevant local authority that could be brought into use as a community facility with its agreement.

Assessment of impacts and effects

Neighbourhood quality

8.4.7 The term 'neighbourhood quality' is used in this assessment to describe the combination of environmental factors that influence people's experience of, and feelings about, their local environment. When these factors are altered people's levels of satisfaction with their living environment may change. In turn, this could affect mental wellbeing or behaviours such as the use of outside space.

8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGVs). These will be assessed in the relevant sections of the ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).

8.4.9 In contrast, a qualitative approach is taken to assessing impacts on neighbourhood quality. The assessment looks at changes in character, tranquillity and amenity across the neighbourhood as a whole, including streets and other public and private outdoor areas. This is judged on a case-by-case basis, taking into account the characteristics of each neighbourhood. It will be informed by the findings from other assessments, but does not rely on the same significance thresholds, as it is not focused on individual receptors. The assessment of health and wellbeing effects considers issues such as

people's feelings of attachment to, and pride in, their neighbourhood and enjoyment of outside space, and how these may change.

8.4.10 The sections most relevant to the neighbourhood quality assessment are: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport.

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no adverse effects with respect to the effects of construction activities on dust soiling and human health within the Hucknall to Selston area, taking account of mitigation measures contained in the CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme may have temporary and permanent[71] impacts on neighbourhood quality in areas close to construction sites, including those at Westville in Hucknall, Annesley Woodhouse, Selston and Pinxton. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, as they may give rise to negative feelings in relation to quality of life and the local environment, and may potentially change behaviours, such as deterring the use of outdoor space.

8.4.13 Construction noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. It is currently expected that the construction of the Proposed Scheme may be visible from a number of locations, as listed in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

8.4.14 Traffic and transport impacts in the Hucknall to Selston area may include:

- construction vehicle movements to and from the various construction compounds and sites;
- temporary and permanent road closures and associated diversions; and
- temporary and permanent alternative routes for PRoW.

8.4.15 Construction traffic, including HGVs, may be present on a number of roads in the area, as listed in Section 14, Traffic and transport.

8.4.16 The link between health and the aesthetic value of the public realm is not well understood, but there is moderate evidence to suggest that an attractive environment can improve people's enjoyment and sense of wellbeing. Conversely, poor quality environments have been shown to have negative effects on people's health. There is moderate evidence that people have a preference for views of natural environments

[71] The SMR defines temporary changes (impacts) to health determinants as short term (<6 months), medium term (6 months – 2 years), and long term (2 years +). Permanent impacts have not been defined in the SMR. A change in a health determinant lasting 4 years or more will be considered as a permanent impact. A professional judgement will be made as to when an impact would lead to a permanent effect on the health of the population.

over man-made environments, and that exposure to views of natural environments is associated with increased wellbeing.

8.4.17 Settlements in the Hucknall to Selston area include the largely urbanised town of Hucknall and the smaller, rural villages of Annesley Woodhouse, Selston, and Pinxton. Construction activities and permanent structures would be visible from a number of locations due to the scale of the Proposed Scheme. Section 11, Landscape and visual, identifies locations that may experience changes to existing views, including roads, PRoW and views from properties close to the Proposed Scheme. Effects on views of the rural landscape may have negative impacts on residents' perceptions of the quality and character of their local environment, leading to a reduction in wellbeing.

8.4.18 Overall, it is considered that the construction of the Proposed Scheme has the potential to affect wellbeing through changes to neighbourhood quality. This will be assessed in the formal ES.

Access to services, health and social care

8.4.19 There is strong evidence linking access to healthcare facilities with health outcomes, and there is also weak to moderate evidence to suggest that transport problems are a key barrier to people's ability to access these services. There is moderate evidence to suggest that access to shops and other local services can affect health. This is based on a range of factors affecting quality of life, and includes issues such as reducing feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.

8.4.20 The Hucknall to Selston area is predominantly rural in character. Typically, there is a reliance on shops and services in nearby towns and villages. Opportunities to access alternative services and facilities are limited, resulting in the necessity to travel longer distances to access alternative facilities. There is potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. This will be assessed and reported in the formal ES.

Access to green space, recreation and physical activity

8.4.21 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and local amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.

8.4.22 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:

- impacts of construction traffic, including HGVs, on pedestrians and cyclists;
- any loss of green space or facility used for physical activity; and
- the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians.

8.4.23 The route of the Proposed Scheme would intersect a number of PRoW in the Hucknall to Selston area. The effects on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be reported in the formal ES.

8.4.24 Construction traffic would mainly use site haul routes along the route of the Proposed Scheme. Some construction traffic, however, including HGVs, would be present on a number of roads in this area, as outlined in Section 14, Traffic and transport. This could obstruct or deter pedestrians, cyclists and equestrians from using these routes. In the case of recreational users, it is considered that alternative routes are likely to be available in most cases, and therefore that impacts on the affected roads would not reduce overall levels of recreational NMUs. For those using affected routes for active travel to work or to access shops and services, there is the possibility that people would choose instead to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

8.4.25 It is estimated that approximately 15% of Park Forest would be lost temporarily for a period of approximately three years and five months, and 5% of Park Forest would be lost permanently as a result of construction of the Misk Hill and Park Forest cutting and Park Forest embankment[72]. Park Forest is bisected by the M1 and provides recreational footpaths and trails for users. Park Forest is a designated LWS and access to Park Forest makes a positive contribution to the local community through the provision of an area for physical activity and access to green space. While there are alternative woodlands at Morning Springs LWS and High Park Wood LWS, neither of these facilities are easily accessible from Hucknall or Annesley Woodhouse whereas Park Forest is readily accessed from these locations. The temporary loss of 15% of the Forest would have an adverse effect on health and wellbeing; however, the permanent loss of only 5% of the Forest would not result in an adverse health and wellbeing effect for users, given the small area of space lost compared to the overall quantum[73].

Social capital

8.4.26 The connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other, is important for health and wellbeing. A measure of the effectiveness of these connections within communities is termed 'social capital' and is a recognised determinant of health. The Office for National Statistics defines social capital as follows:

8.4.27 'In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust.'[74]

[72] These figures will be refined in the formal ES
[73] These figures will be refined in the formal ES
[74] Office for National Statistics- Measuring Social Capital. Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

8.4.28 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A change in social capital has the potential to influence health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

8.4.29 The settlements along the route support well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including satellite compounds in the vicinity of the settlements of Hucknall, Annesley Woodhouse, Selston and Pinxton. The duration of the works at each site would range from approximately one to four years. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds and workers using facilities such as shops, restaurants and public houses within local settlements, particularly Hucknall, Annesley Woodhouse, Selston and Pinxton.

8.4.30 The introduction of a temporary construction workforce into communities has the potential to alter people's perceptions and interactions within their communities, modifying behaviour and the value they place on social capital. Such a reduction in social capital has the potential to adversely affect wellbeing, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.

8.4.31 The draft CoCP includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

8.4.32 The Community section of the ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.

8.4.33 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its characteristics. Therefore not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.34 Within Annesley Woodhouse, one residential property would be demolished as a result of the construction of the Annesley Lane cutting. However, the demolition of this property would not constitute an erosion of social networks and impact on

residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.35 Within Selston, nine residential properties would be demolished as a result of the construction of the Salmon Lane embankment. However, the demolition of these properties would not constitute an erosion of social networks and impact on resident's health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.36 Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.37 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities. Potential health and well-being effects will be reported in the formal ES.

Other mitigation measures

8.4.38 Any other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal ES.

8.4.39 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.

8.4.40 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential adverse effects identified in this assessment. Any other mitigation measures will be described in the formal ES.

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Hucknall to Selston area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby neighbourhoods, as described in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

Other mitigation measures

8.5.3 If a need is identified for mitigation to reduce adverse impacts on health determinants during the operation of the Proposed Scheme in this area, the mitigation will be described in the formal ES.

Monitoring

8.5.4 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

8.5.5 No area-specific monitoring of health effects during the operation of the Proposed Scheme have been identified at this stage.

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within Hucknall to Selston area. Consideration is given to the extent and value (significance) of heritage assets including archaeological and palaeo-environmental remains, historic buildings, the built environment and historic landscape.

9.1.2 Engagement has been undertaken with Historic England (HE) and Nottinghamshire County Council (NCC), Derbyshire County Council (DCC) and other local authorities including Ashfield District Council (ADC) and Broxtowe Borough Council (BBC). The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book. Only designated heritage assets within the Hucknall to Selston area are shown on maps CT-10-371b to CT-10-374a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

9.1.4 A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal ES. The formal ES will also include a Historic Landscape Characterisation Report, which will identify historic landscape character areas potentially affected by the Proposed Scheme.

9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) or Historic Environment Record (HER) name and number (numbers prefixed MNT). If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[75], including the method for determining the value of a heritage asset and magnitude of impact (Tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the

[75] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m in urban areas and 500m in rural areas. This is referred to in the remainder of this assessment as the 250m or 500m study area.

9.2.4 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.

9.2.5 The historic environment methodology includes consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.

9.2.6 Where noise is considered, this is within the context of the contribution that this makes to the heritage significance of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.7 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, the results of which will be reported in the formal ES.

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. However, the exception to this is, Kirkby Furnace, Kirkby-in-Ashfield (MNT16502) which, although within the land required for the construction of the Proposed Scheme, would not be physically impacted. In addition, Hucknall Aerodrome (MNT10444) although within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant.

9.2.9 With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

9.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered but have been included in the baseline, as part of the historic landscape character and will be considered as part of the overall assessment of impacts on historic landscape reported in the formal ES.

9.2.11 In undertaking the assessment, the following limitations were identified and assumptions made:

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;

- desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and
- intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.2.12 At the time of writing, the Nottinghamshire HER data were not fully available, and will be reported in full in the formal ES.

9.3 Environmental baseline

Existing baseline

9.3.1 Baseline data were collated from a variety of sources in compiling this assessment, including:

- the NHLE (Historic England register of designated heritage assets);
- Derbyshire HER;
- conservation area appraisals;
- historic maps and aerial photography; and
- relevant documentary and published sources at Derbyshire and Nottinghamshire County Record Offices.

9.3.2 In addition to collating documentary baseline data, site visits have been undertaken.

Designated assets

9.3.3 There are no designated heritage assets located partially or wholly within the land required for the Proposed Scheme.

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within the 2km study area:

- five scheduled monuments comprising: Greasley Castle (NHLE 1020943), Beauvale Carthusian Priory (NHLE 11002920), Annesley motte and bailey castle (NHLE 1009305, All Saints Church. Annesley and graveyard (150m south of Annesley Hall Lodge) (NHLE 1020778) and Fishponds 170m south of Damstead Farm (NHLE 1018119), all of high value;
- one Grade I listed building: Ruins of Church of All Saints, Annesley (NHLE 1234999) within the All Saints Church. Annesley and graveyard (150m south of Annesley Hall Lodge) Scheduled Monument (NHLE 1020778), of high value;
- three Grade II* listed buildings: Beauvale Priory Church and attached Priors lodgings (NHLE 1278052), Beauvale House service wing and stables and garden wall (NHLE 1278051),Moorgreen and the Church of St. Helen, Selston (NHLE 1275170), all of high value;
- 24 individual Grade II listed buildings, including: four farmhouses, four buildings relating to Beauvale Manor, five buildings associated with Annesley

Hall, one church, one war memorial and nine other domestic, rural, commercial and industrial buildings, all considered to be of moderate value; and

- one Grade II* registered park and garden: Annesley Hall (NHLE 1001077), of high value.

Non-designated assets

9.3.5 The following non-designated assets of moderate value lie wholly or partially within the land required for the Proposed Scheme:

- Kirkby Furnace, Kirkby-in-Ashfield (MNT16502).

9.3.6 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:

- Hucknall Aerodrome (MNT10444);
- Misk Hills, Hucknall - Roman pottery scatter (MNT2228);
- Roman pottery from Hucknall (MNT2227);
- Two Dales Farm and associated outbuildings (identified on the 1880 OS);
- windmill in Kirkby-in-Ashfield parish (MNT13989); and
- engine in Kirkby-in-Ashfield parish (MNT2423).

9.3.7 Non-designated heritage assets located partially or wholly within the 500m study area include:

- Beacon Hill – Beacon (MNT15643);
- Misk Farm, Misk (MNT25744);
- post-medieval Village of Annesley (MNT17082);
- Garfit's House/Grange Farm, Annesley (MNT25077);
- coal mine, Selston (MNT13984);
- Langton Hall (MNT 14059); and
- Cliff Farmhouse and Cart Shed (MNT 24981).

Historic environment overview

9.3.8 There is no evidence for prehistoric activity within the study area. The study area is located on an area of higher ground between the river valleys of the River Leen, to the east of Hucknall, and the River Erewash, between Selston and Pinxton. Both of these rivers flow into the Trent Valley, to the south, which has a greater concentration of known prehistoric archaeological remains.

9.3.9 The earliest archaeological evidence are the discovery of two scatters of Romano-British pottery in relative proximity to each other. The first was recovered from Misk Hill (MNT2228) and the second (MNT2227) from approximately 220m north of the

first. Both are located within 500m of the Proposed Scheme. These concentrations of Romano-British pottery in proximity to each other may indicate that there is a settlement of this date in the immediate vicinity.

9.3.10 There is currently no archaeological evidence for early medieval activity within the study area. However, Hucknall, Greasley, Annesley and Selston are all included within the Domesday Survey of 1086 indicating that these settlements had been established by at least the mid-11th century.

9.3.11 There is extensive evidence for activity during the medieval period within the Hucknall to Selston area. Greasley Castle (NHLE 1020943) is located to the west of land required for the Proposed Scheme. The castle is first recorded within historic documents at the end of the 13th century as a manor house. In 1340, the owner of the manor, Nicholas de Cantelupe, gained a licence to crenellate[76] from Edward III, from which point the manor was recorded as Greasley Castle.

9.3.12 Following gaining a licence to crenellate, Nicholas de Cantelupe also received permission from Edward III in 1343 to establish a monastery at Beauvale. Beauvale Carthusian Priory (NHLE 1002920), a scheduled monument, is located approximately 450m west of the land required for the Proposed Scheme. The scheduled area contains the standing remains of the Grade II* listed Priory Church and attached Priors lodgings (NHLE 1278052), Grade II listed gatehouse range (NHLE 1248104) and Beauvale Priory boundary wall (NHLE 1278053). The Grade II listed Beauvale Abbey Farmhouse (NHLE 1248103) dates to the 16th century and was partially constructed using reclaimed stone from the priory buildings.

9.3.13 The Annesley Castle Scheduled Monument (NHLE 1009305) is a motte and bailey castle likely to have been constructed in the early 13th century. The castle is located within the medieval Grade II* Registered Park and Garden of Annesley Hall (NHLE 1001077). The park dates from the 13th century and contains the Grade II listed Annesley Hall (NHLE 1234836) which was originally constructed as an aisled hall in the mid to late 13th century but has been recently partially destroyed by fire.

9.3.14 The registered park and garden also contains the standing remains of the Grade I listed Ruins of Church of All Saints (NHLE 1234999), the earliest phase of which dates to the 12th century. The location of the post-medieval village of Annesley (MNT17082) lies to the immediate south-west of the church. The land required for the Proposed Scheme lies adjacent to the boundary of the registered park.

9.3.15 Approximately 60m east of the land required for the Proposed Scheme lie a series of Fishponds 170m south of Damstead Farm that are designated as a scheduled monument (NHLE 1018119). These fishponds were excavated in the medieval period to exploit the natural valley through which the Cuttail Brook flows. The fishponds were historically part of the estate associated with Annesley Hall.

9.3.16 The study area contains substantial evidence for coal mining dating from the 19th century onwards. There is evidence for earlier coal mining activity, as the monks at

[76] A license to crenellate was issued by the ruling monarch and allowed the holder to fortify their property. These licenses were issued between the 12th and 16th centuries.

Beauvale Priory were granted a lease in 1457. However, it was not until the 19th century that the Middle Pennine Coal Measure was systematically exploited. Evidence for this includes the New Watnall Colliery (1880 OS map), with an adjacent brick works located within the land required for the Proposed Scheme, and a coal mine at Selston (MNT13984).

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[77] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
- route-wide principles, standards and techniques for works affecting heritage assets; and
- a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

Temporary effects

9.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts would occur to assets both within the land required for the Proposed Scheme and to assets in the wider study area as a result of changes to their settings.

9.4.4 The following significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets due to changes to their settings.

9.4.5 Annesley Hall (NHLE 1001077) is a Grade II* registered park and garden of high value. It abuts the eastern edge of land required for the Proposed Scheme. Associated with the parkland are the scheduled remains of Annesley Castle (NHLE 1009305) and All Saints Church and graveyard, a scheduled monument (NHLE 1020778), and Grade I listed building (NHLE 1234999) along with five Grade II listed buildings, including the hall building itself, Annesley Hall (NHLE 1234836). The registered parkland provides a positive contribution to the setting of these designated heritage assets. The parkland has historic and evidential value as an early medieval deer park, with well-preserved

[77] Supporting document: Draft Code of Construction Practice

17th and 19th century terraces and pleasure grounds. Its setting is defined by its surrounding estate land of fields and woodland that is represented by place names such as Kennel Lane and Park Forest. To the east and north, the parkland has been severed by the A611 and A608 respectively, while to the west, the parkland affords notable incidental views towards the Proposed Scheme. However existing designed landscape planting screens this view from the cluster of listed buildings at Annesley Hall (NHLE 1234836), Annesley motte and bailey castle (NHLE 1009305), and the gatepier at South Lodge, Annesley Hall (NHLE 1235003) from within the parkland. Land required for the construction of the Proposed Scheme abuts the western edge of the parkland and the setting would be affected by construction activities associated with Audrey Wood viaduct and the temporary movement of construction traffic along the edge of the parkland to Kennel Lane satellite compound. This would be a temporary effect on the registered park and garden and constitutes a low magnitude of impact, resulting in a moderate adverse effect.

Permanent effects

9.4.6 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

9.4.7 The following significant effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme:

- the location of Roman pottery (MNT2227 and 2228) is indicative of a potential Romano-British settlement. The potential settlement, if present, would be of moderate value. The site is located within land required for the construction of the Proposed Scheme next to Misk Hill and Park Forest cutting. The remains would be physically impacted by construction activity. This would have a high magnitude of effect resulting in a moderate adverse impact;
- Two Dales Farm and associated outbuildings are recorded on the 1880 OS map and are non-designated heritage assets of low value. The buildings are located within the land required for the Proposed Scheme as part of the construction of the Salmon Lane embankment and would therefore be demolished. This would have a high magnitude of impact resulting in a moderate adverse effect; and
- The archaeological remains, likely to comprise the foundations, of a windmill (MNT13989) and associated engine (MNT2423) in Kirkby-in-Ashfield parish are non-designated assets of low value. Situated south of the B6018 Park Lane the assets are within the land required for the construction of the Proposed Scheme. The archaeological remains of the windmill and its engine house would be physically impacted as part of construction of the Park Lane cutting. This would have a high magnitude of impact resulting in a moderate adverse effect.

9.4.8 The following significant effects are currently expected to occur as a result of permanent impact on the setting of designated or non-designated heritage assets:

- The setting of Annesley Hall (NHLE 1001077), a Grade II* registered park and garden of high value located 270m from the Proposed Scheme (discussed above), would be affected by Audrey Wood viaduct. This would adversely affect notable views to the west from within the parkland. These views are considered to be important to the understanding of the landscape setting for the park and are located on the western edge of the registered parkland. The listed buildings within the park (as noted above) are screened by existing planting and the Proposed Scheme will not appear in any key views of the buildings within their parkland setting. However, the Proposed Scheme, particularly the Audrey Wood viaduct, would impact the ability to fully appreciate the heritage significance of the registered park through changes in its setting and relationship to its surrounding estate landscape. This impact would be seen in proximity to the current route of the M1. This would constitute a low magnitude of impact resulting in a moderate adverse significance of effect.

Other mitigation measures

9.4.9 No additional construction phase mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, however potential opportunities for further mitigation measures will continue to be considered through detailed design. These may include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and
- locations where the physical impacts on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

9.4.10 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and would be restricted to the duration of the construction works.

9.4.11 As no specific mitigation measures have yet been identified in relation to heritage assets described above, the residual effects are the same as those reported under permanent effects. Over time, the effect on the setting of some heritage assets could change as planting matures and the Proposed Scheme assimilates into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the Map Series CT-06 within the Volume 2: LA07 Map Book:

- noise mitigation measures have been included within the Proposed Scheme that could reduce potential impacts on some heritage assets; and

- Landscape planting could increasingly reduce impacts on the setting of the designated assets within the study area as it matures.

Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent.

9.5.3 During the operation of the Proposed Scheme no further ground works are anticipated, and as such, there would be no further physical impacts on heritage assets arising from the operation of the Proposed Scheme.

9.5.4 Impacts on heritage assets due to changes in their settings arising from the presence of the Proposed Scheme are reported as permanent construction effects and are not repeated in detail here, although they would continue throughout the operation of the Proposed Scheme.

9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or appreciated, for example as a result of increased noise or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

9.5.6 It is currently anticipated that in relation to Annesley Hall (NHLE 1001077), a Grade II* registered park and garden that there would be no significant effects as a result of the operation of the Proposed Scheme and that therefore the significance of effect would remain as described for the permanent construction phase effect.

Other mitigation measures

9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, no additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified. Potential opportunities for further mitigation have not been identified, and will be considered as part of the detailed design process.

Summary of likely residual significant effects

9.5.8 As no mitigation beyond that described has been identified, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

9.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage.

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Hucknall to Selston area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), areas of historical mineral extraction and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Nottinghamshire County Council (NCC), Ashfield District Council (ADC), Broxtowe Borough Council (BBC), the Environment Agency, the Coal Authority, the Animal and Plant Health Agency (APHA), the Open University Geological Society East Midlands, the Geological Society Regional Group East Midlands, the Nottinghamshire Biological and Geological Records Centre and the Nottinghamshire RIGS Group. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book.

10.1.4 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3: Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[78].

10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased up to 1km.

[78] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the conceptual site model (CSM) approach, and the lack of contact with nearby potentially contaminated sites, and the absence of sensitive receptors within the roadways reduces the risk of an impact occurring to very low levels. The impact of laying these new and diverted utilities has therefore been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.

10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.

10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.

10.2.7 The minerals assessment is based upon the mineral resources[79] identified on published minerals plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the relevant minerals plans).

10.2.8 The geo-conservation assessment is based upon local authority and publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping (OS), the BGS, the Coal Authority, NCC, ADC, BBC, Public Health England (PHE), the Environment Agency, Natural England, APHA, as well from local geological trusts.

[79] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDL), Shale Protection Areas (ShPA)'

Geology

10.3.2 This section describes the underlying ground conditions within the Hucknall to Selston area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[80].

10.3.3 Table 16 provides a summary of the geology (made ground, superficial and bedrock units) underlying the study area.

Table 16: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Western extent of Hucknall Airfield, northwest of Annesley Woodhouse and where the Proposed Scheme would cross the B6019 Kirkby Lane.	Artificial ground comprising variable deposits of reworked natural and man-made materials.	Not classified
Superficial			
Head deposits	Located near Misk Hill and adjacent with the Cuttail Brook.	Typically gravel, sand and clay.	Unproductive
Alluvium	Associated with the River Erewash, Maghole Brook, Cuttail Brook, an unnamed drain through Beauvale, and south of Whyburn House/Farm.	Clay, silt, sand, peat and gravel.	Secondary A
Glaciofluvial deposits	Located west of Hucknall, west of Annesley Woodhouse, and north of Millington Springs Woodland.	Sand and gravel, locally with silt, clay or organic material.	Secondary A
Glacial till[81]	Present throughout the majority of the study area from Misk Hill to the B6018 Park Lane near Kirkby Park.	Variable typically comprising sandy, silty clay with pebbles.	Secondary Undifferentiated
Bedrock			
Lenton Sandstone Formation	Located across the centre of the study area from the west of Eelhole Wood to the A608 Mansfield Road.	Sandstone with mudstone and conglomerate.	Principal
Zechstein Group – Edlington Formation	Where the route of the Proposed Scheme would cross Starth Wood and Hollybush Farm to the west of Westville.	Mudstone with siltstone and sandstone. Dolostone (dolomitic limestone) and gypsum/anhydrite (sulphate rich mineral) are also locally encountered.	Secondary B
Zechstein Group – Cadeby Formation	Southern extent of the study area to Kirkby Woodhouse, and south of where the route of the Proposed Scheme would cross Salmon Lane.	Dolostone (dolomitic limestone) with mudstone, dolomitic siltstone and sandstone.	Principal

[80] British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01.* Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904

[81] Glacial till is sometimes described as diamicton in the BGS lexicon. The term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case the term "glacial till" refers to diamicton of glacial origin.

