HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA15: Warmfield to Swillington and Woodlesford

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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.

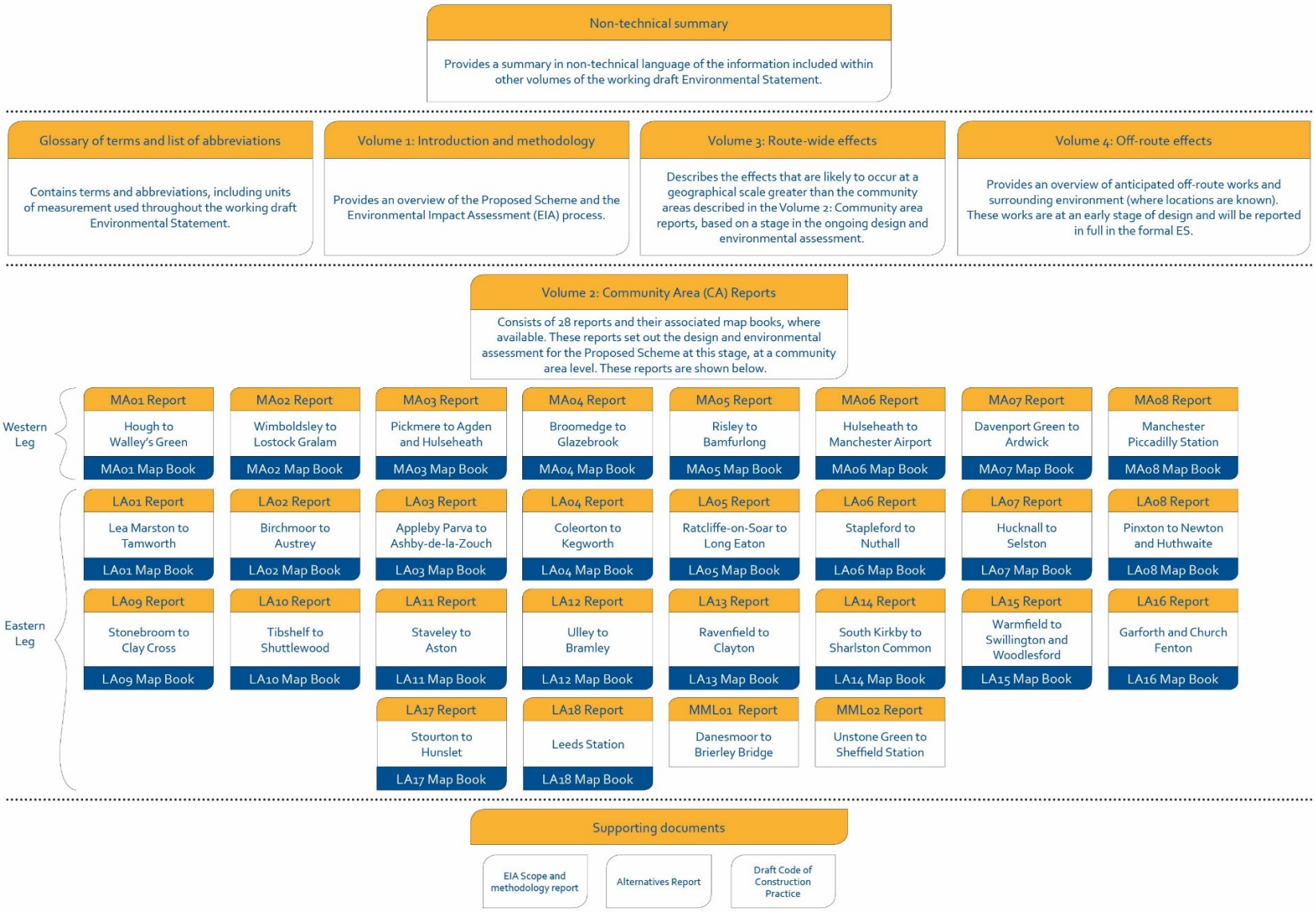
Volume 4: Off-route effects

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.