Geology	Distribution	Formation description	Aquifer classification
Pennine Coal Measures Group – Pennine Middle Coal Measures Formation	North of The Dumbles and Millington Springs Woodland and where the route of the Proposed Scheme would cross Salmon Lane.	Mudstone, siltstone, sandstone with coal seams.	Secondary A

Made ground

10.3.4 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled. There is evidence of historical and authorised landfilling within the area, which may comprise more significant deposits of made ground.

10.3.5 The BGS geological mapping[82,83] including artificial ground mapping data, indicates the presence of made ground within the western extent of Hucknall Airfield and adjacent to the east of the land required for the construction of the Proposed Scheme around Misk Hill. Further presence of made ground has been identified across a large area to the northwest of Annesley Woodhouse (associated with the site of the former Portland and Annesley Bentinck Colliery, and Bentinck and Kirkby Farm open cast coal sites), and an area within the northern extent of the study area where the route of the Proposed Scheme would cross the B6019 Kirkby Lane (corresponding with the historical Langton Hall Colliery).

10.3.6 No known farm burial or pyre sites associated with the 1967 and 2001 outbreaks of foot and mouth Disease (FMD) are known to be present within the Hucknall to Selston study area. The 2001 to 2002 FMD outbreak risk assessment map[84] identifies the Hucknall to Selston study area to lie within a FMD free county. However, older unrecorded sites may be present from the 1967 outbreak. Similarly, anthrax-infected cattle burials may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials.

Superficial geology

10.3.7 Head deposits are associated with slopes, forming down-slope layers and fans of accumulated material. Head deposits are present in localised areas to the west of Hucknall and along a section of the Cuttail Brook. These typically comprise sand and gravel but can also contain silt, clay and peat.

10.3.8 Alluvium deposits variably comprising silty clay, silt, sand, peat and gravel occurs along the courses of streams and rivers. Alluvium in the study area is associated with the River Erewash, Maghole Brook and Cuttail Brook. Further localised alluvial deposits are also present, associated with an unnamed drain that flows through Beauvale and south of Whyburn Farm.

[82] BGS (2014), geological map sheet 125 (Derby) and 112 (Chesterfield) 1:50,000 scale (Solid and Drift)
[83] BGS (2016) Geology – 1:50,000 (DIGMapGB-50) Artificial Version 8
[84] Animal Plant and Health Agency (2001), *Foot and Mouth Disease 2001 County Status Map 01.10.2001*

10.3.9 Glaciofluvial deposits comprising sand and gravel are present at intermittent locations to the west of Hucknall, west of Annesley Woodhouse and north of Millington Springs Woodland. The Proposed Scheme would also cross an isolated area of these deposits to the north-west of Hucknall.

10.3.10 Glacial till deposits typically comprising sandy, silty clay with gravel are present throughout the majority of the study area from Misk Hill to the B6018 Park Lane.

Bedrock geology

10.3.11 The Lenton Sandstone Formation overlies the older Zechstein Group and outcrops in small areas towards the centre of the study area from the west of Eelhole Wood to the A608 Mansfield Road. This formation comprises sandstones with subordinate beds of mudstone and conglomerate.

10.3.12 The Lenton Sandstone Formation overlies the Edlington Formation, which in turn overlies the Cadeby Formation, both of which form part of the Zechstein Group. The Cadeby Formation is a dolostone with mudstone, dolomitic siltstone and sandstone. The Edlington Formation is a mudstone, with siltstone and sandstone. However, locally within the Nottinghamshire area, sandstone is more common. Dolostone and gypsum/anhydrite may also be present within this unit. From the southern extent of the study area to Kirkby Woodhouse, the Zechstein Group is the dominant shallow bedrock geology.

10.3.13 The Pennine Middle Coal Measures Formation, which is the dominant bedrock geology outcropping across the northern third of the study area, is described as an alternation of sandstone, siltstone and mudstone, with frequent coal seams. This formation either outcrops or is present beneath superficial deposits from the north of the A608 Mansfield Road within the northern extent of the study area. The Pennine Coal Measures Group is present below the younger Zechstein Group.

Radon

10.3.14 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential Dataset[85].

10.3.15 Within the central section of the study area to the west of Annesley Woodhouse and Hucknall, it is indicated that between 5% and 10% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m^3) for residential properties. The remainder of the study area is either within a radon area of intermediate probability (between 1% and 3% of homes, or between 3% and 5% of homes) or within a radiation area of lower probability (less than 1% of homes).

[85] British Geological Survey (2018), *Radon data: radon potential dataset*. Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. This data set underpins Public Health England's Indicative Atlas on Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers, A.H. (2007). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 078-0-85951-608-2.29 pp). Available online at: www.ukradon.org/information/ukmaps

10.3.16 The formal ES will include an assessment of areas where 5% and over of homes are estimated to have radon levels at or above the action level of 200 Bq/m^3.

Groundwater

10.3.17 Five aquifer designations have been identified within the study area, as defined by the Environment Agency[86]:

- the Lenton Sandstone Formation and the Cadeby Formation of the Zechstein Group are designated Principal aquifers;
- alluvium, glaciofluvial deposits and the Pennine Middle Coal Measures of the Pennine Coal Measures Group are designated as Secondary A aquifers;
- the Edlington Formation of the Zechstein Group is designated as a Secondary B aquifer;
- glacial till is designated as Secondary (Undifferentiated) aquifers; and
- head deposits are designated as Unproductive strata.

10.3.18 The Environment Agency reports that there are no licensed private groundwater abstractions located within the study area, although it is recognised that other unlicensed abstractions may exist.

10.3.19 The centre of the study area, to the west and north-west of Hucknall, lies within a total catchment (Zone 3) groundwater source protection zone (SPZ)[87]. This extends between Beacon Hill Farm and junction 27 of the M1. This SPZ is associated with multiple public water supply (utility) groundwater abstractions that are located beyond the study area. No inner (Zone 1) or outer (Zone 2) SPZ are identified within the study area. In addition, the study area does not lie within a groundwater Drinking Water Safeguard Zone.

10.3.20 Details of the licensed abstractions are provided in Section 15, Water resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.21 Further information on groundwater in the Hucknall to Selston area is provided in Section 15, Water resources and flood risk.

[86] Environment Agency (2017), New groundwater vulnerability mapping methodology mapping in England and Wales, Report SC040016/R
[87] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

Surface water

10.3.22 The River Erewash is designated as a main river by the Environment Agency and would be crossed by the route of the Proposed Scheme near Pinxton. This watercourse is located within the northern extent of the study area to the north of a mineral railway line (Sutton Junction to Pye Bridge Railway, an out-of-use spur), to the west of Lower Portland Farm.

10.3.23 A single tributary of the River Leen, designated a main river, and two tributaries of the River Erewash – including Beauvale Brook (ordinary watercourse) and Maghole Brook (ordinary watercourse) – would also be crossed by, or appear to start within the land required for the construction of the Proposed Scheme.

10.3.24 Surface water bodies in the Hucknall to Selston area are described in more detail in Section 15, Water resources and flood risk.

10.3.25 There are no licensed surface water abstractions located within the study area. The study area does not lie within a surface water Drinking Water Safeguard Zone. Further information on surface water in the Hucknall to Selston area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.26 Current potentially contaminative land uses within the study area includes six industrial and commercial sites. The key potentially contaminative sites are:

- Ambergate–Pye Bridge railway line;
- A-one+ depot and Highways England outstation;
- Sherwood Business Park;
- Brookhill Industrial Estate; and
- works and engineering contractors located along Kirkby Lane.

10.3.27 Historical land uses identified within the study area with the potential to have caused contamination include four historical landfill sites, 25 mining sites and nine industrial sites. Infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed. The key historical potentially contaminative sites are:

- collieries including New Watnall and Langton Hall;
- RAF Hucknall (military airfield) and Rolls-Royce test centre;
- New Watnall Colliery branch railway;
- landfills at Eel Hole Farm and Portland Fields; and
- Bentinck and Kirkby Park Opencast workings.

10.3.28 Further details of these key current and historical contaminative land uses, within the study area are shown in Table 17, Table 18 and Table 19.

Table 17: Current and historical landfill sites located in the study area

Name and Area Reference	Location	Description
Eel Hole Farm/Hucknall Airfield (LA07-01 and LA07-03)	Eel Hole Farm is within the land required for the construction of the Proposed Scheme and Hucknall Airfield landfill is adjacent east, crossing the B6009 Long Lane and south of Eel Hole Farm	Environment Agency records state that the historical landfill was licensed in November 1977 to receive inert waste. The first deposit of waste occurred in December 1976 and the last input was in March 1994. The licence was surrendered in April 1994. The landfill occupied an area of 0.54ha.
Alfreton Skip Hire (LA07-30)	Located at Kirkby Park Farm 130m south-west of the land required for the construction of the Proposed Scheme	Environment Agency records do not provide any information about disposal dates and licenses. No record of licence or licence surrender. The landfill occupied an area of 7.84ha.
Portland Fields (LA07-31)	Located north of the A6018 Park Lane from 150m to the north-east of the land required for the construction of the Proposed Scheme	Environment Agency records state that the historical landfill was licensed to receive inert, industrial, commercial and household waste between October 1965 and December 1974. The closure and licence surrender dates are not known. The landfill occupied an area of 55.62ha.

Table 18: Current and historical mining, mineral sites and colliery spoil sites located within the study area

Name and Area Reference	Location	Description
New Watnall Colliery (LA07-07)	Located within the land required for the construction of the Proposed Scheme west of Hucknall beside the M1	Historical coal colliery with five shafts. Also with lime kilns and brickworks. Colliery operations started in 1875 and worked for 75 years.
Historic pits and quarries (LA07-17, LA07-18, LA07-23 and LA07-69)	A portion are located within and a portion outside the land required for the construction of the Proposed Scheme being located between Hucknall and Annesley Woodhouse beside the M1	A number of small scale pits and quarries dating from the end of the 19th century, most now infilled. Lime kilns were present in some, suggesting limestone extraction.
Portland Colliery (no 2) and Annesley Bentinck Colliery (LA07-26)	Both areas are located within the land required for the construction of the Proposed Scheme being located between Selston to the west and Annesley Woodhouse to the east	Coal colliery site later becoming Kirkby Farm opencast pits and tips with associated railway infrastructure. A number of underground shafts were also sunk. Mineral mined was coal. Colliery closed in 2000 and opencast now disused with majority of footprint still evident along with spoil heaps and ponds. Mine spoil from Annesley is recorded as being tipped at this site.
Langton Hall Colliery (LA07-40)	Located within the land required for the construction of the Proposed Scheme east of Pinxton on B6019 Kirkby Lane	Langton Hall Colliery (coal) with a gasometer at the end of the 19th century; expanding over time with numerous pits, railway land and spoil heaps to end of historic mapping. Current mapping shows infilled land with a number of office/light commercial buildings. Operated at least until 1973.
Shallow mine workings (coal), approx. 25 shafts and unnamed mines (LA-87 and LA-92)	Both areas are located within the land required for the construction of the Proposed Scheme being east of Pinxton	Mine entries from records held by the Coal Authority.

Table 19: Current and historical industrial sites located within the study area

Name and Area Reference	Location	Description
Hucknall Airfield (LA07-01)	Located south-west of Hucknall off Watnall Road, the largest part is within the land required for the Proposed Scheme. The smaller landfill component, is outside the land required for the construction of the Proposed Scheme	Historic military airbase to 1970, later operated as a Rolls Royce test centre. Currently being converted into a mixed-use development called Hawkers Place.
New Watnall Brickworks (LA07-07)	Located within the land required for the construction of the Proposed Scheme being located west of Hucknall beside the M1	Lime kilns and brickworks. 4no kiln chimneys present in the works. Chimneys demolished 2009. Linked with the colliery site. 1990.
Former railway (LA07-08)	Partly located within and partly outside the land required for the construction of the Proposed Scheme being west of Hucknall roughly following the path of the M1	New Watnall Colliery branch line the East Midlands Mainline until circa 1960, currently part undeveloped and part of the M1 motorway.
A-one+ depot and Highways England outstation (LA07-21)	Located 150m west of the land required for the construction of the Proposed Scheme being close to Junction 27 of the M1 northbound	A highways maintenance depot with construction vehicles and equipment.
Railway (LA07-35)	Located within the land required for the construction of the Proposed Scheme south of Pinxton running in an east-west direction	Ambergate–Pye Bridge railway line forming a link between the Erewash Valley and Midland Main lines. At present freight only.
Brookhill Industrial Estate (LA07- 91)	Located 150m west of the land required for the construction of the Proposed Scheme being south of Pinxton centred around Brookhill Road	Numerous heavy industrial and commercial sites including plastic fabrication and vehicle scrappage yards.

10.3.29 Contaminants commonly associated with the sites in Table 17, Table 18 and Table 19 could include metals, semi-metals, asbestos, organic and inorganic compounds. Additionally, infilled pits and landfills could also give rise to landfill gases such as methane or carbon dioxide and leachate.

10.3.30 Contaminants commonly associated with mining and mineral sites (Table 18) could include heavy metals, acid mine waters and mine gases such as methane, carbon dioxide and hydrogen sulphide.

Other regulatory data

10.3.31 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents, and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences). Five minor pollution incidents (Category 3) to controlled waters were reported between 1996 and 1998.

10.3.32 There are no Control of Major Accident Hazards (COMAH) sites in the study area.

10.3.33 There is a single permitted local authority pollution prevention control site within the study area for Van Elle Holdings Ltd. and this is located 225m north-east of the land required for Proposed Scheme and just south of B6019 Kirkby Lane. The permit relates to the process of burning waste oil.

10.3.34 The Environment Agency reports that there are no consented discharges to groundwater within the study area. There are five consented discharges to surface water (two currently revoked) within the study area, both are shown within the land required for the Proposed Scheme. Further details on these consents can be found in Section 15, Water resources and flood risk.

10.3.35 There are two nationally significant ecological designated sites within the study area and as defined in the land quality section of the SMR[88]. These are as follows:

- Annesley Woodhouse Quarries are located 70m east of the Proposed Scheme and this is also designated as a site of special scientific interest (SSSI), being located between Annesley Woodhouse and Selston; and
- Bogs Farm Quarry is classified as a SSSI and it is adjacent east of the Proposed Scheme to the south-west of Kirkby Woodhouse.

10.3.36 Further information on ecological designated sites in the study area is provided in Section 7, Ecology and biodiversity.

Mining/mineral resources

10.3.37 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These include coal, which can be protected via local or county level minerals plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Minerals plan

10.3.38 NCC is responsible for the overall minerals local plans for Nottinghamshire. The Minerals Local Plan (MLP) for Nottinghamshire[89] was adopted in December 2005 and sets out the NCC policies aimed at controlling mineral related developments within Nottinghamshire up to the year 2014. The plan is currently in the process of being

[88] Sensitive ecological receptors are defined as national designations such as SSSI
[89] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan*

replaced by a new MLP which will cover the period 2016 to 2036. An 'issues and options' consultation document[90] has been published as part of the new plan development process.

10.3.39 The 2005 extant MLP does not list any mineral extraction allocation sites within the study area. In addition, the MLP oil resources plan shows that there are no oil fields within the study area.

10.3.40 The far northern extent of the Proposed Scheme at the Pinxton to Newton and Huthwaite area (LA08) interface lies partially within Derbyshire. The policies and proposals for mineral workings are set out in the MLP for Derby and Derbyshire[91] which was first adopted in April 2000 and amended in February 2002. Derbyshire County Council and Derby City Council are currently preparing a new MLP. The current MLP does not list any mineral extraction allocation sites, mineral safeguarding (MSA) or mineral consultation areas within the study area. The location of specific mining and mineral resources within the study area are described below.

Coal mining

Open cast coal mining

10.3.41 NCC's 'issues and options' consultation document includes a plan showing the proposed extent of minerals safeguarding. The plan shows that there is a MSA within the study area concerning surface coal. The MSA, which covers around a quarter of the study area to the north, would intersect the route between Selston and the northern extent of the study area.

10.3.42 The MSA listed above is proposed and not within the adopted minerals plan. They have not therefore, been considered further in the assessment.

10.3.43 Available records from the Coal Authority show that the route of the Proposed Scheme would not pass through any area of licensed historical open cast coal mining. However, the route of the Proposed Scheme would pass through areas of unlicensed historical open cast coal mining between Kirkby-in-Ashfield and Selston. The open cast mines located here comprise Bentinck and Kirkby Park, both of which mined the Swinton Pottery Upper (0.37m thick) and Swinton Park Lower/Middle leaves (0.29m and 0.42m thick respectively).

10.3.44 In addition, the Coal Authority maps identify two small areas of probable coal mining workings within the study area. There is a probable shallow workings area located 230m to the east of the land required for the construction of the Proposed Scheme, and to the north of B6018 Park Lane. There is also a probable moderate workings area shown 220m to the west of the Proposed Scheme in the north-eastern area of Selston.

[90] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan* - Issues and Options Consultation
[91] Derby City Council and Derbyshire County Council (2000) *Derby and Derbyshire Minerals Local Plan. Final draft 2000.* Available online at: https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/planning/planning-policy/minerals-waste-development-framework/derby-and-derbyshire-minerals-local-plan-part-one.pdf

Deep coal mining

10.3.45 The underground working areas described above also have a number of mine entries that indicate the recorded (charted) entrances to mine workings. The route of the Proposed Scheme passes over a number of these mine entries, all defined as shafts.

10.3.46 In the south of the study area lies Watnall Colliery to the west of the Proposed Scheme. This worked the Top Hard seam at a depth of 301m. The Annesley Colliery and Bentinck Colliery complex, whilst having pit heads located outside the study area, also included Portland Shafts No. 1 to 6. These shafts lie within a coal processing area located 50m east of the route of the Proposed Scheme around Kirkby Park. One or more of the Portland Shafts worked the Bright Coal, Risler, Hard Coal and Bottom Soft Coal seams. The Hard seam was 132m deep and 0.53 m thick in places. Langton Colliery was located close to Alfreton to the north of the study area 150m to the east of the route of the Proposed Scheme. The seam worked here is unknown.

Petroleum exploration and development licence (PEDL/hydrocarbons)

10.3.47 Available records from the Oil and Gas Authority[92] show the Proposed Scheme does not run through any coal bed methane, oil or gas fields.

10.3.48 The Proposed Scheme is not in a Shale Prospective Area (ShPA). However, the Proposed Scheme would pass through an area under Petroleum Exploration and Development Licence 303 north of the village of Hucknall, continuing to the end of the study area. The current licence is held by INEOS Upstream Ltd. with an end date of July 2046.

Geo-conservation resources

10.3.49 The study area contains one geo-conservation resource, as identified by Nottinghamshire Biological and Geological Records Centre. This geo-conservation resource is a LGS that is an extension of the Annesley Woodhouse Quarry SSSI. It comprises an old quarry face exposing a good clear section of Lower Magnesian Limestone which exhibits marl lenses, cross breeding and other sedimentary features. This LGS is located 70m to the east of the land required for the construction of the Proposed Scheme.

Receptors

10.3.50 The sensitive receptors that have been identified within the study area are summarised in Table 20. A definition of receptor sensitivity is given in the SMR.

[92] Onshore Oil and Gas Activity, Oil and Gas Authority, https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa, assessed 13.03.2018

Table 20: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, schools, study centres, play areas and public open space.	High
		Employees and visitors at commercial areas, retail parks and areas and hotels.	Moderate
		Industrial.	Low
	Groundwater	Principal aquifers – Lenton Sandstone Formation and Cadeby Formation (Zechstein Group).	High
		Secondary A aquifers – Pennine Middle Coal Measures (Pennine Coal Measures Group), alluvium and glaciofluvial deposits.	Moderate
		Secondary B aquifers – Edlington Formation (Zechstein Group). Secondary (Undifferentiated) aquifers – glacial till.	Low
	Surface waters	River Erewash and its tributaries, River Leen and its tributaries.	Moderate
		Unnamed streams, tributaries, drains and ponds within the study area.	Low
	Built environment	Underground structures and buried services.	Low
	Natural environment	Bogs Farm Quarry – SSSI Annesley Woodhouse Quarries – SSSI	High
	Geo-conservation sites	Annesley Woodhouse Quarry - Lower Magnesian Limestone.	Moderate
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Proposed surface coal safeguarding area.	Low

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[93]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

[93] Supporting document: Draft Code of Construction Practice

10.4.2 The requirements in the draft CoCP relating to work in contaminated areas would ensure the effective management and control of the work. These requirements include:

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Sections 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated haul route to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[94] and British Standards BS10175[95] and BS8576[96]and Construction Industry Research and Information Association (CIRIA) SP32[97]Construction over abandoned mine workings.

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line

[94] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*
[95] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*
[96] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*
[97] CIRIA (1983), SP32, Construction over abandoned workings

with the framework set out by the Sustainable Remediation Forum UK[98]. The preferred option would then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA07 Map Book.

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, commercial and mining sites.

10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

[98] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*

10.4.10 A simple summary of the baseline CSM is provided in Table 21. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 21: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[99]	**Area name**	**Human health risk**	**Groundwater risk**	**Surface water risk**	**Ecosystem risk**	**Buildings risk**
On site[100]						
LA07-12, LA07-20, LA07-24, LA07-63, LA07-72, LA07-96	Misk Farm, Grange Farm, Two Dales Farm, Lower Portland Farm, and further unnamed historical farms. (Farms group)	Very low	Moderate	Moderate/low	N/A[101] Moderate/low	Very low
LA07-07, LA07-26, LA07-35, LA07-39, LA07-40, LA07-42, LA07-88, LA07-98	Key sites include: New Watnall, Portland (no. 2), Annesley Bentinck and Langton Hall Collieries and gasholder and a network of historic and current railway land. (Industrial/commercial group)	Low to moderate	Moderate/low	Moderate/low	Moderate	Low to moderate/low
LA07-01, LA07-03	Sites located at Hucknall Airfield and Eel Hole Farm. (Landfill group)	Very low to moderate/low	Moderate	Low	Moderate/low	Moderate/low to moderate
LA07-87	Two Coal Authority mine entries	N/A	Moderate	Moderate/low	Moderate/low	N/A
LA07-65, LA07-67, LA07-90	Marshland (Marshland group)	Very low to low	Low	Low	Low	Moderate/low

[99] Each potentially contaminated site is allocated a unique reference number
[100] 'On site' is within the area of land required for construction of the Proposed Scheme
[101] N/A refers to the receptor being absent or a receptor being not applicable to the contaminant source being assessed

Area reference[99]	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
Off site[102]						
LA07-08, LA07-29, LA07-43, LA07-51, LA07-64, LA07-70, LA07-91.	Industrial/commercial sites including railway land, Portland Colliery (No. 1) and businesses associated with the Brookhill Industrial Estate. (Off site industrial/commercial group)	Very low to moderate	High	Moderate	Moderate/low	Low
LA07-21	A-one+ and Highways England Depot.	Low	Moderate/low	Low	N/A	Low
LA07-30, LA07-31,	Alfreton Skip Hire and Portland Fields. (Off site landfill group)	Low to moderate	Moderate/low	Low	Moderate/low	Moderate
LA07-92, LA07-95	Unnamed shaft northeast of Pinxton and pit	Very low to moderate/low	Moderate	Low	Moderate/low	Moderate/low

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP. This would also include mining related contamination risks.

10.4.14 In the event that unexpected contamination is encountered during the construction of the route in this area, this would be remediated as described in the draft CoCP resulting in an overall beneficial effect.

[102] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it

10.4.15 All of the sites set out in Table 6 have been assessed for the change in impact associated with the construction stage of the work and were found to have non-significant effects.

10.4.16 The adoption of the draft CoCP makes it unlikely that there will be any adverse effects, but it is considered that there may still be temporary minor adverse effects during the construction period from ground disturbance in these areas. These minor adverse impacts at the construction stage are not regarded as significant in line with the methodology set out in the SMR.

10.4.17 The extent of earthworks required has been considered together with the specific nature of the potential current and historical contamination sources and receptors identified. The following key issues have been identified which the draft CoCP will address:

- the Proposed Scheme will pass through a number of historic collieries and their associated spoil heaps. Disturbance and introduction of air can lead to combustion within the tip, which may lead to damaged plant and present a risk to construction workers. A particular cutting of concern is Kirkby Lane, located in the spoil heap from Langton Hall Colliery, as well as a number in the Bentinck/Annesley area; and
- An area of landscape mitigation planting within the Proposed Scheme would overlie a section of the historic Eelhole Farm/Hucknall Airfield landfill. This mitigation feature may require shallow excavation into what is expected to be backfilled material.

10.4.18 Construction compounds located in this study area would include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials resulting in no significant effects.

Permanent effects

10.4.19 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.

10.4.20 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in adverse effects and an improvement would result in beneficial effects.

10.4.21 All of the sites set out in Table 21 have been assessed for the change in impact associated with the permanent post-construction stage. Table 22 presents the summary of the resulting post-construction effects that have been found to be significant. All other sites referenced in Table 6 were found to have non-significant effects.

Table 22: Summary of permanent (post-construction) effects

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
LA07-12, LA07-20, LA07-24, LA07-63, LA07-72, LA07-96 (Farm group) Misk Farm, Grange Farm, Two Dale Farm, Lower Portland Farm, and further unnamed historical farms.	Controlled waters – groundwater	Moderate	Low	Moderate beneficial (significant)
LA07-07, LA07-26, LA07-35, LA07-39, LA07-40, LA07-88, LA07-98 (Industrial/commercial group) New Watnall, Portland (no. 2), Annesley Bentinck and Langton Hall Collieries and a network of historic and current railway land.	Human health – (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Low to moderate	Low	Neutral to moderate beneficial (Significant)
	Impact on ecological/geological designations	Moderate	Low	Moderate beneficial (significant)
LA07-01, LA07-03 (Landfill group) Hucknall Airfield and Eel Hole Farm.	Impact on property receptors – ground gas	Moderate	Low	Moderate beneficial (significant)
	Controlled waters – groundwater	Moderate	Low	Moderate beneficial (significant)

10.4.22 Table 22 indicates that where remediation is carried out on sites identified within the land required for the construction of the Proposed Scheme, there will be in all instances, overall moderate beneficial effects which are considered to be significant.

10.4.23 Additional site-specific permanent remediation measures, that could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would ensure that risks to people and property from gas and vapours in the ground, the principal risk in this area, would be controlled to an acceptable level.

Mining/mineral resources

10.4.24 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[103] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.25 There are no MSA defined in the adopted minerals plan and all MSA discussed previously are proposed within the minerals plan under consultation and therefore not considered as part of the assessment.

10.4.26 There is one PEDL, beginning north of Hucknall and covering the area to the end of the Proposed Scheme in this study area. It is PEDL 303 and is licensed to Ineos Upstream Ltd.

Temporary effects

10.4.27 Temporary adverse effects may occur where construction compounds are proposed within the MSA or mineral designation. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

Petroleum exploration and development licences (PEDL)/hydrocarbons

10.4.28 The following construction compounds fall within the licenced areas:

- A608 Mansfield Road main compound
- Salmon Lane satellite compound
- Erewash and Mineral Railway south satellite compound;
- Erewash and Mineral Railway siding; and
- Kirkby Lane satellite compound.

10.4.29 Due to the nature of the resource, extraction does not have to occur directly above it, therefore the effect of construction of the Proposed Scheme on the PEDL is expected to be negligible

Permanent effects

10.4.30 The majority of effects on mining and mineral sites would be permanent where overlain by the footprint of the permanent works, with a strip of mineral becoming sterilised.

Petroleum exploration and development licence (PEDL/hydrocarbons)

10.4.31 Petroleum exploration and development licence 303 includes the route of the Proposed Scheme north of the village of Hucknall, continuing to the end of the study

[103] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site

area. However, it is unlikely that the Proposed Scheme will place a constraint on future exploration or exploitation of oil or gas resources. Additionally, the relatively small footprint of the finished scheme will not impede resource extraction if resource is confirmed to be present as there is no need for extraction to occur directly above the source. The effects of the Proposed Scheme on the identified PEDL would be negligible.

10.4.32 Table 23 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 23: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Petroleum exploration and development licence 303	Extent of hydrocarbons	Extent of hydrocarbon resource (oil and gas).	Low	Negligible	Negligible (N)

10.4.33 There would be negligible effects on gas resources, which is not significant.

Geo-conservation sites

10.4.34 One geo-conservation LGS is present within the study area named Annesley Woodhouse Quarry - Lower Magnesian Limestone.

10.4.35 This LGS is located 70m outside the land required for the Proposed Scheme hence the level of exposure currently presented at this site will not be affected. The LGS has a medium sensitivity though it is likely there will be a negligible impact resulting in a negligible effect on the site.

Other mitigation measures

10.4.36 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

10.4.37 Mitigation of the effects on mineral resources within the PEDL could include extraction of the resource in landscaping areas within the Proposed Scheme. These areas would be adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at NCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the PEDL.

Summary of likely residual significant effects

10.4.38 Based on the information currently available and with the application of the mitigation measures detailed above, no likely significant adverse residual effects are anticipated with respect to land quality. However, where remediation is undertaken there may be significant beneficial residual effects.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include two auto-transformer stations, located at Misk Hill and Salmon Lane. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

10.5.6 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Hucknall to Selston area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Engagement with Ashfield District Council (ADC), Broxtowe Borough Council (BBC), East Midlands Councils, Nottinghamshire County Council (NCC), Nottingham City Council and Natural England has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

11.1.4 The Volume 2: LA07 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[104].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July to September 2017, and winter surveys from January to March 2018, to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES.

[104]Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

11.2.3 At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity and magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.4 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover would mean the actual extent of visibility is substantially less than that shown in the ZTV, and professional judgement will be used to further refine the study area to focus on likely significant effects.

11.2.5 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment.

11.2.6 Landscape and visual receptors within approximately 1.5km of the route of the Proposed Scheme have been assessed as part of the study area.

11.2.7 This assessment is based on preliminary design information and makes reasonable worst-case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. 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. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.8 The assessment in this report does not include assessment of night time visual effects, although where general night time visual effects can be substantiated they are discussed in the relevant part of this section. The findings from the night time surveys will be included in the formal ES.

11.2.9 Professional judgements on landscape value are summarised in the baseline descriptions and judgements on landscape susceptibility and sensitivity are summarised as part of the assessment of effects on each significantly affected LCA. Full judgements on value, susceptibility and sensitivity will be provided in the formal ES.

11.2.10 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area landscape is rural in character despite the strong presence of the M1 and the marked influence of the nearby settlements of Hucknall, Annesley Woodhouse, Selston and Pinxton. Pinxton is located on the northern side of the River Erewash, within the adjoining community area of Pinxton to Newton and Huthwaite (LA08) and is described further in Volume 2: Community area report LA08 Pinxton to Newton and Huthwaite.

11.3.2 The study area extends from Greasley Footpath 18, west of Bulwell Wood, through to the Maghole Brook, near Pinxton, in the north.

11.3.3 The rural landscape varies considerably in both quality and character. The land next to Hucknall is predominantly arable farmland, located on an extensive flat hill top. Despite some woodland it has a lack of landscape structure. Its tranquillity is adversely impacted by the Hucknall urban fringe and the M1.

11.3.4 To the north of Hucknall, the landform is more pronounced. The main limestone ridgeline extends in a south-north direction from Hucknall to Sutton-in-Ashfield and beyond. Minor ridgelines cross the study area, creating a landscape that is steeply undulating in places. There are large areas of intact farmland and substantial blocks of woodland, some of which is ancient, associated with Park Forest and estates, including Annesley Hall Grade II* Registered Park and Garden. In areas away from the M1, the combination of undulating farmland and woodland, cut by narrow wooded stream valleys, known locally as 'dumbles', has a particularly high level of scenic attractiveness. The area has literary associations, with Lord Byron and with DH Lawrence, who incorporated many local places, such as Moorgreen Reservoir, into his works.

11.3.5 North of this comparatively undisturbed stretch of countryside is an area of land located around the upper reaches of the River Erewash, which flows east to west. The landscape has in general been impacted by historic coal mining, quarrying and the presence of the nearby towns of Annesley Woodhouse and Selston. A legacy of coal mining activities is the presence of mineral railway lines, one of which runs along the valley of the River Erewash.

11.3.6 Land to the south of the River Erewash includes the Bentinck Tip, a former colliery spoil heap and lagoons, currently under restoration. Former mineral workings at Annesley Woodhouse Quarries and Bogs Farm Quarry are both designated as sites of special scientific interest (SSSI).

11.3.7 Land to the north of the River Erewash is primarily agricultural, with medium-sized arable fields occupying the higher land, and smaller pasture fields occupying the lower land along the Erewash valley. Other land use includes a solar farm, and the estates of Langton Hall and Brookhill Hall.

11.3.8 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of the historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[105], the East Midlands Regional Landscape Character Assessment[106], the Greater Nottingham Landscape Character Assessment[107], and the Landscape Character of Derbyshire[108].

11.3.9 These published LCAs have been adapted for this assessment, to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

11.3.10 For the purposes of this assessment, the study area for Hucknall to Selston area has been subdivided into nine LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

11.3.11 Three of the nine LCAs would not be significantly affected by the Proposed Scheme on account of their distance from the Proposed Scheme or small proportion affected. A summary of the remaining six LCAs that would be significantly affected in the Hucknall to Selston area is provided in Table 24.

[105] Natural England (2013, 2014), National Character Area profiles. Available online at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles

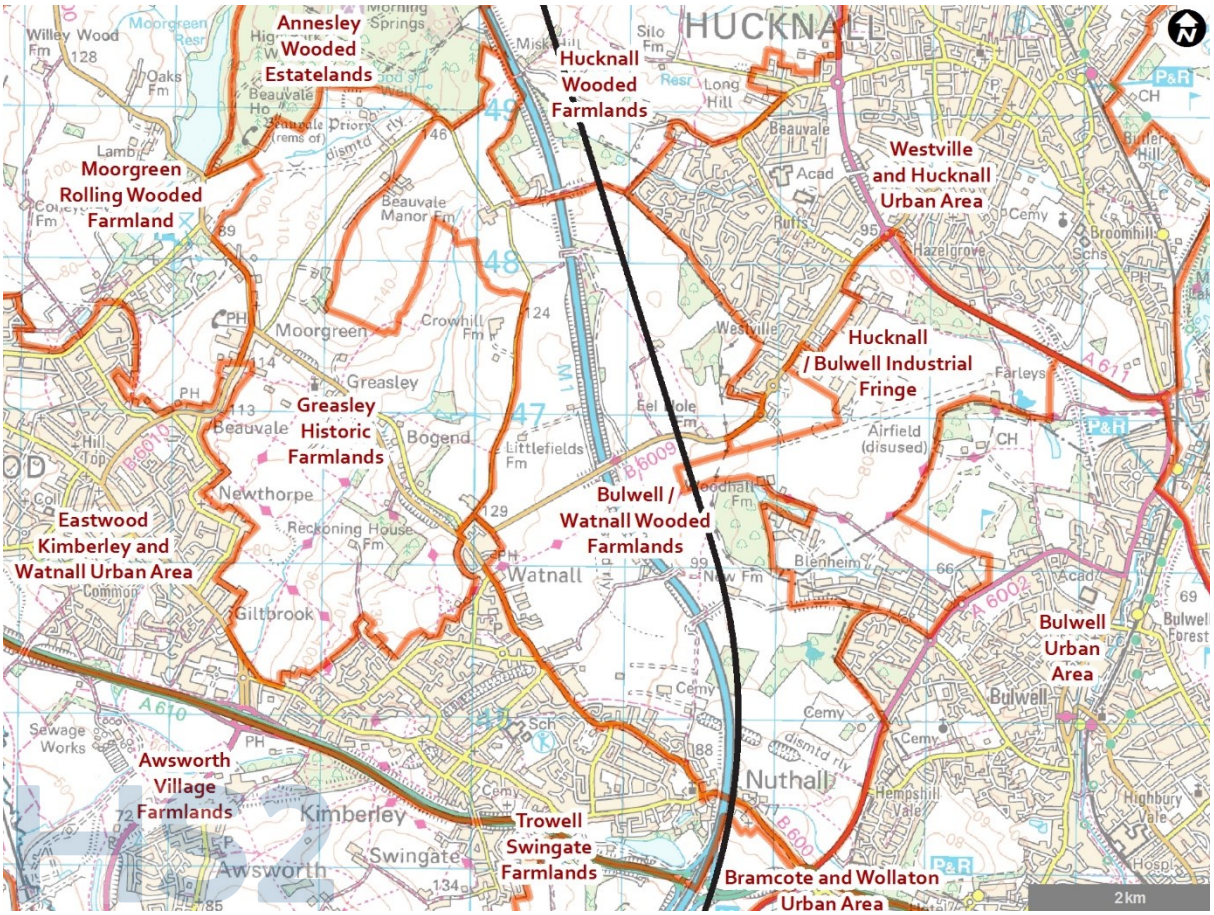
[106] Natural England's East Midlands Region (2010), *East Midlands Regional Landscape Character Assessment*. Available online at: http://publications.naturalengland.org.uk/publication/5635681403535360?category=2431119

[107] Nottinghamshire County Council (2009), Greater Nottingham Landscape Character Assessment. Available online at: http://www.rushcliffe.gov.uk/planningpolicy/localplan/supportingstudies

[108] Derbyshire County Council (2014), The Landscape Character of Derbyshire (4th Edition). Available online at: http://www.derbyshire.gov.uk/environment/conservation/landscapecharacter/default.asp

Table 24: Summary of significantly affected LCAs

Bulwell/Watnall Wooded Farmlands



Open landscape east of Watnall

Landscape west of Westville

The Bulwell/Watnall Wooded Farmlands LCA is characterized by a gently undulating landform, underlain for the most part by limestone. A minor ridgeline extends along the western edge of the LCA, and in general, the land falls across the LCA from the north-west (130m AOD) to the south-east (70m AOD). There is only one watercourse within the LCA, a stream which runs southwards from Starth Wood, through Bulwell Wood, and then south-east through Bulwell to join the River Leen.

Land use within the LCA is predominantly farmland, with a few areas of woodland, mainly located in the east of the LCA. These woodlands include Bulwell Wood, Starth Wood and Eelhole Wood, most of which comprise ancient woodland. Bulwell Wood (located in LA06) is also designated as a SSSI. Woodland belts also extend along the M1 corridor on both west and east sides, particularly north of the B6009 Long Lane.

Farmland is mainly arable, although there is some land used for grazing near to Westville. Field sizes are variable, but are generally delineated by low clipped hedgerows with occasional mature trees. In general, the LCA has an open character, with local visual enclosure provided by the woodland blocks.

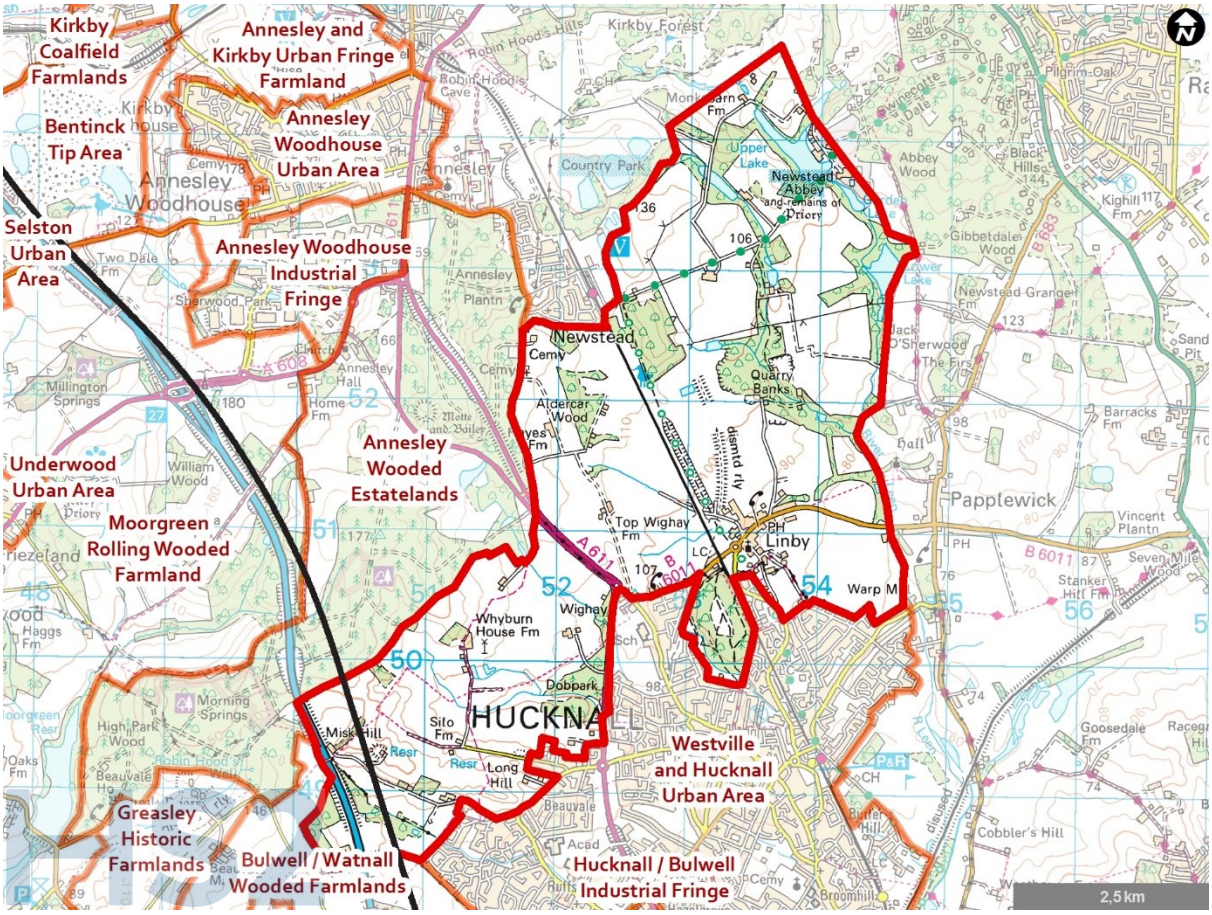
The LCA includes the remains of a former brickworks, located on the eastern side of the M1. This was Watnall Brickworks, which notably used colliery spoil rather than clay. The brickworks was closed in 1975, but its four tall chimneys, which formed a local landmark, were not demolished until 2009.

The LCA is sparsely populated, with isolated farmsteads being the only settlement within the LCA. However, urban settlement abuts the LCA for most of its boundary, influencing its mainly rural character. The LCA has some scenic quality although the M1 detracts from some views. The M1 is generally in a shallow cutting but traffic, lighting columns, signs and gantries are noticeable in some views across the LCA, such as from Watnall. Motorway traffic noise and movement also detract from local tranquility in the LCA.

Many PRoW cross the LCA, including Greasley Bridleway 15, which forms part of the Robin Hood Way and Greasley Bridleway 21, which forms part of the Broxtowe Country Trail, both long-distance routes.

The overall value of this LCA is medium derived from its mainly rural character, relative tranquillity, recreational value, and also the presence of the detracting influence of the M1.

Hucknall Wooded Farmlands



Beacon Hill, north of Westville

Partially enclosed landscape at Misk Hill

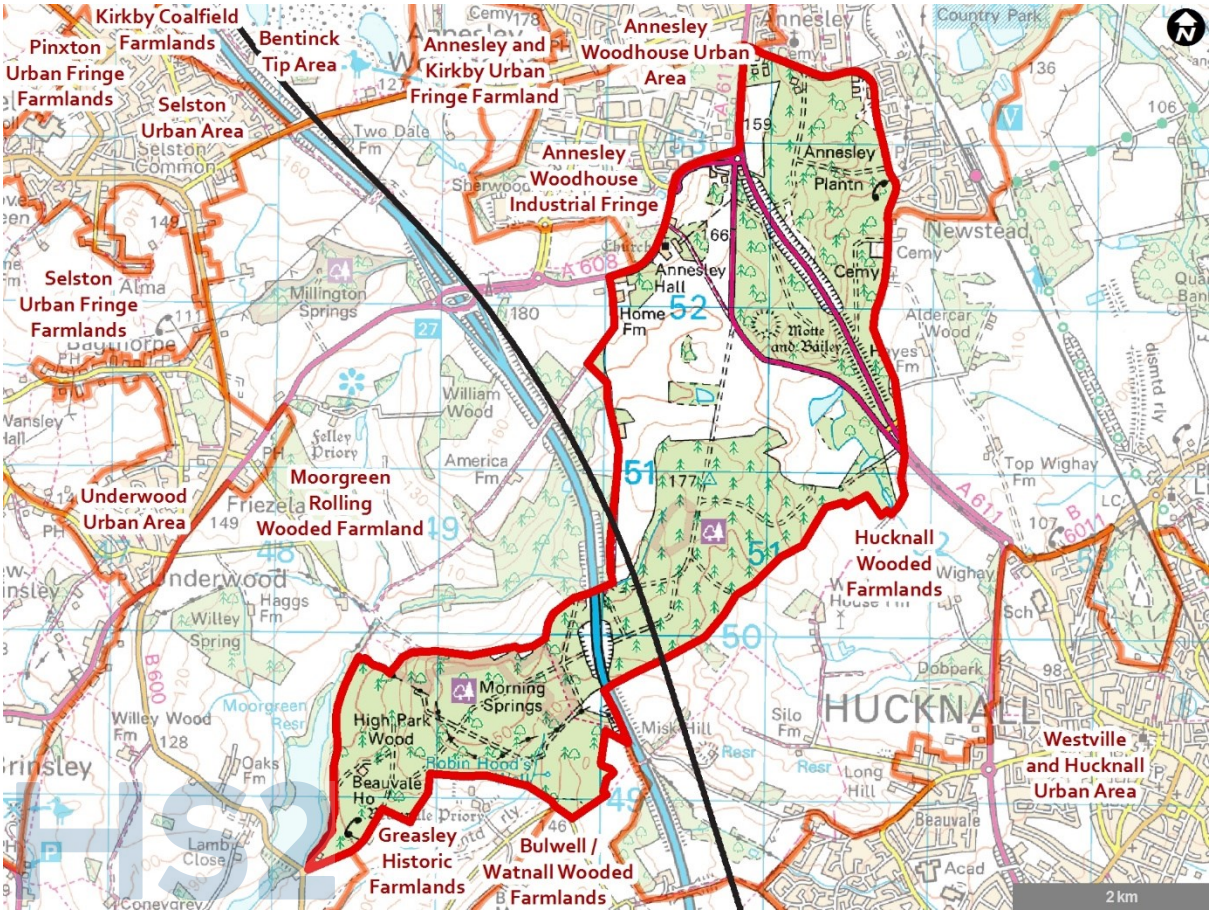
The Hucknall Wooded Farmlands LCA is underlain by a narrow band of sandstone and mudstone, associated with limestone. The sandstone has formed an undulating ridgeline, extending in a north-westerly direction from Westville, marked by a series of high points, including Leivers' Hill (140m AOD), Beacon Hill (145m AOD), and Misk Hill (155m AOD). From this ridgeline, the land falls steeply to the south-west, to a small stream valley which passes through Watnall Coppice; the land then rises gently to around 140m AOD on the western side of the M1. The land falls more gently from the ridgeline towards the east, to the northern part of Hucknall. A few watercourses flow south-east towards lower ground, to join the River Leen.

Land use within the LCA is predominantly farmland, with some woodland copses and deciduous/ mixed/ conifer plantations. The steeper ground is generally used for pasture (cattle grazing), with arable farming occupying the more gently sloping ground. Field sizes vary from small (pasture) to medium (arable), generally with bushy hedgerows and occasional mature trees. However, some hedgerows have been removed, especially in the north-east of the LCA. The areas of woodland include the ancient and semi-natural woodland of Watnall Coppice and The Coppice, which has been bisected by the M1 corridor. Overall, the LCA has a partially enclosed character, with woodland blocks and tall hedgerows enclosing the otherwise open agricultural landscape. It has good scenic quality and tranquility in areas away from the M1.

The LCA is predominantly rural, with isolated farmsteads being the only settlement. However, the LCA abuts the edge of Westville and Hucknall residential development. The M1 corridor provides another urban influence, adversely impacting tranquility in the western part of the LCA. A few PRoW cross the LCA, including Greasley Bridleway 21, which forms part of the Broxtowe Country Trail, a long-distance route.

The overall value of this LCA is medium-high derived from its strong rural character, scenic qualities, tranquillity, and also the presence of the detracting influence of the M1 in the western part.

Annesley Wooded Estatelands



Annesley Hall Registered Park and Garden

DH Lawrence walk in Park Forest

The Annesley Wooded Estatelands LCA has an underlying geology of sandstone, mudstone, and limestone. The sandstone has formed an undulating ridgeline, which extends in a rough arc from the south-west to the north-east. High points along the ridgeline include 160m AOD at Morning Springs and at Park Springs (areas of woodland), to the west of the M1. The ridgeline has been cut by the M1 corridor at Park Forest. Ground levels rise to the east of the M1, with local high points of 170m AOD at Castle Hill, and 180m where the A611 Annesley Road crosses Annesley Plantation. The land then falls towards the Leen valley to the east.

The predominant land cover of the LCA is plantation woodland. The area of Park Forest which lies to the west of the M1 comprises ancient woodland (replanted), including pockets of ancient and semi-natural woodland. The Forestry Commission owns both Park Forest and Annesley Plantation.

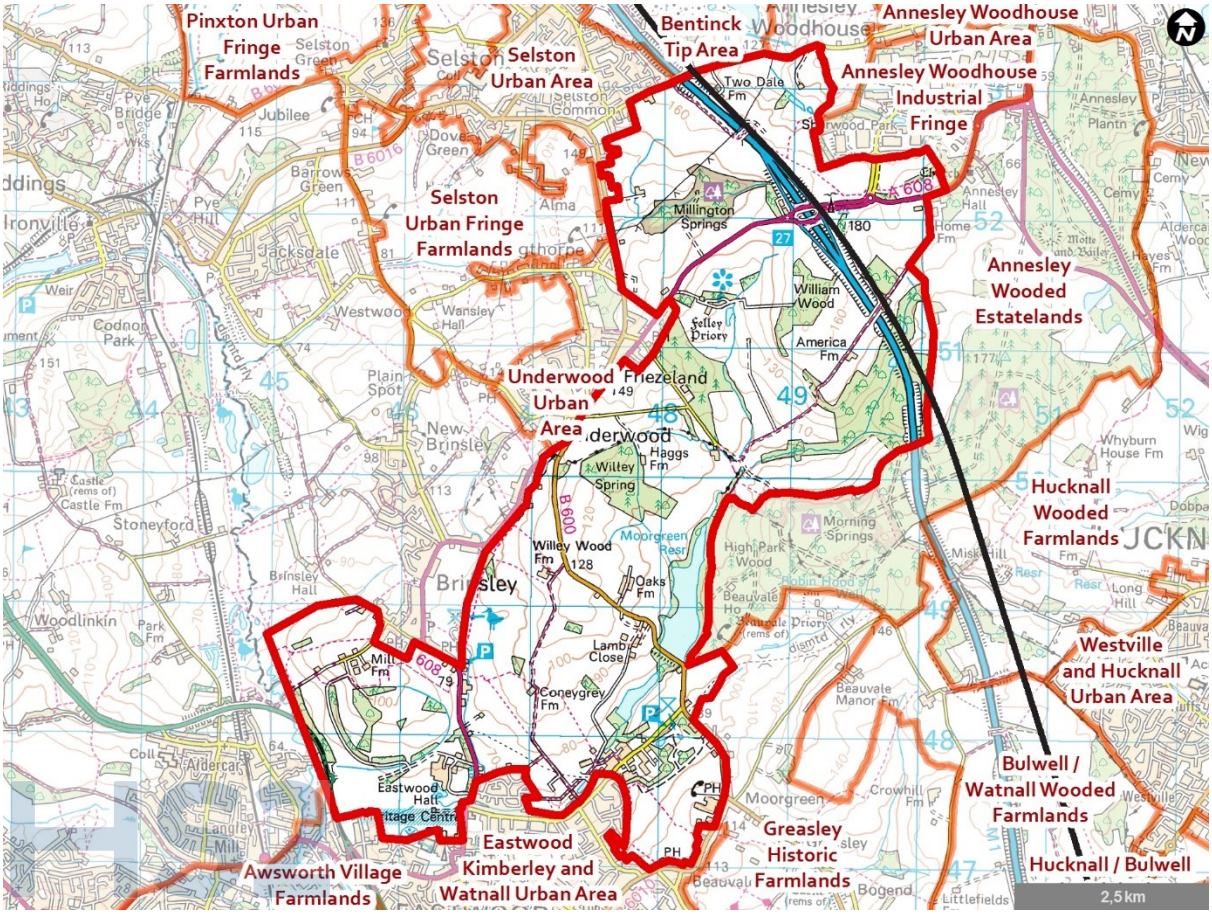
A large part of the LCA on the eastern side of the M1 is occupied by the Annesley Hall Grade II* Registered Park and Garden (not open to the public). The historic park includes the remains of a 13th century motte and bailey castle at Castle Hill, also designated as a scheduled monument. Castle Hill lies within an area of plantation woodland and the castle is not noticeable in the landscape. In the 14th century the estate included a deer park, located to the north-west of the present hall that now is part of the industrial estate to the north of the A608 Mansfield Road. Annesley Hall, together with its gatehouse and terraces are Grade II listed, and the adjacent All Saints Church and graveyard is a scheduled monument. On the west side of the A611 Annesley Road lies a parkland landscape of arable fields with specimen mature trees, and two large ponds enclosed by woodland copses.

There are few PRoW within the LCA. Annesley Footpath 2, along Kennel Lane, provides connectivity across the M1, which dissects the landscape and affects local tranquility. On the western side of the M1, Annesley Footpath 2 and Annesley Footpath 3 form part of the circular route from Moorgreen promoted as a DH Lawrence related walk. The LCA has strong cultural associations with the novelist DH Lawrence, who came from the nearby town of Eastwood, and also with the poet Lord Byron, who lived at Newstead Abbey, the neighbouring estate to Annesley Hall.

The LCA has a strong and distinctive character, with good scenic quality and tranquility in areas away from the M1.

The overall value of this LCA is medium-high derived from its strong rural character, tranquillity, large areas of woodland, historic and cultural associations, and also the presence of the detracting influence of the M1.

Moorgreen Rolling Wooded Farmlands



Landscape south of M1 junction 27

Landscape north of M1 junction 27

The Moorgreen Rolling Wooded Farmlands LCA is predominantly underlain by coal measures, giving way to limestone in the east of the LCA. The landform is steeply undulating, with many small stream valleys falling towards Moorgreen Reservoir in the south of the LCA. The area of limestone is generally the higher land, traversed by the M1, with a local high point of 180m AOD near junction 27 of the M1. The land falls away from the M1 in both directions.

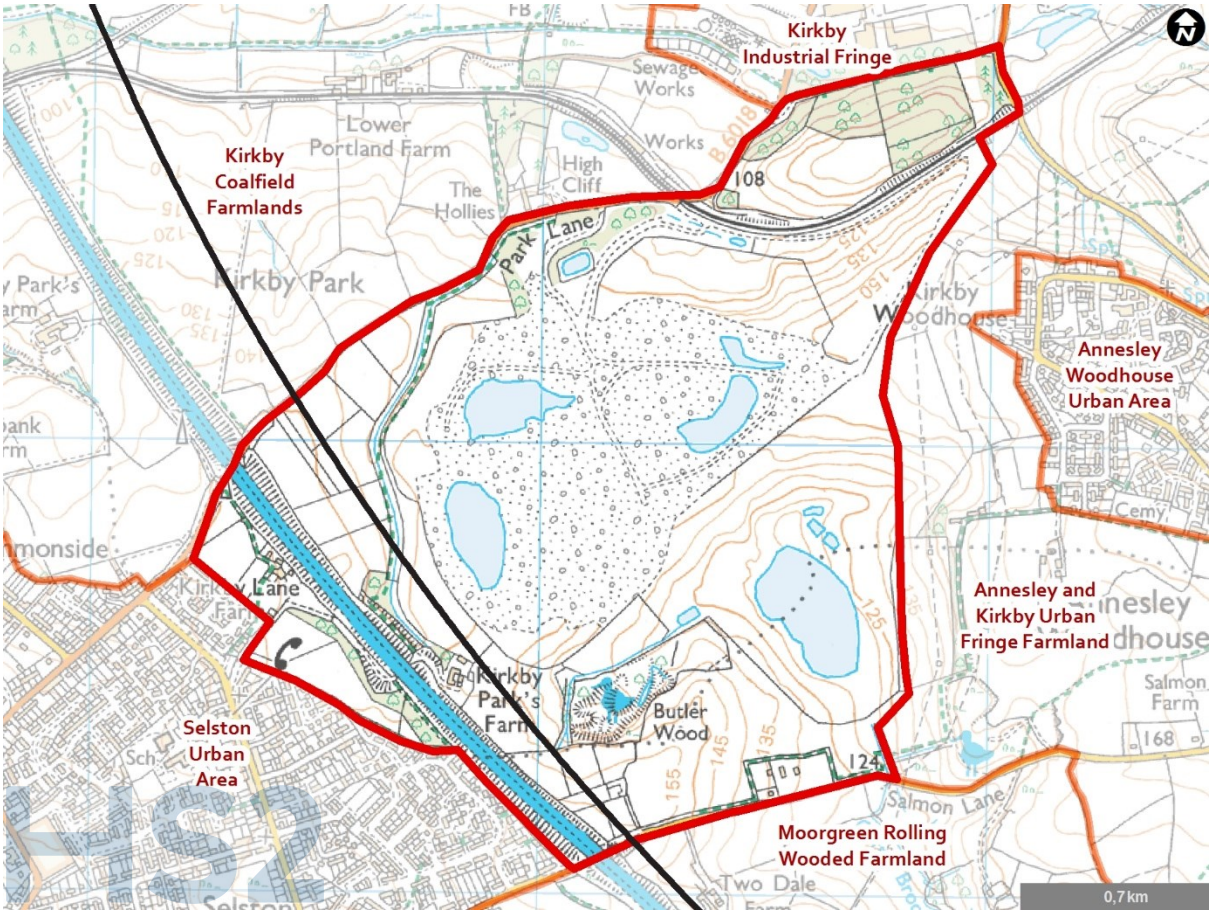
Land use within the LCA is a mix of farmland (mainly arable) with substantial blocks of woodland and plantations. It includes areas of ancient and semi-natural woodland at Willey Spring (south of Underwood), and High Park wood, which adjoins Park Forest, on the eastern side of the Moorgreen Reservoir. Field boundaries mainly comprise substantial bushy hedgerows, some with mature trees. The LCA also includes grassland designated as Friezeland Grassland SSSI.

The LCA includes the small valley of the Cuttail Brook, which runs through fishponds 170m south of Damstead Farm Scheduled Monument, close to the north-west corner of Sherwood Business Park, east of the M1. The fishponds are thought to date from the medieval period, when they formed part of the Annesley Hall Estate. Other heritage assets within the LCA include the Grade II* listed Beauvale House, located within High Park Wood. The area is associated with the novelist DH Lawrence, from Eastwood, with many local places, including Moorgreen Reservoir, being represented in his works.

The LCA is rural in character, with few urban influences apart from the M1, and the edges of settlements on the western and northern boundaries. Settlement within the LCA is confined to isolated farmsteads, and there are few roads. The LCA has much scenic value, derived from its rolling landform, and patchwork of farmland and woodland, and including the distinctive and attractive landscape feature of Moorgreen Reservoir. Few PRoW cross the LCA, although Annesley Bridleway 1 (Weaver's Lane) and Annesley Footpath 8 both provide crossing points over the M1. Greasley Bridleway 9, which forms part of the DH Lawrence related walk, passes the reservoir and follows the northern edge of High Park Wood/ Park Forest.

The overall value of this LCA is medium-high derived from its strong rural character, tranquillity, historic and cultural associations, and also the presence of the detracting influence of the M1.

Bentinck Tip Area



Landscape west of Bentinck Tip

Eastern perimeter of restored land

Bentinck Tip Area LCA is predominantly located on the eastern side of the M1. It includes the Bentinck Spoil Heap and Lagoons, which is a colliery spoil disposal site currently being capped to create a golf course, as well as former opencast quarries and areas of restored land.

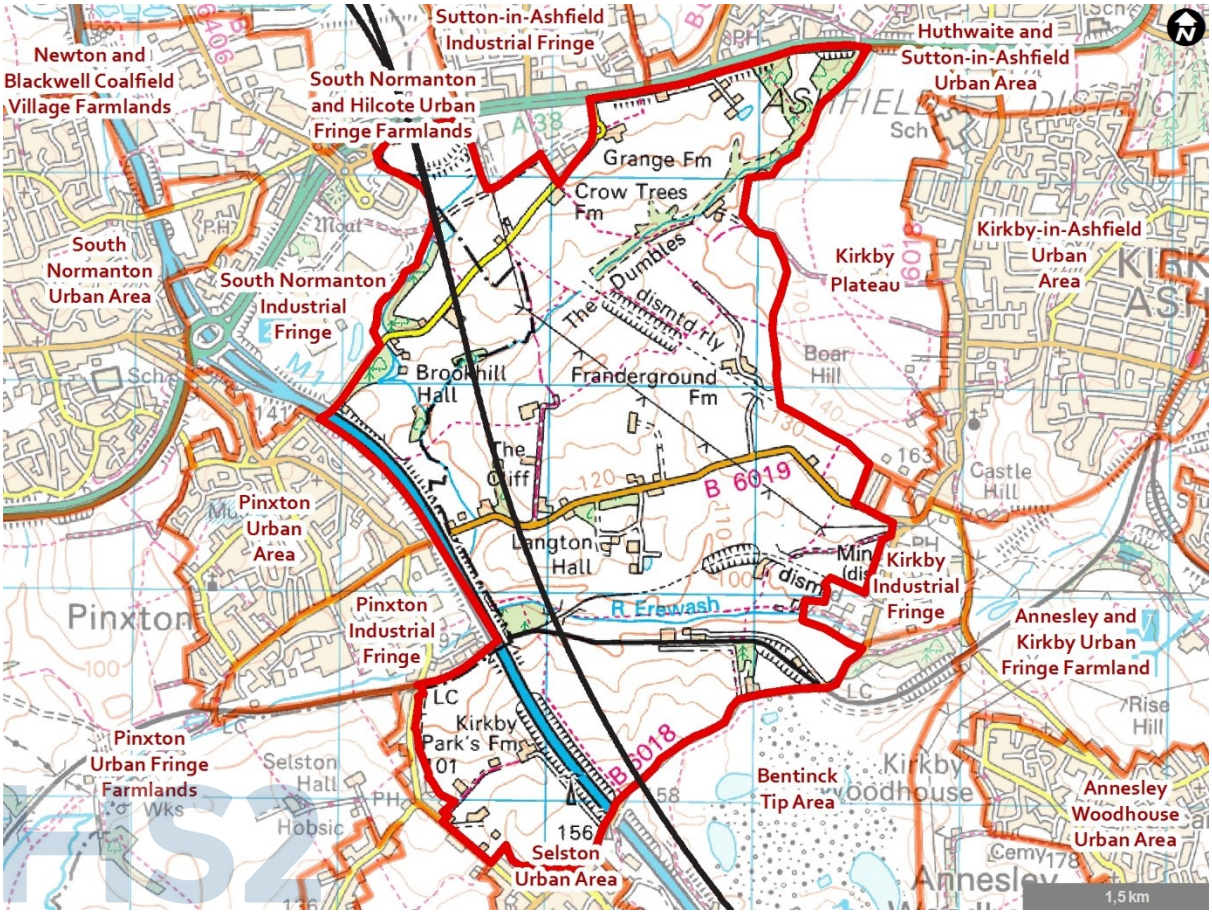
Bentinck Tip occupies a large area and includes bare ground and water bodies. Restored land around the perimeter is generally covered with rough grassland and areas of scrub. Rising ground around the perimeter serves to screen most views into the site.

Immediately to the south of the Bentinck Tip is land designated as Annesley Woodhouse Quarries SSSI. This is a large site and is nationally important for its unimproved dry calcareous grassland, marshy grassland and presence of protected species. The site includes a former opencast coal quarry, now a permanent water body. The site also includes a Nottinghamshire Wildlife Trust area that is open to the public. The LCA includes Bogs Farm Quarry, a former quarry designated as a SSSI for its species-rich grassland communities, and for a narrow wooded valley cut by a small stream.

Three PRoW (Annesley Footpath 12, Kirkby Footpath 19, Kirkby Footpath 20) cross the LCA, skirting around the former quarry/ colliery sites. The LCA has distinctive qualities, with its ecological interest, industrial heritage and sense of place. Noise and movement associated with the restoration works and motorway traffic detract from tranquility in the LCA.

The overall value of this LCA is medium derived from its ecologically importance, recreational value, and historic associations, and also the detracting influence of the M1 and the on-going restoration works.

Kirkby Coalfield Farmlands



Undulating landscape west of M1

Landscape north of B6019

The Kirkby Coalfield Farmlands LCA is underlain by coal measures, which have formed an undulating landform. The sloping escarpment of the Magnesian Limestone ridge lies on the eastern edge of the LCA , with the higher ground of the Kirkby Plateau (175m AOD) above. Many springs issue from the escarpment, feeding streams, which flow towards the River Erewash, or its tributary, the Maghole Brook. The River Erewash flows in a shallow valley, in an east-west direction across the LCA, to pass under the M1 and through the Brookhill Industrial Estate. The Maghole Brook also crosses the LCA, in a generally north-east to south-west direction, to join the River Erewash near to the M1. To the east of the Brookhill Industrial Estate, on the eastern side of the M1 a former colliery spoil heap has been restored: its domed contours appear out of place in the relatively flat land of the River Erewash valley.

Land use is primarily agricultural, with arable fields occupying the higher land, and smaller pasture fields occupying the lower land along the Erewash valley. Other land use includes a solar farm, located near Crow Trees Farm, in the north of the LCA. The LCA includes estates of Langton Hall and Brookhill Hall (Grade II listed building with a non-designated designed parkland landscape). The setting of Brookhill Hall and its parkland has been adversely affected by the nearby distribution warehousing development (Castlewood Business Park) which is uncharacteristic with the landscape in terms of mass and scale, and by the M1 which runs an embankment to the west.

In general field boundaries within the LCA comprise hedgerows of variable quality, with some being sparse and gappy, and others more substantial with mature trees. There is little woodland within the LCA, although there are wooded corridors along the River Erewash, Maghole Brook, and the two disused railway lines (Sutton Junction to Pye Bridge Railway out of use spur, and a disused colliery railway). The Dumbles and Bloomer Wood, adjacent to Maghole Brook, includes areas of ancient and semi-natural woodland. Many PRoW cross the LCA from east to west, such as Kirkby Footpath 17, which flows the River Erewash, as well as from north to south, e.g. Kirkby Bridleway 12.

The LCA has some degraded characteristics, such as poorly maintained field boundaries, and variable scenic quality.

The overall value of this LCA is medium derived from its mainly rural character, relative tranquillity, recreational value, and also the presence of the detracting influences of the M1 and the adjacent urban fringe areas.

Visual baseline

11.3.12 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: LA07 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[109], 4: Transport, 5: Hotels/healthcare/education and 6: Employment (none within this area).

11.3.13 Residential views within the area are obtained from the large settlement of Hucknall and the southern outskirts of Kirkby-in-Ashfield, smaller settlements such as Selston and Annesley Woodhouse, villages and hamlets such as Watnall, Greasley and Hall Green, and scattered farmsteads and other dwellings. Views from settlement edges in this area are generally framed by buildings and filtered or restricted by fences and vegetation including garden or street trees. Intervening buildings, garden fences or vegetation truncate views from some areas. Hedgerows, woodland and the gently undulating landform limit open views to some extent.

11.3.14 Urban residential views in this area are generally dominated by the components of the street scene, such as roads, footways, grass verges, and street furniture such as lighting columns and road signs. Views also include dwellings of various types and ages including houses with enclosed gardens, garden and street trees. In some areas, such as Selston, views are influenced by the presence of industrial and commercial

[109] Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath

development and infrastructure. The M1 corridor divides the study area and is visible as part of the wider view where it is noticeable due to moving traffic, though in places the motorway is screened by planting.

11.3.15 Views from the PRoW network are often restricted by hedgerows and woodland, particularly in the south of the Hucknall to Selston area. The Robin Hood Way crosses the southern part of the study area from east to west. The route incorporates Greasley Bridleway 15 for part of its length. Views from this recreational route, where it crosses farmland, are relatively open and unrestricted.

11.3.16 Where PRoW cross the M1 on bridges, such as Annesley Bridleway 1, which forms part of Weaver's Lane, these provide vantage points allowing views to the wider surroundings, framed by highway planting beside the M1.

11.3.17 Mature roadside hedgerows, trees and woodland generally limit views for users of local roads. Field gateways, and locations where the roadside hedgerows are gapped and/or are lower, offer glimpses and wider views of farmland, hedgerows and trees. In the central part of the Hucknall to Selston area (Park Forest and wooded farmlands), the gently undulating landform and the large numbers of trees and dense hedgerows limit the number of far-reaching views.

11.3.18 Motorists travelling on the M1 experience views of safety barriers, motorway infrastructure as well as wider views of the surrounding countryside. Views out from the M1 are sometimes limited by cuttings and planted embankments. However, this highway planting also contributes to the strongly wooded characteristics of some views within the study area.

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between the start of 2021 and the end of 2024. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[110] to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[111];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings; erection of viaducts; construction of embankments; the removal of existing landscape elements including trees and hedgerows; and the closure and diversion of existing public highways and PRoW. Other key changes include: the construction of overbridges and underbridges, auto-transformer stations, an auto-transformer feeder station, and overhead line equipment; utility diversions; the presence of transfer nodes and pre-cast yards; and the demolition of buildings and structures.

[110] Supporting document: Draft Code of Construction Practice
[111] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 25 would be significantly affected during construction of the Proposed Scheme.

Table 25: Summary description and assessment of effects on LCAs

Bulwell/ Watnall Wooded Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The open character of the landscape with isolated blocks of ancient woodland imparts a medium susceptibility to change arising from the Proposed Scheme. Clearance operations and large-scale construction activities required for the construction of the Proposed Scheme would directly affect the landscape character of this gently undulating, predominantly rural landscape. In addition to the removal of agricultural land, hedgerow boundaries and ancient woodland (at New Farm Wood, within the adjacent Stapleford to Nuthall area (LA06)), the wide corridor (minimum 200m) required would interrupt the existing pattern and scale of the landscape. The large-scale earthworks required to construct the Westville embankment, the B6009 Long Lane satellite compound, and the adjacent temporary earthworks stockpile, would create physical and visual severance. The LCA would be further impacted by construction vehicle movements and noise, albeit the M1 already detracts from the tranquillity of the rural landscape. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Hucknall Wooded Farmlands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The undulating landscape, presence of ancient woodland, good scenic quality and tranquility impart a medium-high susceptibility to change arising from the Proposed Scheme. Clearance of vegetation would be required over a wide corridor including the site of Westville satellite compound and Misk Farm ATS satellite compound. There would be removal of an area of ancient woodland at Watnall Coppice, agricultural land and hedgerow boundaries. Prominent changes to the undulating landform would result from a series of large-scale earthworks, including the Westville embankment (up to around 19m in height) and the Misk Hill and Park Forest cutting (around 15m deep). Additionally Westville satellite compound would be located on high ground, prominent in views across the LCA. Changes to character would be further affected by construction activities impacting on tranquility through the introduction of vehicles and large-scale machinery. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant).
Annesley Wooded Estatelands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The presence of Annesley Hall Grade II* Registered Park and Garden, strong cultural associations and good scenic quality impart a medium-high susceptibility to change arising from the Proposed Scheme. However, this predominantly rural landscape, characterised by arable fields, plantation and ancient woodland is already impacted by the deep cutting of the M1 through the ridge of Misk Hill, and by associated traffic noise. The character of the LCA would be further impacted by the removal of plantation woodland within Park Forest and arable land, resulting in a wide corridor of atypical open landscape. The area of Park	**Level of effect:** Major adverse (significant).

Forest ancient woodland on the western side of the M1 would not be affected. The excavation of a second, deep cutting through the ridge would constitute a large-scale change to the local landform. North of Misk Hill, construction activities would extend to the M1 boundary on the west and to the boundary of the Annesley Hall Registered Park and Garden to the east. Combined with the prominent location the Proposed Scheme would change the character of the already impacted LCA through construction vehicle movements and noise, further reducing tranquillity. Construction activity would have an indirect impact on the setting of the Annesley Hall Registered Park and Garden. There would therefore be an overall high magnitude of change and major adverse effect.	
Moorgreen Rolling Wooded Farmlands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The rolling landform with its patchwork of farmland and woodland, presence of ancient woodland, good scenic quality and tranquillity, together with strong cultural associations, impart a medium-high susceptibility to change arising from the Proposed Scheme. The removal of woodland at The Dumbles, Audrey Wood and William Wood Spinney would open up views towards the M1 during the construction period increasing the visual prominence of the M1, and affecting the character of the predominantly rural landscape. The large-scale construction activities would be seen on or near the skyline in views from the east. There would also be removal of agricultural land and hedgerow boundaries. The land required for construction would include the site of the A608 Mansfield Road main compound and adjacent temporary earthworks stockpile which would alter landform characteristics, close to the boundary of the Annesley Hall Registered Park and Garden, but would also help to screen some views towards the construction activities. Tranquillity in the eastern part of the LCA already impacted by motorway traffic would be further reduced by construction vehicle movements and noise. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant).
Bentinck Tip Area	**Medium susceptibility and sensitivity**
Susceptibility to change: The presence of nationally designated ecological sites (Annesley Woodhouse Quarries SSSI and Bogs Farm Quarry SSSI) impart a medium susceptibility to change arising from the Proposed Scheme. The removal of agricultural land, hedgerow boundaries and a small extent of woodland in the south-western corner of Bogs Farm Quarry SSSI would result in a more open landscape character in the western part of the LCA. The scale of the Proposed Scheme through the LCA and the prominent nature of construction activity would change the character of the perimeter agricultural landscape of the LCA. Large-scale earthworks in the northern part of the LCA would create changes to landform characteristics. Despite activities associated with restoration of the Bentinck Tip being characteristic of the LCA, additional vehicle movements and associated noise would further reduce tranquillity of the area. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant).
Kirkby Coalfield Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating rural landscape, including estates of Langton Hall and Brookhill Hall, impart a medium susceptibility to change arising from the Proposed Scheme.	**Level of effect:**

The character of the predominantly rural landscape would be changed by the introduction of a wide corridor of more open landscape created from the demolition of farm buildings, removal of trees, hedgerows, and parts of wooded corridors associated with the Maghole Brook and The Dumbles. This would accommodate substantial construction infrastructure, including Farmwell Lane main compound, three satellite compounds (Erewash and Mineral Railway South, Kirkby Lane, and Maghole Brook), and the Erewash and Mineral Railway construction siding. This temporary infrastructure would support the construction of several components of the Proposed Scheme: earthworks and structures including the River Erewash South embankment, Erewash and Mineral Railway viaduct (up to approximately 29m in height), River Erewash North embankment, Kirkby Lane cutting, Kirkby Lane and Maghole Brook embankment, Maghole Brook viaduct, Brookhill Lane embankment, A38 Alfreton Road South cutting, and A38 Alfreton Road box structures. Construction works would significantly alter the character of the LCA, creating physical and visual severance. Tranquillity would be further reduced by train movements associated with the construction siding, construction vehicle movements and noise. There would therefore be an overall high magnitude of change and major adverse effect.	Major adverse (significant).

Visual assessment

Introduction

11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.10 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

11.4.11 Table 26: Construction phase potentially significant visual effects describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA07 Map Book.

Table 26: Construction phase potentially significant visual effects

View west from Robin Hood Way/ Hucknall Bridleway 19 **(VP 382-03-007) (Map Number LV-03-382b)**	**High sensitivity visual receptors**
There would be close to middle-distance views of activities associated with the construction of Westville embankment. New housing development would partially screen views directed towards the construction of B6009 Long Lane underbridge. B6009 Long Lane satellite compound and temporary earthworks stockpile would be visible in the background. Construction traffic would be visible on the site haul route to the west. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

View from Greasley Bridleway 19 beside former Watnall Brickworks site **(VP 383-03-007) (Map Number LV-03-383)**	**Medium-high sensitivity visual receptors**
Bridleway users would have close distance views of the construction area at Westville embankment immediately east, extending in full view across the midground from north to south. Construction traffic would be conspicuous moving on the site haul route within 150 metres of the viewpoint. Removal of mature trees and other vegetation would affect key characteristics of the view. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View east from Greasley Bridleway 21 **(VP 383-03-010) (Map Number LV-03-383)**	**Medium-high sensitivity visual receptors**
Bridleway users would have middle distance views of Westville embankment partially screened by the existing bridge parapet railings and existing bridge embankment trees in the foreground, and retained trees and hedgerow trees in the midground. There would be full vegetation clearance within the land required for construction affecting key characteristics of the midground of the view. The removal of part of Watnall Coppice would be noticeable. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from residences, Greasley Footpath 20 and Greasley Bridleway 21 on the outskirts of Hucknall **(VP 383-02-011 and VP 383-02-012) (Map Number LV-03-383)**	**High sensitivity visual receptors**
Key characteristics of the existing view would be altered by the removal of existing hedges and trees opening up views to the M1, and of the land required for construction. There would be a substantial change to the foreground view. Fore- to midground views would be dominated by the construction works for Westville embankment and the realigned bridleway which would be visible in the centre ground of VP 383-02-012.Views from adjacent residential properties would be dominated by the construction works. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View south-west from Hucknall Bridleway 33 at Beacon Hill **(VP 383-03-013) (Map Number LV-03-383)**	**Medium-high sensitivity visual receptors**
From this high vantage point there would be views to the construction works associated with Westville embankment across the full angle of view. The construction area would occupy a noticeable extent of the view, on rising land between Westville and the M1. Footpath users would experience changes to key characteristics from removal of open fields, hedgerows and woodland, despite the construction works being located more than 500m in the distance. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View north-east from residences, Greasley Footpath 10 and Hucknall Footpath 35 near Misk Farm **(VP 384-03-002 and VP 384-02-003) (Map Number LV-03-384)**	**Residents: High sensitivity receptors; Footpath users: Medium-high sensitivity visual receptors**
Mid-ground views of construction activities for Westville embankment would be partially screened by intervening vegetation. From VP 384-03-002, foreground trees beside the motorway would partially	**Level of effect:** Moderate adverse (significant)

screen views. From VP 384-02-003 views of works associated with the construction of Misk Hill and Farm Forest cutting would be partially screened by woodland on rising ground behind Misk Farm. The removal of woodland would change the characteristics of the skyline. Removal of woodland at Park Forest is likely to be visible in more distant, oblique views. Construction traffic using the site haul route on the western side of the construction area would be visible in the midground of views, adding traffic elements to the existing views of motorway traffic. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
View west from Hucknall Footpath 35 **(VP 384-03-006) (Map Number LV-03-384)**	**Medium-high sensitivity visual receptors**
Users of the footpath would have panoramic views of the construction works with the Misk Farm ATS satellite compound prominent in the foreground. The construction of Misk Hill and Farm Forest cutting would be prominent; landform changes and removal of hedgerows, individual trees and woodland would affect key characteristics of the view. Distant views of the cutting would be affected by a noticeable change to the skyline. Construction traffic on the site haul route would be visible on the skyline on the opposite side of the cutting across the whole view. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View south-west from residences and Annesley Footpath 2 near Kennels Farm **(VP 385-02-002) (Map Number LV-03-385)**	**High sensitivity visual receptors**
Construction works for Audrey Wood south embankment and Audrey Wood viaduct would dominate mid-ground views for residents and footpath users. This and mid-ground views of construction traffic using the haul route would be partially screened/ filtered by retained woodland, but remain as a substantial change in views on skyline, landform, and vegetation. Woodland clearance would open up views to the M1 and moving traffic, and alter the characteristics of the view. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View south-west from Annesley Bridleway 1 (Weaver's Lane) at junction with Kennel Lane **(VP 385-03-003) (Map Number LV-03-385)**	**Medium-high sensitivity visual receptors**
There would be close distance views of construction activities associated with the balancing pond and Audrey Wood viaduct beyond. To the north west, the temporary earth stockpile on the northern side of Weaver's Lane would form the prominent element in the foreground. Combined with the retained part of Audrey Wood, this would be likely to screen further views of construction activities on the northern side of Weaver's Lane. Construction works and the temporary earth stockpile area would be the prominent elements in the foreground across the majority of the view. Removal of woodland and hedgerows would alter the key characteristics of the view, and create a more open skyline. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View south-west from Weaver's Lane, Annesley Bridleway 1 **(VP 385-03-005) (Map Number LV-03-385)**	**Medium-high sensitivity visual receptors**
Highly visible new features and components would affect mid-ground views for bridleway users including the A608 Mansfield Road main compound and temporary earthworks stockpile on rising ground. These features, together with existing farm buildings in the foreground, would partially screen construction activities for the A608 Mansfield Road cutting. Beyond the stockpile,	**Level of effect:** Major adverse (significant)

construction of the Audrey Wood viaduct would be visible on the skyline, filtered by retained woodland. There would therefore be an overall high magnitude of change and major adverse effect.	
View north-west towards the M1 from Annesley Footpath 8 north of the M1 Junction 27 with the A608 Mansfield Road **(VP 385-03-006) (Map Number LV-03-385)**	**Medium-high sensitivity visual receptors**
Footpath users would be affected by a substantial change to skyline, landform, and vegetation: the realignment of junction 27 of the M1 and construction of the A608 Mansfield Road cutting would dominate near-distance views. Construction traffic using the site haul route would be visible across the width of the view. Removal of vegetation beside the M1 junction 27 slip road, and around the footpath overbridge to the north-west in the distance, would open up views to motorway traffic. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View north-west from Annesley Footpath 9 **(VP 386-03-003) (Map Number LV-03-386)**	**Medium-high sensitivity visual receptors**
Construction activities associated with the A608 Mansfield Road cutting and Salmon Lane embankment would result in changes to landform. Combined with construction traffic using the site haul route, these would be prominent and disrupt the wooded skyline. A belt of woodland in the centre of the view would be removed opening up views of the M1 and moving traffic for a period of time until construction of the landscape earthworks. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west from Kirkby Footpath 20 **(VP 386-03-013) (Map Number LV-03-387a)**	**Medium-high sensitivity visual receptors**
Footpath users would experience a substantial change in the characteristics of views due to the removal of hedgerows, individual trees and woodland on the skyline, and the prominence of the construction area. Clearance of vegetation is likely to increase the visibility of the M1 infrastructure including lighting columns, which would be seen beyond the construction area. The B6018 ATS satellite compound with construction activities for the B6018 Park Lane cutting beyond would dominate the view. Construction traffic on the site haul route would be prominent. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west from residences and Kirkby Bridleway 12 **(VP 387-02-011) (Map Number LV-03-387a)**	**High sensitivity visual receptors**
There would be a substantial change to key characteristics of the view, due to the removal of hedgerows and woodland, and introduction of construction activities in the near distance. Foreground views of Kirkby Lane satellite compound would be likely to partially screen views of construction activity beyond. Construction of the B6019 Kirkby Lane and Maghole Brook embankment and the B6019 Kirkby Lane underbridge would be noticeable in oblique views. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west from Kirkby Bridleway 12 **(VP 387-03-012) (Map Number LV-03-387a)**	**Medium-high sensitivity visual receptors**

Users of the public bridleway would experience a substantial change in views. Key characteristics would be affected by removal of vegetation and skyline trees, and introduction of construction activities. The existing low hedgerow in the foreground would partially screen the construction of B6019 Kirkby Lane and Maghole Brook embankment, but these and haul route traffic would still be visible. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west from Kirkby Bridleway 12 (Mawkin Lane) **(VP 388-03-001) (Map Number LV-03-387a)**	**Medium-high sensitivity visual receptors**
Bridleway users would experience a substantial change to existing views from this elevated viewpoint due to vegetation removal and construction activity which would be highly visible across the majority of the view. The M1 would remain visible beyond extensive, medium distance views of the construction area, including works associated with the construction of Maghole Brook viaduct and haul route traffic in the central part of the view. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant

Other mitigation measures

11.4.12 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme to help achieve earlier landscape and visual integration.

11.4.13 However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

11.4.14 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents and users of PRoW within the Hucknall to Selston area.

11.4.15 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- major adverse effects in relation to five LCAs;
- moderate adverse effects in relation to one LCA;
- major adverse visual effects at four residential viewpoint locations;
- moderate adverse visual effects at one residential viewpoint location;
- major adverse visual effects at 10 recreational viewpoint locations; and
- moderate adverse visual effects at three recreational viewpoint locations.

11.5 Permanent effects arising from operation

11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with Year 30 (2063) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be integrated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments (such as the Westville embankment) and cuttings (such as the Park Lane cutting) into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where reasonably practicable. Earthworks design also takes account of the relationship to surrounding land uses and management, such as agriculture;
- woodland planting to help screen the Proposed Scheme from nearby residential properties in settlements such as Westville in Hucknall and other individual farmsteads and recreational facilities such as long-distance recreational routes and PRoW;
- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), such as compensatory woodland planting for the partial loss of Watnall Coppice and Park Forest, and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to visually soften embankments and viaduct abutments;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; and
- compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement in the River Erewash corridor.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the Audrey Wood viaduct, Erewash and Mineral Railway viaduct, and Maghole Brook viaduct, the presence of earthworks and retaining walls, and two auto-transformer stations. Other aspects include the presence of overhead line equipment and noise fence barriers.

Landscape assessment

11.5.4 Based on the current design it is anticipated that the LCAs set out in Table 27 would be significantly affected during operation of the Proposed Scheme.

Table 27: Operational phase significant landscape effects

Bulwell/ Watnall Wooded Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The open character of the landscape with isolated blocks of ancient woodland imparts a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The introduction of the Westville embankment would result in substantial change to the gently undulating landform. Westville embankment would be around 4m in height in the southern part of the LCA, rising to 14m height at the northern boundary of the LCA, with an additional 3-4m height provided by landscape earthworks. Such a high earthworks structure would create permanent landscape severance, and increase enclosure in the LCA. Elements associated with the Proposed Scheme, such as noise fences and overhead line equipment, would create additional infrastructure features to those of the M1, and would adversely affect the predominantly rural character. The movement of trains, and associated noise, would reduce tranquillity, albeit this is already influenced by the M1. The Proposed Scheme would have a direct impact on the site of the former Watnall Brickworks (local wildlife site). Replacement grassland habitat is proposed as ecological mitigation, on the western side of the Proposed Scheme, which would be in keeping with the land cover characteristics within the LCA. Proposed woodland planting on the eastern side of the Proposed Scheme would not be sufficiently established at year 1 to provide landscape mitigation. There would be changes to the PRoW network as a result of the Proposed Scheme. Greasley Footpath FP22 would be permanently closed, and Greasley Bridleways BW15, BW19 and BW21 would be realigned. There would be fewer choices of routes to use, and east-west connectivity would be restricted, with crossing points limited to underpasses at Bulwell Wood (within LA06), B6009 Long Lane, and Watnall Coppice. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Landscape mitigation planting and ecological woodland habitat creation would mitigate loss of woodland to the Proposed Scheme, partially compensate for the loss of ancient woodland at New Farm Wood (within LA06) and assist with some integration of earthworks and structures into the landscape. However, the operational railway, including the large-scale Westville embankment, would remain as uncharacteristic features of the landscape. By year 15 the medium magnitude of change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)
Hucknall Wooded Farmlands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The undulating landscape, presence of ancient woodland, good scenic quality and tranquillity impart a medium-high susceptibility to change arising from the Proposed Scheme. **Year 1:** The introduction of a series of large-scale earthworks, i.e. the high Westville embankment (up to around 19m in height) and the Misk Hill and Park Forest cutting (around 15m in depth) would create prominent changes to the undulating landform in the western part of the LCA. Elements associated with the Proposed Scheme, such as noise fences and overhead line equipment, would create additional infrastructure features to those of the M1, and would adversely affect the predominantly rural character. The movement of trains, and associated noise, would reduce tranquillity, albeit this is already influenced by the M1.	**Level of effect:** Moderate adverse (significant)

Woodland would be reduced in scale and extent in year 1 in comparison with the baseline. Areas of proposed replacement planting would not be sufficiently established to provide mitigation in year 1. There would be minor changes to the PRoW network as a result of the Proposed Scheme: Greasley Bridleway 21 would be diverted through Watnall Coppice underbridge and Hucknall Footpath 35 would be realigned to cross the Proposed Scheme at Hucknall Footpath 35 overbridge. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15: Substantial areas of woodland habitat creation planting are proposed on both sides of the Proposed Scheme, to help to mitigate the loss of the area of ancient woodland at Watnall Coppice. These areas of planting would assist with the integration of earthworks and structures into the landscape by the summer of year 15. However, the large embankment and cutting would remain as a permanent adverse effect of modified landform, and the area of ancient woodland would be lost. By year 15 the medium magnitude of change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)
Annesley Wooded Estatelands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The presence of Annesley Hall Grade II* Registered Park and Garden, strong cultural associations and good scenic quality impart a medium-high susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme would create changes to the undulating landform, introducing the deep Misk Hill and Park Forest cutting (up to 22m below ground level) through the sandstone ridgeline. The landscape would also incur direct impacts as a result of the loss of characteristic features of plantation woodland and agricultural land in part of the LCA. Where the Proposed Scheme would run in shallow cutting (The Dumbles cutting) and on embankment (Audrey Wood south and north embankments), elements such as overhead line equipment would be visible above the landscape earthworks, adding uncharacteristic elements to the rural landscape. The Proposed Scheme would result in a permanent reduction in local tranquillity. Woodland would be reduced in scale and extent in year 1 in comparison with the baseline. Areas of proposed replacement planting would not be sufficiently established to provide mitigation in year 1. Elements of the Proposed Scheme, such as Audrey Wood viaduct and Kennel Lane overbridge, would be visible from the Annesley Hall Registered Park and Garden, incurring indirect impacts on its setting through the introduction of infrastructure beyond the boundary, where none is currently visible. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: On the northern side of Park Forest, planting is proposed on the western side of Kennel Lane, to replace woodland lost within the Forest, and to provide a link between Park Forest and The Dumbles areas of retained woodland. Further planting along the route of the Proposed Scheme, would link these areas with the retained part of Audrey Wood. Further north, a large area of woodland habitat creation planting is proposed on land which would have been used as the A608 Mansfield Road main compound, By year 15 the woodland planting would have sufficiently established to partially mitigate the impact of the Proposed Scheme on the setting of Annesley Hall Registered Park and Garden. The planting would help to enclose the Proposed Scheme where it passes through Park Forest. However, the large cutting through the ridgeline would remain as a permanent adverse effect of modified landform. By year 15 the medium magnitude of change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)

Moorgreen Rolling Wooded Farmlands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The rolling landform with its patchwork of farmland and woodland, presence of ancient woodland, good scenic quality and tranquillity, together with strong cultural associations, impart a medium-high susceptibility to change arising from the Proposed Scheme. **Year 1**: The LCA would be directly affected by the Proposed Scheme. The Proposed Scheme would be aligned close to, and parallel with, the M1 through the LCA. The Proposed Scheme would therefore increase the level of severance in the landscape. Audrey Wood south and north embankments, the large A608 Mansfield Road cutting (around 11m in depth), and Salmon Lane embankment would alter the local landform/ ridgeline characteristics in the eastern part of the LCA. The loss of areas of woodland would result in skyline modification in some views from the east, which would create a more open landscape character. Proposed woodland planting on the eastern side of the Proposed Scheme would not be sufficiently established at year 1 to provide landscape mitigation. Elements associated with the Proposed Scheme, such as overhead line equipment, would create additional infrastructure features to those of the M1, and would change the character of the eastern part of the LCA. The movement of trains, and associated noise, would affect the tranquillity of the rural landscape, albeit this is already influenced by the M1. There would be changes to the PRoW network as a result of the Proposed Scheme. Kennel Lane would be realigned, and Kennel Lane overbridge would be a new prominent feature in the landscape. Weaver's Lane would be unaffected but would pass under Audrey Wood viaduct. Annesley Footpath FP8 would be diverted to run along the eastern side of the Proposed Scheme, to Salmon Lane, and would no longer use the existing overbridge across the M1. There would therefore be one fewer crossing point over the M1, an adverse impact on the ability of people to experience the landscape. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Large areas of ecological woodland habitat creation are proposed on both sides of the Proposed Scheme, which would replace areas of woodland lost and provide connective habitats. In addition, landscape mitigation planting is proposed on the outer slopes of the mitigation earthworks. These areas of planting would together assist with the integration of structures into the landscape by the summer of year 15. Woodland planting would also recreate the skyline features which form part of the character of views from the east. The presence of the operational railway, including the large-scale A608 Mansfield Road cutting, embankments and overbridges would remain as permanent changes to the landscape. Such features are, however, not altogether uncharacteristic within the LCA, as the M1 alignment has already altered the landform through cuttings along the ridgeline. By year 15 the medium magnitude of change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)
Bentinck Tip Area	**Medium susceptibility and sensitivity**
Susceptibility to change: The presence of nationally designated ecological sites (Annesley Woodhouse Quarries SSSI and Bogs Farm Quarry SSSI) impart a medium susceptibility to change arising from the Proposed Scheme. **Year 1**: The route of the Proposed Scheme would create permanent changes in landform, including the B6018 Park Lane cutting, up to approximately 12m in depth. Such features are somewhat characteristic of the LCA, given that it includes excavations for past coal extraction and quarrying. The landscape would incur direct impacts as a result of the removal of characteristic features of agricultural land and hedgerows, and a small extent of woodland. The loss of vegetation would result in a wide corridor of more open landscape.	**Level of effect:** Moderate adverse (significant)

The Proposed Scheme is aligned roughly parallel to the M1, adding another transport corridor and extending the area of urban influence further into the rural landscape. The Proposed Scheme would permanently reduce local tranquillity, in addition to the reduction in tranquillity resulting from the M1. The introduction of the deep B6018 Park Lane cutting, together with infrastructure elements, such as overhead line equipment, would create permanent changes to the landscape. The magnitude of change is assessed as medium adverse. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15: Due to the maturing vegetation, effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant
Kirkby Coalfield Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating rural landscape, including estates of Langton Hall and Brookhill Hall, impart a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the Proposed Scheme in summer and winter of year 1 of operation. The introduction of the proposed Erewash and Mineral Railway viaduct and Maghole Brook viaduct with their associated embankments to the north and south, and B6019 Kirkby Lane cutting and A38 Alfreton Road south cutting, would result in a substantial change to the pattern and scale of the undulating landform. The introduction of deep cuttings, high embankments, and the introduction of very high viaducts, of up to around 29m, would create permanent landscape severance and truncation of valley landform, and would affect views across the LCA. Elements such as noise fences and overhead line equipment associated with the Proposed Scheme would create additional infrastructure features to those of the M1, and would change the predominantly rural characteristics of the LCA and alter its aesthetic qualities. The movement of trains, and associated noise, would affect the tranquillity of the rural landscape, which is already reduced by the M1. There would be changes to the public highway and PRoW network as a result of the Proposed Scheme: Kirkby Footpath 20, and Kirkby Footpath 13 would be diverted. Proposed landscape mitigation planting would not have established at year 1 and would not provide screening or landscape integration at this stage. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: Landscape mitigation planting would replace woodland lost to the Proposed Scheme and contribute to the integration of structures into the landscape by the summer of year 15. However, the operational railway, and large-scale embankments and cuttings and viaducts would remain as uncharacteristic, intrusive features. The magnitude of change would reduce to medium, and the level of effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.5.6 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity would be lower than those reported.

11.5.7 Table 28 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. These locations are shown in Map Series LV-04 in the Volume 2: LA07 Map Book.

Table 28: Operation phase significant visual effects

View west from Robin Hood Way/ Hucknall Bridleway 19 (VP 382-03-007) (Map Number LV-04-382b)	**High sensitivity visual receptors**
Year 1 – winter and summer: Users of the bridleway would experience substantial changes to mid-distance views in both winter and summer of year 1 due to the loss of vegetation and introduction of new landforms and structures. Westville embankment would extend across much of the midground of the view. The embankment would form a prominent, uncharacteristic feature. Earthworks would partially screen views of trains, although overhead line equipment would be visible above the earthworks, appearing against the skyline for the most part of the view. The proposed landscape mitigation planting would not provide any screening at year 1. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: The landscape mitigation planting would have established and would be maturing to provide partial screening in the area to the south and west of the public bridleway. By the summer of year 15, views of Westville embankment, overhead line equipment and trains would be partially screened by maturing landscape mitigation planting on the slopes of the mitigation earthworks. The earthworks would remain a noticeable change to a key characteristic of the view. Therefore, the magnitude of change would reduce to medium and the level of effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View from Greasley Bridleway 19 beside former Watnall Brickworks site (VP 383-03-007) (Map Number LV-04-383)	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Bridleway users would have direct views to the high Westville embankment, which would be a prominent uncharacteristic feature, continuously highly visible across the majority of the view in both winter and summer of year 1. Overhead line equipment and the movement of trains would be highly visible on the embankment, which would not include landscape earthworks at this location. Boundary tree loss would substantially alter the main characteristics of the view and change the skyline. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Views would be as at operation year 1. The embankments would still be highly visible across the majority of the view and uncharacteristic, therefore the magnitude of change would remain high and a major adverse effect.	**Level of effect:** Major adverse (significant)
View east from Greasley Bridleway 21 (VP 383-03-010) (Map Number LV-04-383)	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Bridleway users would have middle-distance views to the prominent, engineered Westville embankment, but these would be partially screened in both winter and summer of year 1 by the existing bridge parapet railings and trees on bridge embankments in the foreground, and retained trees and hedgerow trees in	**Level of effect:** Moderate adverse (significant)

the midground. There would be glimpses of railway infrastructure and trains. The embankment would form enclosure in oblique views. Areas of woodland habitat creation would have been newly planted and would not provide any visual screening at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15 – summer: To the left, woodland planting would be established and matured to provide partial screening. From the elevated motorway bridge viewpoint the embankments of the Proposed Scheme would still be visible. The magnitude of visual change would therefore remain as medium and there would remain a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from residences and Greasley Footpath 20 on the outskirts of Hucknall (VP 383-02-011 and VP 383-02-012) (Map Number LV-04-383)	**High sensitivity visual receptors**
Year 1 – winter and summer: Residents and footpath users in this location would experience large-scale changes to the characteristics of close distance views in both winter and summer of year 1. Greasley Footpath 20, would be closed at this point. Westville embankment would form the most prominent element in the view, blocking the openness of the existing view. Landscape earthworks of an additional 3-5m would screen the trains at this point, although overhead line equipment would be visible. Loss of mature hedgerows and trees would also change the character of the existing view. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Views would be partially screened or filtered by established landscape mitigation planting. Westville embankment would be likely to be partially visible in 1st floor residential views on the edge of Hucknall. Adjacent mitigation planting would change the open characteristics of the views. The view across open fields would be replaced by a view of woodland. The magnitude of change would therefore reduce to medium and the effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View north-west from residences and Greasley Bridleway 21 (VP 383-02-012) (Map Number LV-04-383)	**High sensitivity visual receptors**
Year 1 – winter and summer: Westville embankment and Watnall Coppice underbridge abutments would be large, prominent, engineered elements in middle distance view for users of the bridleway in both winter and summer of year 1. Infrastructure features would be prominent. Overhead line equipment would be visible (mostly against the skyline) above earthworks which would partially screen views of trains. Trains would be visible on Westville embankment and above Watnall Coppice underbridge. Westville embankment and landscape mitigation earthworks would obstruct existing views. The character of the view would be affected by loss of existing mature vegetation. Mitigation planting would not contribute to visual screening or integration at this stage. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Mitigation planting and woodland habitat creation would be established and maturing to screen and filter views. This would provide a new foreground to the view, and obstruct any distant views. The magnitude of change would therefore reduce to medium and the effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View north-east from residences, Greasley Footpath 10 and Hucknall Footpath 35 near Misk Farm (VP 384-03-002 and VP 384-02-003) (Map Number LV-04-384)	R**esidents: High sensitivity** visual **receptors; PRoW users: Medium-high sensitivity** visual **receptors**
Year 1 – winter and summer: Midground views of Westville embankment would be partially screened by landform and intervening vegetation. For VP 384-03-002, foreground trees beside the motorway would filter views (to a greater extent in summer), and earthworks at the northern end of the embankment would partially screen views	**Level of effect:** Moderate adverse (significant)

of trains. The tops of trains and overhead line equipment would remain visible. For VP 384-02-003, the local landform would partially screen views. Oblique views to Misk Hill and Park Forest cutting would be partially screened by woodland behind Misk Farm. Further north, tree loss evident on the skyline at Park Forest, would be noticeable in distant, oblique views. The proposed woodland habitat creation would not provide any visual screening at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant
View west from Hucknall Footpath 35 (VP 384-03-006) (Map Number LV-04-384)	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: The Autotransformer station would be a prominent feature in both winter and summer of year 1 in the midground of direct views towards the shallow embankment between the two parts of Misk Hill and Park Forest cutting. Overhead line equipment would be visible, partly against the skyline, but earthworks would partially screen views of trains. Middle distance views to Misk Hill and Park Forest cutting would be partially screened by intervening foreground vegetation and landform. The Hucknall Footpath 35 overbridge would be a prominent feature. Tree loss would be evident on the skyline of Misk Hill and at this stage the landscape mitigation planting associated with the landscape earthworks would not contribute to any visual integration. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer of year 15, established mitigation planting would partially screen the Proposed Scheme, but the characteristic open views would be lost. The magnitude of change would therefore reduce to medium and the effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View south-west from Hucknall Bridleway 33 at Beacon Hill (VP 383-03-013) (Map Number LV-04-383)	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: New embankments and loss of vegetation would noticeably change views for footpath users in both winter and summer of year 1. Westville embankment would be visible in the background, other changes being partially screened by foreground trees. Earthworks would screen views of trains and overhead line equipment would be barely discernible. Tree loss would be evident on the low ground beyond Hucknall in the centre of the view. The newly planted landscape mitigation planting would not provide any screening at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant
View south-west from residences and Annesley Footpath 2 near Kennels Farm (VP 385-02-002) (Map Number LV-04-385)	**High sensitivity visual receptors**
Year 1 – winter and summer: Footpath users and occupants of nearby residential properties would experience a substantial change in views in both winter and summer of year 1. Audrey Wood south embankment and Audrey Wood viaduct would be visible as prominent features in the midground of the view, with the viaduct partially screened by an area of retained woodland. Landscape earthworks at Audrey Wood south embankment would partially screen trains; overhead line equipment would be visible above the earthworks. The proposed woodland habitat creation would not provide any visual screening at this stage.	**Level of effect:** Major adverse (significant)

There would therefore be an overall high magnitude of change and major adverse effect.	
Year 15 – summer: By summer of year 15, views of the Proposed Scheme would be partially screened by the established mitigation planting, but the characteristic open views would be lost. The magnitude of change would therefore reduce to medium and the effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View south-west from Annesley Bridleway 1 (Weaver's Lane at junction with Kennel Lane) (VP 385-03-003) (Map Number LV-04-385)	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Bridleway users would experience a substantial alteration to existing views in both winter and summer of year 1, caused by the visually prominent Audrey Wood viaduct which would be seen on the skyline in the centre of the view. A balancing pond would be seen in front of the viaduct. Views to Audrey Wood north embankment would be partially screened by the retained part of Audrey Wood, but the proposed woodland habitat creation would not provide any visual screening at this stage. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Established woodland would have matured to provide partial landscape integration and screening, but the Audrey Wood viaduct would remain visible above the planting. Audrey Wood north embankment would be partially screened by the retained part of Audrey Wood, supplemented by the established planting. The magnitude of change would therefore reduce to medium and the effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View west from Weaver's Lane (Annesley Bridleway 1) adjacent to Annesley Hall Registered Park and Garden, Home Farm and Chaworth Lodge **(VP 385-03-005) (Map Number LV-04-385)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Users of the bridleway would experience noticeable changes to middle-distance views due to vegetation loss on the skyline and introduction of Audrey Wood viaduct and Audrey Wood north embankment. The existing landform and mature hedgerows (particularly in summer) would provide partial screening. Trains would be partially screened by earthworks at Audrey Wood north embankment, and fully screened in the A608 Mansfield Road cutting. The retained section of Audrey Wood would filter views of Audrey Wood viaduct. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant
View north-west towards the M1 from Annesley Footpath FP8 north of the M1 Junction 27 with the A608 Mansfield Road **(VP 385-03-006) (Map Number LV-04-385)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Footpath users would experience large-scale changes to near- and middle-distance views in both winter and summer of year 1. The enlarged M1 junction 27 with A608 Mansfield Road and associated tree loss would bring road infrastructure and traffic closer to the viewpoint, being more visible in the midground and detracting from the view. New woodland planting would not provide any screening at this stage. Earthworks at the A608 Mansfield Road cutting (and embankment) would screen the M1 and partially screen trains, but would alter character by interrupting and obstructing existing open views. Overhead line equipment would be visible. On balance, there would therefore be an overall medium magnitude of visual change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant

View north-west from Annesley Footpath 9 **(VP 386-03-003) (Map Number LV-04-386)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: The Proposed Scheme would be seen near the skyline in both winter and summer of year 1. Earthworks would partially screen trains and the M1, and, although the tops of trains and overhead line equipment would remain visible, the reduction of views of motorway traffic would be a beneficial effect. There would be substantial alteration to landform. Grading out of outer slopes would enable return to agriculture. The embankments would limit some longer views to the surroundings which would change the character of the views. Loss of the wooded skyline would change the character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: There is little proposed planting at this location, and therefore the moderate magnitude of visual change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)
View west from Kirkby Footpath 20 **(VP 386-03-013) (Map Number LV-04-386)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Direct views towards the Proposed Scheme at this location would be to Park Lane cutting (up to 12.3m deep) in the mid-distance, in which trains would be screened from view. The tops of trains and overhead line equipment would be visible in more oblique views towards the shallower part of the cutting. To the north-west the realigned B6018 Park Lane and B6018 Park Lane overbridge structure would be noticeable. The foreground of the view would encompass grassland and ponds created as ecological mitigation. Footpath users would experience changes to key characteristics of skyline and landform due to vegetation loss, and views to elements of the Proposed Scheme, in both winter and summer of year 1. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: There is no proposed planting at this location, and therefore the moderate magnitude of visual change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)
View west from residences and Kirkby Bridleway 12 **(VP 387-02-011) (Map Number LV-04-387a)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Bridleway users and occupants of nearby residential properties would experience a substantial change in views in both winter and summer of year 1. B6019 Kirkby Lane and Maghole Brook embankment would be a prominent feature in the midground of the view. The trains operating on the Proposed Scheme would be mostly screened from view by landscape earthworks, however the tops of trains and overhead line equipment would remain visible. The embankment itself would be conspicuous and would limit views to the west. Skyline tree loss to the west and introduction of the Proposed Scheme would alter key characteristics of the view. Loss of the hedgerow beside the bridleway would open up wide angle views of the Proposed Scheme. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Maturing landscape mitigation planting would provide visual screening beside the landscape mitigation earthworks. The maturing trees would contribute to re-establishment of a wooded skyline. The magnitude of change would therefore reduce to medium and the effect would reduce to moderate adverse.	**Level of effect:** Moderate adverse (significant)
View west from Kirkby Bridleway 12 **(VP 387-03-012) (Map Number LV-04-387a)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer:	**Level of effect:**

Vegetation would partially filter views of earthworks at the B6019 Kirkby Lane and Maghole Brook embankment in both winter and summer of year 1. These in turn would screen views of trains. In distant views to the south there may be glimpses of the proposed B6019 Kirkby Lane cutting. To the west and south west, the foreground hedgerow, intervening buildings and landform combine to partially filter and screen views. The skyline would be altered due to tree loss across the mid-ground of the view. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Moderate adverse (significant)
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant
View west from Kirkby Bridleway 12 **(VP 388-03-001) (Map Number LV-04-387a)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: The skyline would be altered in views from this elevated viewpoint due to mid-ground tree loss. Moving trains would be noticeable in mid-distant views of Maghole Brook viaduct in both winter and summer of year 1. To the west, trains would be screened by earthworks at B6019 Kirkby Lane and Maghole Brook embankment. Brookhill Lane embankment landscape earthworks would screen distant views of trains further north. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: Established and maturing mitigation planting would provide partial screening in the area to the west of Kirkby Cliff Farm. The Maghole Brook viaduct structure would remain highly prominent in the middle distance. The medium magnitude of visual change and moderate adverse effect would therefore remain.	**Level of effect:** Moderate adverse (significant)

Other mitigation measures

11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors would be reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or greenspace, including use of materials, would be considered as part of the ongoing development of contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

11.5.9 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:

- moderate adverse effects in relation to five LCAs;
- moderate adverse visual effects at five residential viewpoint locations;
- major adverse visual effects at one recreational viewpoint location; and
- moderate adverse visual effects at seven recreational viewpoint locations.

Monitoring

11.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

11.5.11 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Hucknall to Selston area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Hucknall to Selston area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Ashfield District Council (ADC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3: Route-wide effects.

12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[112].

12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES.

12.3 Environmental baseline

Existing baseline

Study area description

12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Hucknall to Selston area. It lies within the administrative area of ADC and Broxtowe Borough Council (BBC). As the Community are falls predominantly within the ADC administrative area the baseline is only reported for ADC. It also falls within the Derby, Derbyshire, Nottingham, Nottinghamshire (D2N2) Local Enterprise Partnership (LEP) area[113] and East Midlands region.

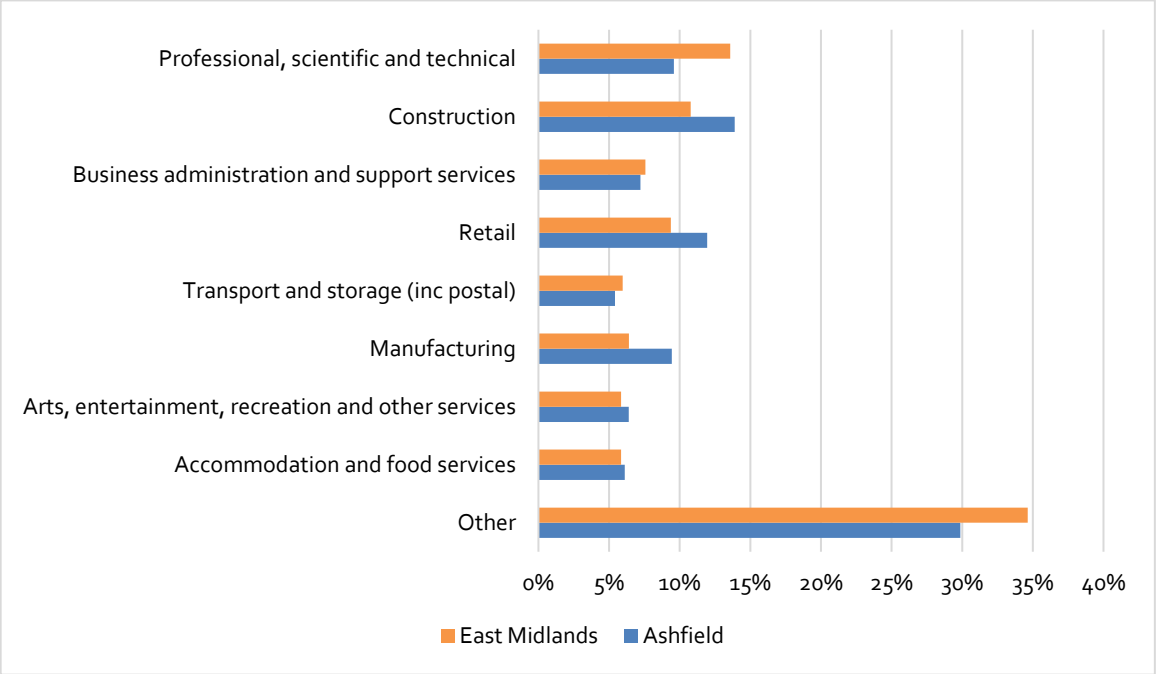
[112] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

[113] Derby, Derbyshire, Nottingham and Nottinghamshire Local Enterprise Partnership, (2014), Strategic Economic Plan March 2014.

Business and labour market

12.3.2 Within the ADC administrative area there is a wide spread of business types reflecting a diverse range of commercial activities. The construction sector accounts for the largest proportion of businesses (14%), with retail the second largest (12%) followed by professional, scientific and technical and manufacturing (10%). This is shown in Figure 8. For comparison within the East Midlands region, the largest sectors were professional, scientific and technical (14%), followed by construction (11%) and retail (9%)[114].

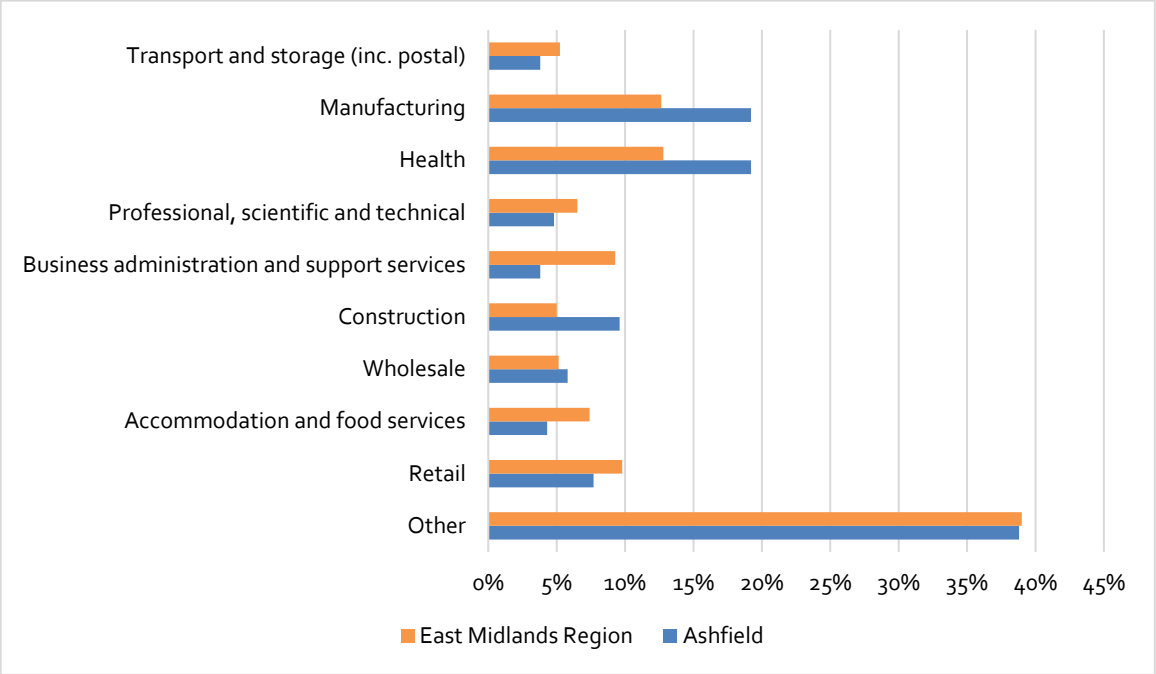
Figure 8: Business sector composition in Ashfield District Council administrative area and the East Midlands region [115]



12.3.3 In 2017[116], approximately 52,000 people worked in the ADC administrative area. According to the Office for National Statistics Business Register and Employment Survey 2017, the top five sectors in terms of share of employment in the ADC administrative area were manufacturing (19%); health (19%); construction (10%); retail (8%); and education (7%). For comparison, the top five sectors for the East Midlands region were: manufacturing (13%); health (13%); retail (10%); business administration and support (9%); and education (8%). This is shown in Figure 9.

[114] Office for National Statistics; UK Business count –Local Units 2015; https://www.nomisweb.co.uk
[115] "Other" includes: Information and communication; Manufacturing; Wholesale; Transport and storage (including postal); Motor trades; Property; Education; Financial and insurance; Public administration and defence; Mining, quarrying and utilities
[116] Office for National Statistics; 2017; Business Register and Employment Survey; http://www.nomisweb.co.uk, this number includes both residents and non-residents of ADC who work within its boundaries

Figure 9: Employment by industrial sector in the Ashfield District Council administrative area and the East Midlands region.



12.3.4 According to the Annual Population Survey (2016)[117], the employment rate[118] within the ADC administrative area was 73% (55,500 people), which is lower than that recorded for both the East Midlands region (75%) and England (74%). In 2016, unemployment[119] in the ADC area was 4.9%, which was more than the East Midlands region (4.3%) but less than England (5%).

12.3.5 According to the Annual Population Survey (2016)[120], 16.1% of ADC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31.3% in the East Midlands and 38% in England, while 8.5% of residents had no qualifications, which was higher than that recorded both for East Midlands region (7.5%) and England (8%).

Property

12.3.6 A review of employment land in 2015 identified a need for between 41,877 and 48,470m² of office floor space (B1a/B1b[121]), and between 47.81 and 132.13ha of industrial land (B1c/B2 and B8[122]) by 2033 in the ADC administrative area. In the ADC administrative area, a need for between 4,579 and 5,863m² of office floor space (B1a/B1b) and between 10.03 and 27.69ha of industrial land (B1c/B2 and B8) by 2033

[117] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[118] The proportion of working age (16-64 year olds) residents that is in employment
[119] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.
[120] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[120] Nottingham Core HMA and Nottingham Outer HMA Employment Land Foresting Study Final Report (2015), Nathaniel Lichfield & Partners.
[121] B1a is Office Land Use and B1b is R&D Space Land Use as defined under Employment Density Guidance, HCA (2015)
[122] B1C is Light Industrial Land Use, B2 is Industrial and Manufacturing Land Use, B8 is Storage and Distribution Land Use as defined under Employment Density Guidance, HCA (2015)

was identified. There has been a consistently high historic level of provision of employment land up until 2014, but the office space figures are distorted by the development at Sherwood Business Park in 2006[123]. A strategic employment site at Rolls Royce, Watnall Road, has been identified as providing key opportunities for employment growth[124].

12.3.7 The average vacancy rate for industrial and warehousing property in the ADC administrative area has been assessed as 16% based on marketed space against known stock[125].

12.3.8 Based upon the latest available data from the Estates Gazette (October 2017), there is 34,000m² of office space and 200,000m² of industrial space available in the ADC administrative area.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[126] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

[123] Nottingham Core HMA and Nottingham Outer HMA Employment Land Foresting Study Final Report (2015), Nathaniel Lichfield & Partners. Scenario 3 - Labour Supply figure used from 2011 to 2033
[124] Stoke-on-Trent & Staffordshire LEP (undated), Stoke-on-Trent & Staffordshire Economic Growth Strategy 2012 - 2026, v2.1.
[125] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA)
[126] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, both will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

Construction employment

12.4.3 It is currently anticipated that there would be one main compound at A608 Mansfield Road and seven satellite compounds in the Hucknall to Selston area. These sites could result in the creation of up to 2,560 person years of construction employment opportunities[127], broadly equivalent to 256 full-time jobs[128], which, depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.4 Direct construction employment could also lead to opportunities for local businesses to form part of the supply chain for the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.5 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

[127] Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days
[128] Based on the convention that 10 employment years is equivalent to one full time equivalent job

12.4.7 Overall, seven business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These seven units or sites, together, form three defined resources and provide two jobs. These are as follows:

- Park Forest (one business unit);
- Boggs Farmhouse, Salmon Lane (one business unit); and
- Park Lane (one business unit).

12.4.8 It is currently anticipated that no businesses would experience significant permanent direct effects as a result of construction of the Proposed Scheme.

Significance of effects

12.4.9 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently anticipated that there would be no significant impacts on employment. It should be noted that a precautionary approach has been taken in this assessment as outlined in Section 1.2, and it may change by the time of the formal ES.

12.4.10 Across all of the employment areas reviewed, it is currently estimated that two jobs[129] would either be displaced or possibly lost within the Hucknall to Selston area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents within the travel to work areas due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the ADC authority area (approximately 55,500 jobs) and the scale of economic activity and opportunity in the area.

12.4.11 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Other mitigation measures

12.4.12 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

12.4.13 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the route of the Proposed Scheme in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a

[129] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

12.4.14 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently anticipated that no resources would experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

12.5.3 In-combination effects will be assessed and reported in the formal ES.

Operational employment

12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.5 The impact of operational employment creation will be been assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.6 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

12.5.7 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

12.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Hucknall to Selston area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Hucknall to Selston area on:

- 'residential receptors'; people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas[130]; and
- 'non-residential receptors'[131] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[132]; and
  - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy[133], planning policy, planning practice guidance on noise (PPGN)[134] and EIA Regulations as described in the Scope and Methodology Report[135] (SMR).

13.1.3 Engagement has been undertaken with Broxtowe Borough Council (BBC), Ashfield District Council (ADC) and Nottinghamshire County Council (NCC) with respect to the sound, noise and vibration assessment. This engagement process will continue as part of the development of the Proposed Scheme. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route wide basis covering matters including process, scope, method and the approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local and county authorities are invited to attend and witness baseline sound measurements.

13.1.4 Maps of the Proposed Scheme in the Hucknall to Selston area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation (Map series SV-01), can

[130] 'Shared community open areas' are those that the Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.
[131] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate
[132] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces
[133] Noise Policy Statement for England (2015) Department for Environment, Food & Rural Affairs (Defra)
[134] Planning Practice Guidance (2014) Department for Communities and Local Government (DCLG). Available online at: https://www.gov.uk/guidance/noise--2
[135] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

be found in the Volume 2: LA07 Map Book. Map series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The Hucknall to Selston area is characterised by a mix of towns, villages, hamlets and isolated residential properties in a predominantly rural setting. The area also includes several industrial estates including Hucknall industrial area located at the former Hucknall Airfield, Sherwood Business Park and Brookhill Industrial Estate. The sound environment is generally dominated by local and distant road traffic, and local neighbourhood sources, with contributing natural and agricultural sounds, and rail traffic.

13.3.3 There are three main roads within the Hucknall to Selston area: the M1, the A608 Mansfield Road and the A611 Annesley Road. The M1 passes through the Hucknall to Selston area in a south-north orientation. The Proposed Scheme would lie to the east of the motorway. The A608 Mansfield Road runs from west to east connecting the M1 junction 27 to the A611 Annesley Road, providing the primary access to the Sherwood Business Park area. The A611 Annesley Road runs in a south-north direction through the east of the Hucknall to Selston area – connecting the A608 Mansfield Road with Annesley Woodhouse to the north, and with Hucknall to the south.

13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes.

13.3.5 The effects of vibration at all receptors are being initially assessed using specific thresholds, below which receptors would not generally be adversely affected by vibration. Further information is provided in Volume 1 (Section 8).

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[136], Roads[137] or Railways[138]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA07 Map Book) shows any noise Important Areas in the Hucknall to Selston area.

13.4 Effects arising during construction

Assumptions and limitations

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1 (Section 8) and in the draft Code of Construction Practice (CoCP)[139]. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.

13.4.2 The following assumption has also been made in relation to the construction methods specific to the Hucknall to Selston area.

13.4.3 The A608 Mansfield Road overbridges and the Salmon Lane HS2 and M1 overbridges involve construction works in proximity to the M1 junction 27 and to the M1 next to Selston respectively. This includes construction of the piling platform and pile cap and installation of beams and concreting. Some works may be undertaken during the evening or night-time.

[136] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)
[137] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)
[138] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)
[139] Supporting document: Draft Code of Construction Practice

13.4.4 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

13.4.5 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[140].
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- lead contractors would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision.
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities.
- contractors would be required to comply with the terms of the draft CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.6 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case

[140] Including local businesses and quiet areas designated by the local authority

estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.7 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

13.4.8 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA07 Map Book):

- Westville, in Hucknall, arising from construction activities such as embankment formation, landscape bund construction and balancing pond construction;
- Selston, arising from construction activities such as cutting formation, embankment formation, road realignment, overbridge construction, landscape bund construction and balancing pond construction; and
- Pinxton, to the east of the M1, in the vicinity of the B6019 Kirkby Lane, arising from construction activities such as cutting formation, embankment formation, underbridge construction, landscape bund construction and balancing pond construction.

13.4.9 Map Series SV-01 (Volume 2: LA07 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. None of these is likely to experience significant effects (to be confirmed in the formal ES).

13.4.10 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse likely significant effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.11 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- the B6009 Long Lane and the B6009 Watnall Road between the M1 crossing point and the A611 to the east of Hucknall;
- Common Lane, continuing along Wood Lane to the north of Hucknall;
- Whyburn Lane, continuing along Wood Lane to the north of Hucknall;
- Forest Road and Salmon Lane between the A611 at Annesley and Selston;
- the B6018 Park Lane, which links Selston and Kirkby-in-Ashfield; and
- the B6019 Kirkby Lane, which connects Pinxton with Kirkby-in-Ashfield.

13.4.12 The magnitude and extent of effect will depend on the level of construction traffic using the road. Residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.13 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

13.4.14 Further work is being undertaken to confirm significant construction noise and vibration effects, including temporary indirect effects from construction traffic.

13.4.15 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 and 2.4 of this report and in Volume 1 (Sections 4 and 8) and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for Phase 2b is described in Volume 1 (Section 4) and as outlined below for the Hucknall to Selston area.

13.5.2 Passenger services will start at or after 05:00 from the terminal stations and in this area, with Phase One and Phase Two in operation will progressively increase to 11 trains per hour in each direction on the main lines with an operating speed of around 300kph for all the services at the southern end of the Hucknall to Selston area progressively increasing to around 330kph for 90% of services and 360kph for 10% of services for all services at the northern end. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1 (Section 4).

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1 (Section 9).

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia where reasonably practicable. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[141].

13.5.6 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: LA07 Map Book) and described in Section 2.2.

13.5.7 In practice, barriers may differ from this description while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they would need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier because the crest of the earthwork would be further than 5m from the outer rail.

13.5.8 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.9 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where[142] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[143] or the maximum noise level criteria[144] defined in the SMR. Noise insulation is designed to avoid residents experiencing residual significant effect on health and quality of life from resulting noise inside their dwelling.

Ground-borne noise and vibration

13.5.10 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

[141] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[142] Following Government's Planning Practice Guidanc. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[143] Night Noise Guidelines for Europe (2010) World Health Organization
[144] Dependent on the number of train passes

Assessment of impacts and effects

13.5.11 Map Series SV-01 (Volume 2: LA07 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or $L_{pAeq,night}$) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

13.5.12 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

13.5.13 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.14 Likely significant airborne noise effects arising from permanent changes to existing roads will be reported in the formal ES.

Other mitigation measures

13.5.15 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.16 Mitigation, including landscape earthworks and noise fence barriers, described in Volume 1, Section 9; Section 2.2 and presented in Map Series SV-01 (Volume 2: LA07 Map Book) and Map Series CT-06 (Volume 2: LA07 Map Book), would substantially reduce the potential airborne noise effects that would otherwise arise from the Proposed Scheme. It is anticipated that the mitigation would avoid likely significant adverse effects due to airborne operational noise on the majority of receptors and communities.

13.5.17 Taking account of the avoidance and mitigation measures this initial assessment has identified no airborne noise effects with the potential to be considered significant on a community basis due to increased noise levels forecast to arise from the operation of the Proposed Scheme in line with the SMR.

13.5.18 The initial assessment indicates that, on a precautionary basis, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise Insulation Regulations, the night time Interim Target identified in the WHO Night

Noise Guidelines for Europe 2009, or the maximum noise level criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme in:

- Langton Lodge in the vicinity of the B6019 Kirkby Lane (identified on Map SV-01-374a in Volume 2: LA07 Map Book); and
- York Lodge in the vicinity of the B6019 Kirkby Lane (identified on Map SV-01-374a in Volume 2: LA07 Map Book).

13.5.19 These properties are identified on Map Series SV-01 (Volume 2: LA07 Map Book).

13.5.20 The initial assessment indicates that there are no significant effects identified at non-residential receptors in this community area as a result of operational noise.

13.5.21 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

13.5.22 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

13.5.23 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

13.5.24 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles; at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.25 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Hucknall to Selston area.

14.1.2 Engagement with Highways England, Nottinghamshire County Council (NCC) and Derbyshire County Council (DCC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[145].

14.2.2 The study area for traffic and transport includes the areas around the settlements of Hucknall, Westville, Ruffs, Beauvale, Wighay, Nuncargate, Kirkby-in-Ashfield and Selston.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. Strategic roads include the M1 between junctions 26 and 28, part of the strategic road network, linking the Yorkshire and Humber Region with the East Midlands, East of England, South East England and London. Local roads include the A608 Mansfield Road; the A611 Annesley Road/Derby Road; the B6009 Long Lane/Watnall Road; the B6018 Mansfield Road/Park Lane; the B6019 Kirkby Lane; Wood Lane, Common Lane, Whyburn Lane, Forest Road and Salmon Lane.

14.2.4 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.5 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, NCC and DCC (including

[145] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

provision of information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in November 2017 and April 2018. These data have been supplemented by existing traffic data from other sources, including from Highways England, NCC and DCC. Assessment of these data indicate that the peak hours in the area are 07:15-08:15 and 16:45-17:45. However, there are only relatively small differences (2% to 11%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, which are the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic route that passes through the area is the M1 between junction 26 and junction 28. The strategic road network in and around the Hucknall to Selston area is busy at peak times and delays can be experienced. The local roads that could be affected by the Proposed Scheme include: the A608 Mansfield Road which connects to the M1 junction 27 and the A611 which runs between Nottingham and Mansfield; the B6009 Long Lane/Watnall Road, the B6018 Mansfield Road/Park Lane, the B6019 Kirkby Lane; Wood Lane, Common Lane, Whyburn Lane, Forest Road and Salmon Lane. The local road network in this area generally operates well although some localised delays can be experienced, particularly at peak times.

14.3.5 Relevant accident data for the road network subject to assessment have been obtained from Department for Transport[146]. Data for the three-year period (2014-2015-2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

14.3.6 Three accident clusters were identified within the Hucknall to Selston area:

- at junction 27 of the M1 (32 accidents with no serious casualty or fatality accidents);
- at the A611/B6009 Watnall Road signalised roundabout (11 accidents including two serious casualty accidents); and

[146] Department for Transport; Crashmap.co.uk; www.crashmap.co.uk. CrashMap provides accident data for the UK.

- at the B6009 Watnall Road/Nabbs Lane mini roundabout (11 accidents including one serious casualty accident).

14.3.7 The route of the Proposed Scheme would cross three roads with footways within the Hucknall to Selston area. These are the B6009 Long Lane, the A608 Mansfield Road and the B6019 Kirkby Lane. In addition, the Proposed Scheme also crosses the B6018 Park Lane and the Salmon Lane but these do not have footways.

Parking and loading

14.3.8 Parking in the Hucknall to Selston area is largely uncontrolled and there is on street parking in residential areas. Two designated lay-bys adjacent to the eastbound and westbound carriageways of the A608 Mansfield Road, east of the M1 junction 27, have been identified in the Hucknall to Selston area that could be affected by the Proposed Scheme.

Public transport network

14.3.9 Seven bus routes operate on four roads that are crossed by the route of the Proposed Scheme in the Hucknall to Selston area. There are also bus stops primarily located to serve the main built up area. The bus routes that could be affected by the Proposed Scheme include:

- B6009 Long Lane - Service: Amberline (Derby – Heanor – Hucknall);
- A608 Mansfield Road - Service: Black Cat (Derby – Ilkeston – Heanor – Mansfield);
- B6018 Park Lane - Services: Selston Shopper (Selston – Sutton), Underwood Shopper (Underwood – Selston – Sutton) and Jacksdale Shopper (Jacksdale – Selston – Sutton); and
- B6019 Pinxton Lane/Kirkby Lane - Services: 9.3 (Derby – Ripley – Alfreton – Mansfield) and 'Ninety' (Sutton – Kirkby – Selston – Ripley).

14.3.10 National and local rail services are accessible via Hucknall, Newstead and Kirby-in-Ashfield stations. These stations are located 3-4 km to the east of the line of the Proposed Scheme in the Hucknall to Selston area, on the Nottingham to Worksop line (also known as the Robin Hood Line). These stations provide local services to Nottingham and Mansfield/Worksop. The Proposed Scheme would cross a freight-only railway line to the south of Kirkby-in-Ashfield, the Sutton Junction to Pye Bridge Railway, connecting the Erewash Valley Line (Clay Cross-Long Eaton) to the Robin Hood Line.

Non-motorised users

14.3.11 There are pedestrian footways adjacent to many of the roads in the built up areas of Hucknall, Westville, Ruffs, Beauvale, Wighay, Nuncargate, Kirkby-in-Ashfield and Selston. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.12 The route of the Proposed Scheme would cross the route of 12 PRoW (with an additional eight permissive paths) within the Hucknall to Selston area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades, including for maintenance access to the Proposed Scheme. The surveys undertaken to inform the assessment showed that there were fewer than 10 people a day recorded during the survey date on four of the PRoW. The routes with the greatest usage recorded during the survey day were the Greasley Bridleway 21, which forms part of the Broxtowe Country Trail, (used by 456 people, including 27 cyclists), the Annesley Bridleway 1 (used by 102 people, including 33 cyclists) and the Annesley Footpath 2 (used by 80 people, including 11 cyclists). Five of the eight permissive paths were found to have less than 20 users per day, the remaining three were found to have between 25 and 40 users per day.

Waterways and canals

14.3.13 There are no navigable waterways in the Hucknall to Selston area. Consequently, this topic is not considered further in this assessment.

Air transport

14.3.14 There is no relevant air transport in the Hucknall to Selston area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;

- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[147] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[148] to be produced that would include a range of potential measures to mitigate the impacts of

[147] Supporting document: Draft Code of Construction Practice
[148] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

traffic and transport movements associated with construction of the Proposed Scheme.

Assessment of impacts and effects

Temporary effects

14.4.7 The traffic and transport impacts during the construction period within the Hucknall to Selston area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW; and
- possessions on the conventional rail network.

14.4.8 The construction assessment has also considered any impacts in the Hucknall to Selston area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.9 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.10 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA07 Map Book. Highway network.

Strategic and local highway network

14.4.11 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the M1 junctions 27 and 28;
- the A608 Mansfield Road from the A611 junction to the M1 junction 27;
- the A611 Annesley Road/Derby Road, between the junction with the B6009 Watnall Road to the south and Forest Road to the north;
- the B6009 Long Lane/Watnall Road between Hucknall and the A611 Annesley Road to the east and the M1 to the west;
- the B6018 Mansfield Road/Park Lane, west of Kirkby-in-Ashfield, between Common Road (Selston) to the west and Kirkby Park to the east;
- the B6019 Kirkby Lane, west of Kirkby-in-Ashfield, between the junction with

Beaufit Lane/Wharf Road/B6019 Town Street (Pinxton) to the west and Cliff Farm to the east;

- Wood Lane;
- Whyburn Lane;
- Common Lane;
- Forest Road; and
- Salmon Lane.

14.4.12 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users.These are expected to include:

- the M1, north of junction 27 at the location of the Salmon Lane overbridge, requiring temporary traffic management measures;
- the A608 Mansfield Road (eastern arm of the M1 junction 27, west of the roundabout with access road to Sherwood business park);
- the B6018 Park Lane (for an approximate length of 600m, immediately east of the M1) which will be temporarily closed and traffic diverted to other local roads; and
- Salmon Lane (between the edge of Selston, west of the M1, and Boggs Farm, east of the M1) which will be temporarily closed and traffic diverted to other local roads.

14.4.13 Permanent changes to highways are reported under operation.

14.4.14 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.15 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.16 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Parking and loading

14.4.17 It is currently expected that the Proposed Scheme could have impacts on parking. The lay-bys on the A608 Mansfield Road east of the M1 junction 27 roundabout may require temporary closures to accommodate construction of the Proposed Scheme. Some roads that could be used as construction routes and have on-street parking could be affected. Any significant effects will be reported in the formal ES.

Public transport network

14.4.18 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes: Amberline on the B6009 Long Lane, Selston Shopper, Underwood Shopper and Jacksdale Shopper on the B6018 Park Lane. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.19 There are interfaces with the existing rail network in this area, in particular on the operation of the Sutton Junction to Pye Bridge freight-only line. Rail possessions would be required in order to connect the track to the proposed Erewash and Mineral Railway construction siding and construct the Erewash and Mineral Railway viaduct. This could result in disruption to services, although many of the interventions would be combined to reduce the frequency of potential disruption. The effects of railway possessions will be assessed and reported in the formal ES.

Non-motorised users

14.4.20 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.21 It is currently expected that the following PRoW would be temporarily diverted/realigned or closed:

- Greasley Bridleway 15 diverted to the north of its existing alignment, over a parallel 200m-long section across the Proposed Scheme's route;
- Greasley Footpath 20 diverted south of its existing alignment onto the diverted Greasley Bridleway 21;
- Greasley Bridleway 21 diverted south of its existing alignment onto a u-shape route between the edge of Westville (north western corner of the inhabited area) and a point located approximately 120m east of the M1;
- Hucknall Footpath 35 realigned north of its existing alignment onto a u-shape route;
- Annesley Footpath 2 realigned west of its existing alignment from a location approximately 100m east of the M1 (to the south) to a point 300-400m south of Kennel Farm (to the north);
- Annesley Bridleway 1 realigned locally south of the existing alignment;
- Annesley Footpath 8 diverted locally at both its end points, i.e. east of its existing alignment near the A608 Mansfield Road to the south and west of its existing alignment near Salmon Lane to the north;
- Kirkby Footpath 20 realigned locally to the west and north of its existing alignment;

- Kirkby Footpath 17 realigned locally to the east and north of its existing alignment just north of the merge/diverge point between the disused railway line and the Sutton Junction to Pye Bridge freight-only line; and
- Kirkby Footpath 13 realigned locally north of its existing alignment onto a u-shape route just to the west of Kirkby Cliff Farm.

14.4.22 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.23 The realignment of some of the PRoW would increases journey distance and time for non-motorised users and may result in significant effects. It is expected that the greatest increases in journey distance (likely to be in excess of an additional 500 m) would affect the users of Greasley Bridleway 21. The assessment of these changes will be reported in the formal ES.

Permanent effects

14.4.24 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

14.4.25 The implementation of the measures in the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

14.4.26 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.27 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including: the M1 junctions 27 and 28, the A608 Mansfield Road, the A611 Annesley Road/Derby Road, the B6009 Long Lane/Watnall Road, the B6018 Mansfield Road/Park Lane, the B6019 Kirkby Lane, Wood Lane, Whyburn Lane, Common lane, Forest Road and Salmon Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in a change in accident risk.

14.4.28 Construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments. These are expected to include the M1 north of junction 27, the A608 Mansfield Road, the B6018 Park Lane and Salmon Lane.

14.4.29 Construction of the Proposed Scheme is likely to affect parking at the lay-bys on the A608 Mansfield Road east of the M1.

14.4.30 Bus services the Amberline, the Selston Shopper, the Underwood Shopper and the Jacksdale Shopper would be affected by temporary diversions. Rail possessions on the Sutton Junction to Pye Bridge Railway would be required.

14.4.31 A number of PRoW could also be subject to temporary closure or diversion/realignment. These PRoW include: Greasley Bridleways 15 and 21, Greasley Footpath 20, Hucknall Footpath 35, Annesley Footpaths 2 and 8, Annesley Bridleway 1 as well as Kirkby Footpaths 20, 17 and 13.

14.4.32 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

Assessment of impacts and effects

14.5.2 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Hucknall to Selston area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

14.5.5 The Proposed Scheme would result in a number of permanent highway changes. These include:

- the M1 junction 27 roundabout would be modified and enlarged to accommodate the Proposed Scheme's alignment under the A608 Mansfield Road;
- a short section of the existing B6009 Long Lane would be replaced by a 20m span structure built over the existing alignment;
- a short section of the B6018 Park Lane would be replaced by an 88m long span

structure built over the existing alignment;

- a short section of the existing B6019 Kirkby Lane alignment would be provided with a 27m span structure in order to pass under the Proposed Scheme; and
- Salmon Lane would be realigned just south of the existing alignment.

14.5.6 The permanent highway changes are not expected to result in significant changes in travel distances. The effects of these changes, including on non-motorised users, will be reported in the formal ES.

Accidents and safety

14.5.7 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Parking and loading

14.5.8 The capacity of the lay-by adjacent to the eastbound carriageway of the A608 Mansfield Road, east of the M1 junction 27, is expected to be permanently impacted by the Proposed Scheme in order to accommodate a farm access. The assessment of this will be reported in the formal ES. The lay-by adjacent to the westbound carriageway of the A608 Mansfield Road is expected to be reinstated to its current layout with no adverse effects.

Public transport network

14.5.9 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments are likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Hucknall to Selston area.

Non-motorised users

14.5.10 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Greasley Bridleway 15 (part of the Robin Hood Way Long Distance Path) diverted to the east of the existing alignment to connect with the B6009 Long Lane, approximately 30m east of the B6009 Long Lane underbridge;
- Greasley Bridleway 19 realigned to the west of its existing alignment near the Watnall Brickworks former industrial site;
- Greasley Footpath 22 closure; similar end-to-end journeys can be completed by diverting onto the B6009 Long Lane and the realigned Greasley Bridleway 19;
- Greasley Footpath 20 diverted to the west of its existing alignment in the proximity of Westville;
- Greasley Bridleway 21 (part of the Broxtowe Country Trail) realigned north of its existing alignment near the Westville end of the route;
- Hucknall Footpath 35 realigned south of its existing realignment, 200m east of

Minsk Farm;

- Annesley Footpath 2 realigned south of its existing alignment between Park Forest to the east and the M1 to the west;
- Annesley Footpath 8 diverted to the east of the existing alignment, between the A608 Mansfield Road Salmon Lane, to connect with Salmon Lane at the northern end, just to the south of Boggs Farm;
- Kirkby Footpath 12 diverted to the west from its current access point on the existing Salmon Lane alignment, just west of the M1;
- Kirkby Footpath 20 diverted to the west of the existing alignment to the south of the B6018 Park Lane;
- Kirkby Footpath 18 realigned to the west of its original alignment just south of the Sutton Junction to Pye Bridge Railway; and
- Kirkby Footpath 13 realigned to the north of its existing alignment 200m west of Kirkby Cliff Farm.

14.5.11 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the greatest increase in journey distance (likely to be in excess of an additional 500m) would affect the users of Annesley Footpath 8. The assessment of these changes will be reported in the formal ES.

Other mitigation measures

14.5.12 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

14.5.13 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.5.14 Operation of the Proposed Scheme would require the permanent changes to the M1 junction 27 and diversion of the B6009 Long Lane, the B6018 Park Lane, the B6019 Kirby Lane and Salmon Lane although these are unlikely to result in permanent significant effects. Increases in traffic could also result in traffic severance for non-motorised users of the route and changes in traffic could result in changes in accident risk.

14.5.15 The capacity of the lay-by adjacent to the eastbound carriageway of the A608 Mansfield Road, east of the M1 junction 27, is expected to be permanently impacted by the Proposed Scheme.

14.5.16 It is expected that 11 PRoW would either be permanently realigned or diverted including Greasley Bridleways 15, 19 and 21, Greasley Footpath 20, Hucknall Footpath

35, Annesley Footpaths 2 and 8, Kirkby Footpaths 12, 20, 18 and 13. Greasley Footpath 22 would be closed.

14.5.17 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

14.5.18 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

14.5.19 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Hucknall to Selston area.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Hucknall to Selston area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, Broxtowe Borough Council (BBC), Ashfield District Council (ADC), Nottinghamshire County Council (NCC), which is the Lead Local Flood Authority (LLFA), and Severn Trent Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA07 Map Book. This map book also includes Map Series WR-01 and WR-02 showing surface water and groundwater baseline information respectively.

15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)[149].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[150].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km

[149] National Planning Policy Framework, DCLG, 2015
[150] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report.

15.2.3 This assessment is based on desk study information, including information provided by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes the River Erewash.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that it currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Trent Lower and Erewash management catchment of the Humber river basin district (RBD).

15.3.2 The river basin management plan[151] identifies the chemical[152] and ecological[153] status of surface water bodies, and the quantitative[154] and chemical[155] status of groundwater bodies within this RBD.

15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of good status, where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

[151] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan
[152] The chemical status of surface waters reflects concentrations of priority and hazardous substances present
[153] The ecological status of surface waters is determined based on the following elements:
- Biological elements – communities of plants and animals (for example, fish and rooted plants), assessed in the ecology and biodiversity section;
- Physico-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
- Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats.

[154] The quantitative status of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance
[155] The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present

15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.

15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within this study area is provided in Table 29. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 29: Surface water body receptors

Water body name and location[156]	**Designation**	**Q95 value (m^3/s)**[157]	**Receptor value**	**Parent WFD water body name and identification number**[158]	**Current WFD status/Objective**[159]
Tributary of River Leen WR-01-358b G6	Ordinary watercourse	≤0.002	Moderate	Leen from Source to Day Brook GB104028052880	Moderate/Good by 2027
Tributary 1 of Beauvale Brook WR-01-358b I5	Ordinary watercourse	≤0.002	Moderate	Nethergreen Brook Catchment (trib. of Erewash) GB104028052620	Moderate/Good by 2027
Tributary 2 of Beauvale Brook WR-01358b J5	Ordinary watercourse	0.003	Moderate		
Tributary 1 of Erewash River WR-01-359a E5	Ordinary watercourse	≤0.002	Moderate	Erewash from Source to Nethergreen Brook GB104028052740	Poor/Moderate by 2027
Tributary 2 of Erewash River WR-01-359a E5	Ordinary watercourse	≤0.002	Moderate		
River Erewash WR-01-359a G5	Main river	0.03	High		

[156] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA07 Map Book figure (in this case WR-01)
[157] This is the flow within the watercourse that is exceeded for 95% of the time
[158] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number
[159] Status and objectives are based on those set out in the 2015 River basin management plan

Water body name and location[156]	Designation	Q95 value (m^3/s)[157]	Receptor value	Parent WFD water body name and identification number[158]	Current WFD status/Objective[159]
Maghole Brook WR-01-359a H5	Ordinary watercourse	0.004	Moderate		

Abstractions and permitted discharges (surface water)

15.3.6 There are no licensed surface water abstractions in the study area.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than $20m^3$ per day, have been obtained from the local authorities. These data indicate that there is one[160] registered private unlicensed surface water abstraction within the study area. The abstraction is located at Whyburn Farm, Hucknall, and is used for domestic purposes; the average daily abstraction rates are not known. For this reason, this abstraction has been assessed as a high value receptor on a precautionary basis. As there is no obligation to register private water supplies, unregistered private groundwater supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are three[161] consented discharges in total to surface waters within the study area, none of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 30. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 30 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

[160] The number of consents quoted is different to the number quoted in Section 10, Land quality because the Water resources and flood risk study area considers surface water and groundwater features within 1km of the centreline of the Proposed Scheme and do not count revoked consents. The land quality study area considers an area extending 250m from the land required for the construction of the Proposed Scheme.
[161] The number of consents quoted is different to the number quoted in Section 10, Land quality because the Water resources and flood risk study area considers surface water and groundwater features within 1km of the centreline of the Proposed Scheme and do not count revoked consents. The land quality study area considers an area extending 250m from the land required for the construction of the Proposed Scheme.

Table 30: Summary of geology and hydrogeology in the study area

Geology[162]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[163]	WFD status objective[164]	Receptor value
Superficial deposits						
Made ground	Western extent of the Hucknall Airfield and Kirkby Lane	Variable man-made superficial deposit	Not classified	Not Assessed by the Environment Agency	Not Assessed by the Environment Agency	Low
Head deposits	Located near Misk Hill and adjacent with the Cuttail Brook	Typically gravel, sand and clay	Unproductive strata	Not Assessed by the Environment Agency	Not Assessed by the Environment Agency	Low
Alluvium	River Erewash, Maghole Brook, the Cuttail Brook and an unnamed drain through Beauvale	Clay, silt, sand, peat and gravel	Secondary A	Not Assessed by the Environment Agency	Not Assessed by the Environment Agency	Moderate
Glaciofluvial Deposits	Located west of Hucknall, west of Annesley Woodhouse and north of Millington Springs Woodland	Sand and gravel, locally with silt, clay or organic material	Secondary A	Not Assessed by the Environment Agency	Not Assessed by the Environment Agency	Moderate
Glacial till3	Present from Misk Hill to the B6018 Park Lane near Kirkby Park	Variable deposit comprising sandy, silty clay with sand and gravel	Secondary (undifferentiated)	Not Assessed by the Environment Agency	Not Assessed by the Environment Agency	Low
Bedrock						
Lenton Sandstone Formation	Located across the centre of the study area from the west of Eelhole Wood to the A608 Mansfield Road	Sandstone with mudstone and conglomerate	Principal	Trent Lower Erewash - Permo-Triassic Sandstone Wollaton (GB40401G301400) Poor	Poor by 2015	Very high

[162] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[163] As stated in the 2015 River basin management plan
[164] As stated in the 2015 River basin management plan

Zechstein Group – Edlington Formation	Starth Woodland and Hollybush Farm to the west of Westville	Mudstone with siltstone and sandstone	Secondary B	Idle Torne - Magnesian Limestone (GB40401G300600) Poor	Good by 2027	Low
Zechstein Group – Cadeby Formation	Southern extent of the study area to Kirkby Woodhouse and south of Salmon Lane	Dolostone with mudstone, dolomitic siltstone and sandstone	Principal	Lower Trent Erewash - Magnesian Limestone (GB40401G301800) Poor	Good by 2021	High
Pennine Coal Measures Group – Pennine Middle Coal Measures Formation	North of The Dumbles and Millington Springs Woodland and at Salmon Lane	Mudstone, siltstone, sandstone	Secondary A	Lower Trent Erewash - Coal Measures (GB40402G303200) Good	Good by 2015	Moderate

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 30, is outlined briefly as follows:

- Alluvium and glaciofluvial deposits may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified moderate value receptors;
- Glacial till and head deposits may supply baseflow to watercourses or store and yield limited amounts of groundwater and so have been classified as low value receptors; and
- Made ground is a man-made, superficial deposit considered an unproductive strata. It has therefore been classified as a low value receptor.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 30 is outlined briefly as follows:

- the Sherwood Sandstone Group (locally comprising sandstone of the Lenton Sandstone Formation) has been classified as a Principal aquifer by the Environment Agency. This aquifer has a defined Source Protection Zone (SPZ)

3[165] and can also provide an important component of baseflow to rivers. It has therefore been assessed as a very high value receptor;

- the Zechstein Group is present within the study area as Cadeby and Edlington formations. The Cadeby formation has been classified as a Principal aquifer by the Environment Agency. This aquifer can also provide an important component of baseflow to rivers. It has therefore been assessed as a high value receptor. The Edlington formation has been classified as a Secondary B aquifer, and is only capable of storing or yielding limited amounts of groundwater, predominantly within the localised sandstone beds. It has therefore been assessed as a low value receptor; and
- the Pennine Coal Measures Group is generally described as an alternation of sandstone, siltstone and mudstone, with frequent coal seams. Limited quantities of groundwater suitable for domestic or agricultural use are occasionally obtainable within the sandstone beds of this rock formation and it has therefore been classified as a moderate value receptor.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 30. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licenced for public water supply located in the study area. A SPZ is located between Hucknall and Salmon Lane, near Annesley Woodhouse. The SPZ is associated with an area of Lenton Sandstone Formation designated as a Principal aquifer by the Environment Agency[166] and is for an abstraction located outside the study area.

15.3.15 There is one private groundwater abstractions licence registered in the study area, as shown on Map WR-02-201. The licence is for private and commercial usage at Whyburn Farm, Hucknall. The average daily abstraction is not available. For this reason, the abstraction has been assessed as a high value receptor on a precautionary basis. The licence is approximately 930m east of the route and not located within the land required for the Proposed Scheme nor in the potential radius of influence of any cutting of the Proposed Scheme.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been requested from the local authorities. Responses are being sought, however information received to date has not identified

[165] Defined by the Environment Agency as the area around a source within which all groundwater recharge is presumed to be discharged at the source
[166] Defined by the Environment Agency as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.17 There are two[167] consented discharges to groundwater within the study area which are private sewage discharges of final/treated effluent. Neither of these are located within the land required for the Proposed Scheme. These discharges have been assessed as low value receptors.

Groundwater – surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 19 features within the study area that had the potential to be springs; two of these features are within the land required for the construction of the Proposed Scheme. Access was not possible to inspect any of these features at this stage.

15.3.19 The two potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis.

15.3.20 There are eight ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.21 The following nature conservation sites within the study area are potentially groundwater dependent:

- Bogs Farm Quarry Site of Special Scientific Interest (SSSI) is partially within the land required for the Proposed Scheme, east of Selston and is assumed to be groundwater dependent. It consists of marsh, supports many wetland plants and contains potentially groundwater fed ponds[168];
- Friezeland Grassland SSSI is 950m south of the land required for the Proposed Scheme, to the east of Underwood and is assumed to be groundwater dependent. It includes areas of sedge-rich marsh, bryophyte lawn plant communities and neutral marsh habitat. A variation in soil types has led to an interesting range of habitats from neutral marsh to acid grassland with additional interest provided by species-rich flushes;
- Sellers Wood SSSI is 860m from the land required for the Proposed Scheme, west of Bulwell and is assumed to be groundwater dependent. The site includes a number of potentially groundwater fed ponds;
- Annesley Woodhouse Quarries SSSI is 65m east of the land required for the

[167] The number of consents quoted is different to the number quoted in Section 10, Land Quality because the Water resources and flood risk study area considers surface water and groundwater features within 1km of the centreline of the Proposed Scheme and do not count revoked consents. The land quality study area considers an area extending 250m from the land required for the construction of the Proposed Scheme.
[168] A pond feature not connected to or directly supplied by the river network

Proposed Scheme, west of Annesley Woodhouse and is assumed to be groundwater dependent. The site includes areas of marshy grassland vegetation. In places, the tracts of dry grassland are flushed with calcium rich water from the underlying limestone via a number of springs and seepage lines.

15.3.22 The following nature conservation sites within the study area are potentially dependent on surface water flows:

- Bullwell Wood SSSI is adjacent to the land required for the Proposed Scheme both within the Hucknall to Selston area and the Stapleford to Nuttall area to the south and is potentially dependent on surface water flows. The site includes a clean water pool which is fed by an unnamed watercourse;
- Bagthorpe Meadows SSSI is fed by Middle Brook and its tributaries from the land required for the Proposed Scheme, south of Selston;
- Annesley Woodhouse Quarries SSSI is 65m east of the land required for the Proposed Scheme, west of Annesley Woodhouse. The site includes lakes and ponds which are fed by a network of drainage ditches;
- Bulwell Wood and Pond Local Wildlife Site (LWS) is within the land required for the Proposed Scheme in the Hucknall to Selston area. The site includes a pond that feeds into Bulwell Wood SSSI;
- Bentinck Void LWS is adjacent to the land required for the Proposed Scheme, west of Annesley Woodhouse. The site is a former open case site with relic stream and marsh communities;
- Maghole Brook and Ashfield District Dumble LWS is partially within the land required for the Proposed Scheme, east of Brookhill hall. This includes a stream and dumble.

15.3.23 Further details of the ecology of these sites, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.24 The Environment Agency's Flood map for planning (rivers and sea)[169] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define 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).

15.3.25 The updated Flood map for surface water[170] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment

[169]Environment Agency (undated), Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[170] Environment Agency (2018), *Long term flood risk map for England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

Agency risks of flooding from reservoirs national dataset[171]. The British Geological Survey's (BGS) Groundwater flooding susceptibility dataset[172], has been used to assess the future risk of groundwater flooding.

15.3.26 The following reports were used to help determine the baseline flood risk within the study area:

- Nottinghamshire Local Flood Risk Management Strategy (LFRMS) (2015);
- Greater Nottingham LFRMS (2015);
- Nottinghamshire Preliminary Flood Risk Assessment (PFRA) (2011);
- Ashfield District Council Strategic Flood Risk Assessment (SFRA) (2009); and
- Chesterfield, Bolsover & North East Derbyshire District Council SFRA (2009).

River flooding

15.3.27 The study area includes constricted areas of floodplain (Flood Zone 2 and 3) associated with the River Erewash and Maghole Brook. Table 31 shows the watercourses within the study area and the receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

Table 31: River flood risk sources and receptors

Source	**Location description and figure/coordinate**[173]	**Receptor potentially affected**	**Receptor value/sensitivity to flooding**
Tributary 2 of Beauvale Brook	America Farm WR-01-358b J5	M1	Very high
Tributary 2 of River Erewash	Kirkby in Ashfield WR-01-359a E5	Park Lane Road	Moderate
River Erewash	Crossing with Proposed Scheme at Pinxton WR-01-359a G5	Agricultural land	Moderate
River Erewash	Pinxton WR-01-359a G5	M1 (receptor is covered also in LA08: Pinxton to Newton and Huthwaite area)	Very high
Maghole Brook	Green Farm WR-01-359a G5	Kirkby Lane	Moderate

[171] Environment Agency (2018), *Long term flood risk map for England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[172] British Geological Survey (2017), BGS Groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[173] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: CA1 Map Book figure (in this case WR-01)

Surface water flooding

15.3.28 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 32. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 32: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[174]	Receptor potentially affected	Receptor value
Surface water flow path at Long Lane in Westville (Nottingham)	B6009 Long Lane in Westville (Hucknall) WR-01-358b C6	Long Lane	Moderate
Surface water flow path downstream of Westville Embankment North culvert at M1 (Nottingham)	Westville (Hucknall) WR-01-358b C6	Roads and Properties at Westville	High
Surface water flow path downstream of Audrey Wood viaduct	Audrey Wood viaduct WR-01-358b B6	M1	Very high

Artificial water bodies

15.3.29 There are no artificial water bodies present in the study area with potential implications for flood risk in the study area.

Groundwater flooding

15.3.30 Information related to historical incidents of groundwater flooding in the Hucknall to Selston area is provided in the NCC LFRMS & PFRA, the ADC SFRA, the Chesterfield, Bolsover & North East Derbyshire District SFRA and the Greater Nottingham LFRMS & SFRA. Information in these documents indicates that the risk of groundwater flooding is considered to be relatively low within Nottinghamshire, but notes that groundwater has been identified as a problem in the Hucknall to Selston area, with flood gates installed on properties.

15.3.31 The BGS Groundwater flooding susceptibility dataset indicates that there is some potential for groundwater flooding to occur along the River Leen and tributaries west and north-west of Westville and also to the west of Annesley Woodhouse, in the River Erewash floodplain.

Land drainage

15.3.32 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture.

[174] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA07 Map Book figure (in this case WR-01)

The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code and Construction Practice (CoCP)[175] includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme would avoid passing along river or stream valleys, such as that of the River Erewash and Maghole Brook and their associated floodplains. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them will be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: CA1 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 No watercourse realignments are proposed within the Hucknall to Selston area.

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

[175] Supporting document: Draft Code of Construction Practice

15.4.7 The design of infrastructure (including bridge abutments, intermediate piers and outfalls) required within or in proximity to an existing channel will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.8 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.9 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.10 Permanent culverts proposed on the smaller watercourse crossings within this study area include the Westville embankment south and north culverts on a drain and unnamed tributary of the River Leen respectively, Park Forest embankment culvert on unnamed tributary 1 of Beauvale Brook, the drop inlet culvert at Annesley Lane embankment on unnamed tributary 1 of the River Erewash and the Kirkby Park embankment culvert on unnamed tributary 2 of the River Erewash. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided wherever reasonably practicable and are proposed on minor headwater channels or ditches only. An exception to this is one drop inlet culvert proposed for crossing unnamed tributary 1 of the River Erewash at Annesley Lane End embankment;

- culvert lengths have been reduced as far as is reasonably practicable; and
- invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

15.4.11 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.12 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.13 Measures would be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[176] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.14 The exact requirements would be refined and method of mitigation would be designed following ground investigation at foundations or cutting locations.

Flood risk and land drainage

15.4.15 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy would ensure that the impacts on flood flows within rivers and streams, and their floodplains, would be limited to those associated with the intermediate pier structures on the viaducts of the

[176] Impermeable barrier preventing water flow

River Erewash and Maghole Brook floodplains. The Proposed Scheme includes replacement floodplain storage to replace losses associated with the piers;

- the temporary works shown on Map Series CT-05 in the Volume 2: LA07 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that would cross surface water flow paths where reasonably practicable. This would be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme would cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[177];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there would be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme would pass in cutting, drainage measures would be provided with the aim of preventing flow into the cutting. This flow would be diverted into its natural catchment. Where reasonably practicable, runoff from the cuttings would also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could otherwise increase flood risk or impact on land drainage systems; and
- measures would be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

[177] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

15.4.16 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.17 In accordance with Section 16 of the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.18 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction would be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.19 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.20 The proposed cuttings in the study area would intersect the following aquifers: Lenton Sandstone Formation Principal and Secondary (undifferentiated) aquifers, Edlington Formation Secondary (undifferentiated) aquifer, Cadeby Formation Principal aquifer and the Pennine Middle Coal Measures Formation Secondary A and Secondary (undifferentiated) aquifers. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to mean that any impacts on the overall status of these aquifers would not be significant.

15.4.21 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.22 There are no anticipated temporary impacts on abstractions in the study area.

Groundwater - surface water interactions

15.4.23 The Proposed Scheme is likely to result in temporary impacts on two potential spring features at America Farm as they are within the land required for the construction and operation of the Proposed Scheme. The two springs are fed by the Cadeby Formation which is a Principal aquifer and have been assessed as high value receptors. Impact on these springs has been considered to be moderate, resulting in temporary moderate adverse effects, which are significant.

Water dependent habitats

15.4.24 The Proposed Scheme is not anticipated to temporarily impact groundwater flow or quality at:

- Bogs Farm Quarry SSSI, therefore there is no anticipated hydrological impact on this site;
- Friezeland Grassland SSSI, therefore there is no anticipated hydrological impact on this site;
- Seller's Wood SSSI, therefore there is no anticipated hydrological impact on this site; and
- Annesley Woodhouse Quarries SSSI, therefore there is no anticipated hydrological impact on this site.

15.4.25 The Proposed Scheme is not anticipated to temporarily impact surface water flow or quality at:

- Bulwell Wood SSSI, therefore there is no anticipated hydrological impact on this site;
- Bagthorpe Meadows SSSI, therefore there is no anticipated hydrological impact on this site;

- Annesley Woodhouse Quarries SSSI, therefore there is no anticipated hydrological impact on this site;
- Bulwell Wood and Pond Local Wildlife Site LWS, therefore there is no anticipated hydrological impact on this site;
- Bentinck Void LWS, therefore there is no anticipated hydrological impact on this site; and
- Maghole Brook and District Dumble LWS, therefore there is no anticipated hydrological impact on this site.

Temporary effects - Flood risk and land drainage

15.4.26 Construction of the Audrey Wood, River Erewash, and Maghole Brook viaducts would require temporary working within flood zones. Construction sequencing and temporary works design will be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works will be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – Water resources and WFD

15.4.27 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.28 The location of the piers of the River Erewash viaduct are within the floodplain, avoiding the watercourse, and have the potential to impact the hydromorphology of the River Erewash by constraining the ability of the channel to move within its floodplain. This has the potential to cause a minor impact on the River Erewash, which is a high value receptor. With embedded mitigation, this would result in a minor adverse effect, which is not expected to be significant.

15.4.29 The location of the piers of Maghole Brook viaduct are within the floodplain, avoiding the watercourse, and have the potential to impact the hydromorphology of Maghole Brook by constraining the ability of the channel to move within its floodplain. This has the potential to cause a minor impact on the Maghole Brook, which is a high value receptor. With embedded mitigation, this would result in a minor adverse effect, which is not expected to be significant.

15.4.30 Culverts on an unnamed tributary of the River Leen, tributaries 1 and 2 of Beauvale Brook, and unnamed tributary 2 of the River Erewash, would have the potential to cause moderate impacts on the hydromorphology of these watercourses, which have been assessed as moderate value receptors. These would potentially result in moderate adverse effects, which would be significant.

15.4.31 The drop inlet culvert at Annesley Lane Embankment, has the potential to cause a moderate impact on the hydromorphology of unnamed tributary 1 of the River

Erewash, which is a moderate value receptor. This would potentially result in a moderate adverse effect, which would be significant.

Groundwater

Aquifers

15.4.32 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.33 There are two springs, one at Park Forest and one at Kirkby Park within the potential radius of influence of cuttings along the Proposed Scheme. The Proposed Scheme has the potential to cause moderate adverse impacts on these, which are currently assumed high value receptors pending site survey, resulting in a moderate adverse permanent effect, which is significant.

Water dependent habitats

15.4.34 Construction of drainage channel running adjacent to Bulwell Wood SSSI and intersecting the watercourse that feeds into Bulwell Wood SSSI has the potential to result in minor impacts on the hydrological features of the SSSI, in particular the clean water pond. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of potential indirect impacts.

15.4.35 The construction of the Proposed Scheme has the potential to result in a negligible impact on the hydrological features of the SSSI, as the SSSI is fed by the Middle Brook from the A608 Mansfield Road cutting, but is unlikely to change water levels within the SSSI.

15.4.36 Construction of the Annesley Lane cutting, drainage channel [JME1] and Annesley Lane End embankment has the potential to result in a minor impact on the groundwater hydrological function of the Annesley Woodhouse Quarries SSSI. The drainage channel will flow into the unnamed tributary 1 of the River Erewash flows from the Annesley Lane End embankment into Annesley Woodhouse Quarries SSSI, this has the potential to result in a minor impact on the hydrology and water quality of the hydrological features in the SSSI due to changes in the water supply. It is anticipated that the implementation of measures in the draft CoCP would reduce the magnitude of this indirect impact.

15.4.37 Construction of the Annesley Lane cutting, drainage channel [JME2] and Annesley Lane End embankment could also result in a minor impact on the hydrology and water quality of the flushes and open water pools within the Bogs Farm Quarry SSSI due to

changes in water supply via the unnamed tributary 1 of the River Erewash. It is anticipated that the implementation of measures in the draft CoCP would reduce the magnitude of this indirect impact.

15.4.38 The construction of the drainage channel running adjacent to Bulwell Wood and Ponds LWS has the potential to result in a minor impact on the hydrology of the pond, despite the pond being retained.

15.4.39 Construction of Park Lane cutting could have a minor indirect impact on the hydrological features of the Bentinck Void LWS through an alteration in the water supply.

15.4.40 The location of the piers of Maghole Brook viaduct are within the floodplain and could have a minor impact on the hydromorphology of Maghole Brook and District Dumble LWS.

15.4.41 The Proposed Scheme is not anticipated to permanently impact groundwater flow or quality at Friezeland Grassland SSSI, therefore there is no anticipated hydrological impact on this site.

15.4.42 The Proposed Scheme is not anticipated to permanently impact groundwater flow or quality at Seller's Wood SSSI, therefore there is no anticipated hydrological impact on this site.

15.4.43 Details of the significance of these impacts on the nature conservation sites is provided in Section 7, Ecology and biodiversity

Permanent effects - Flood risk and land drainage

15.4.44 The Proposed Scheme includes replacement floodplain storage areas to compensate for floodplain losses associated with the piers. Consequently, impacts on receptors are likely to be negligible, resulting in no significant effects.

Other mitigation measures

15.4.45 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.46 The positioning of piers for the River Erewash and Maghole Brook viaducts would be carefully managed to maximise the distance between the watercourse banks and the pier, and where necessary, scour protection mitigation will be developed to manage erosion. Hydromorphological mitigation will be considered up and downstream of the pier locations to enable erosion patterns to re-stabilise as a result of any scour protection.

15.4.47 The embedded mitigation proposed in the design of five proposed culverts, including the drop-inlet culvert, will be developed further in consultation with the Environment Agency and relevant LLFA.

Groundwater-surface water interactions

15.4.48 A survey of the potential spring features at Park Forest and at Kirkby Park will be undertaken to determine their value and to identify whether further mitigation is required. Measures would be implemented to re-establish these springs nearby in a manner that ensures any adverse impacts are mitigated.

15.4.49 Any such additional measures will be designed in consultation with the Environment Agency.

Summary of likely residual significant effects

15.4.50 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a potential permanent minor adverse effect related to the positioning of the viaduct piers on the hydromorphology of the River Erewash, which is significant;
- a potential permanent minor adverse effect related to the positioning of the viaduct piers on the hydromorphology of Maghole Brook, which is significant;
- permanent moderate adverse effects on the hydromorphology of an unnamed tributary of the River Leen, tributaries 1 and 2 of Beauvale Brook, and tributaries 1 and 2 of the River Erewash, which are significant;
- permanent moderate adverse impact on 2 spring features at Park Forest and Kirkby Park which are high value receptors, resulting in moderate adverse effects, which are significant; and
- temporary moderate adverse impacts on two spring features near America Farm resulting in moderate adverse effects, which are significant.

15.4.51 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects, where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the Formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase would have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment shows that there will be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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