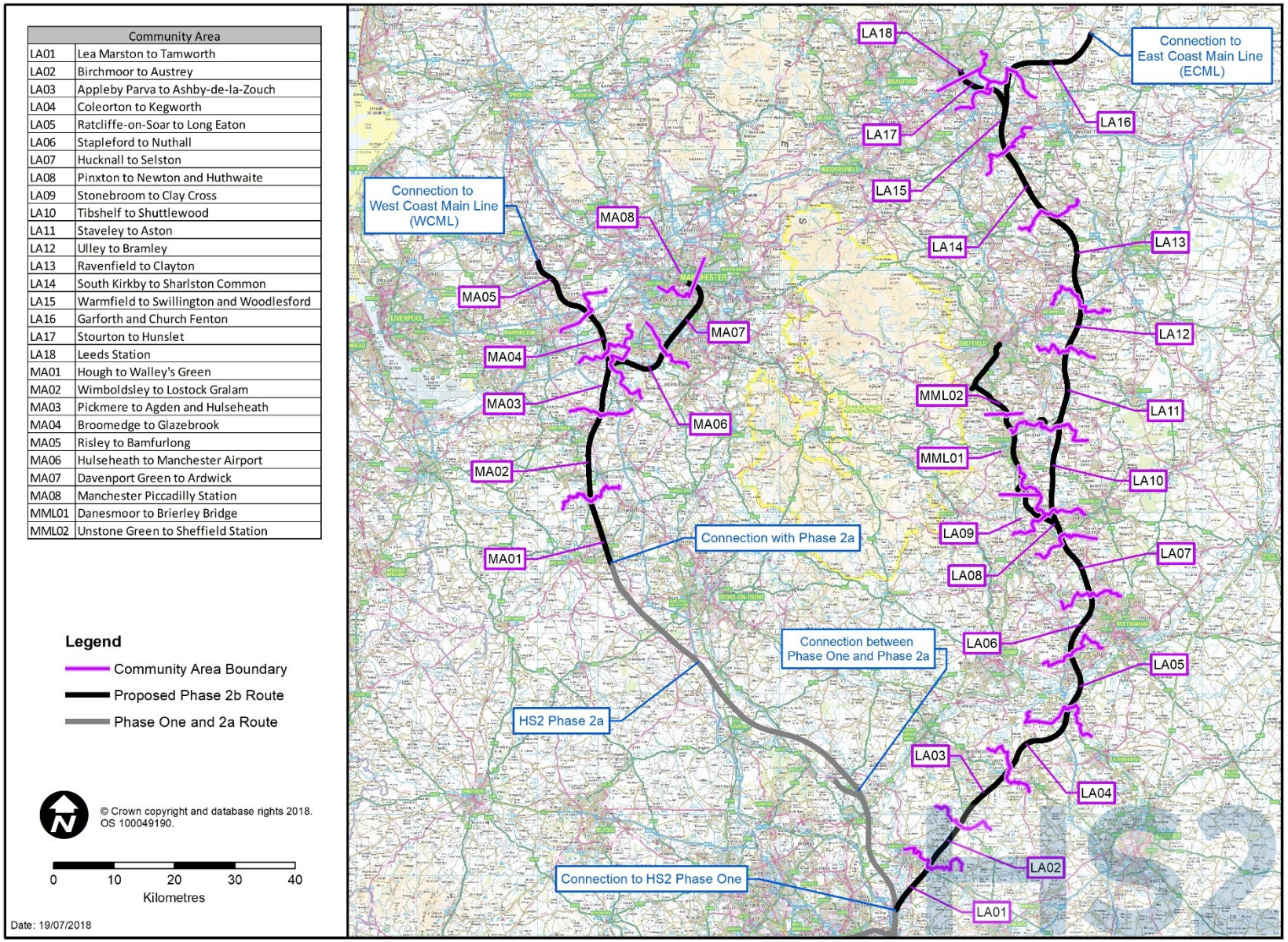
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Warmfield to Swillington and Woodlesford area (CA number LA15) which is located on the eastern leg of the Proposed Scheme.

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



1.2 Purpose and status 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 Warmfield to Swillington and Woodlesford area (LA15). 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;

[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 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;
- 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 Warmfield to Swillington and Woodlesford area (LA15) are provided in a separate corresponding document entitled Volume 2: LA15 Map Book, which should be read in conjunction with this report.

[3] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology 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: LA15 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and 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 Proposed Scheme through the Warmfield to Swillington and Woodlesford area would lie within the local authority areas of Wakefield Metropolitan District Council (WMDC) and Leeds City Council (LCC). The Proposed Scheme would pass through the parishes of Warmfield-cum-Heath, Newland with Woodhouse Moor, Normanton and Swillington.

2.1.2 The route of the Proposed Scheme would diverge at Scholey Hill, immediately north of the M62, to form two separate routes. The HS2 main line, which would be 13.6km in length in this area, would continue north-east towards Ulleskelf, for onward connection with the East Coast Main Line (ECML) at Colton Junction. The Leeds spur would be 4.4km in length and would travel in a north-west direction, where it would continue to the HS2 Leeds station.

2.1.3 The boundary between Sharlston parish and Warmfield-cum-Heath parish forms the southern boundary of the Warmfield to Swillington and Woodlesford area.

2.1.4 The northern boundary of the Warmfield to Swillington and Woodlesford area on the HS2 main line is the parish boundary between Swillington and Austhorpe. On the Leeds spur, the northern boundary of the Warmfield to Swillington and Woodlesford area is located to the south of the M1 and to the north-west of Rothwell Country Park.

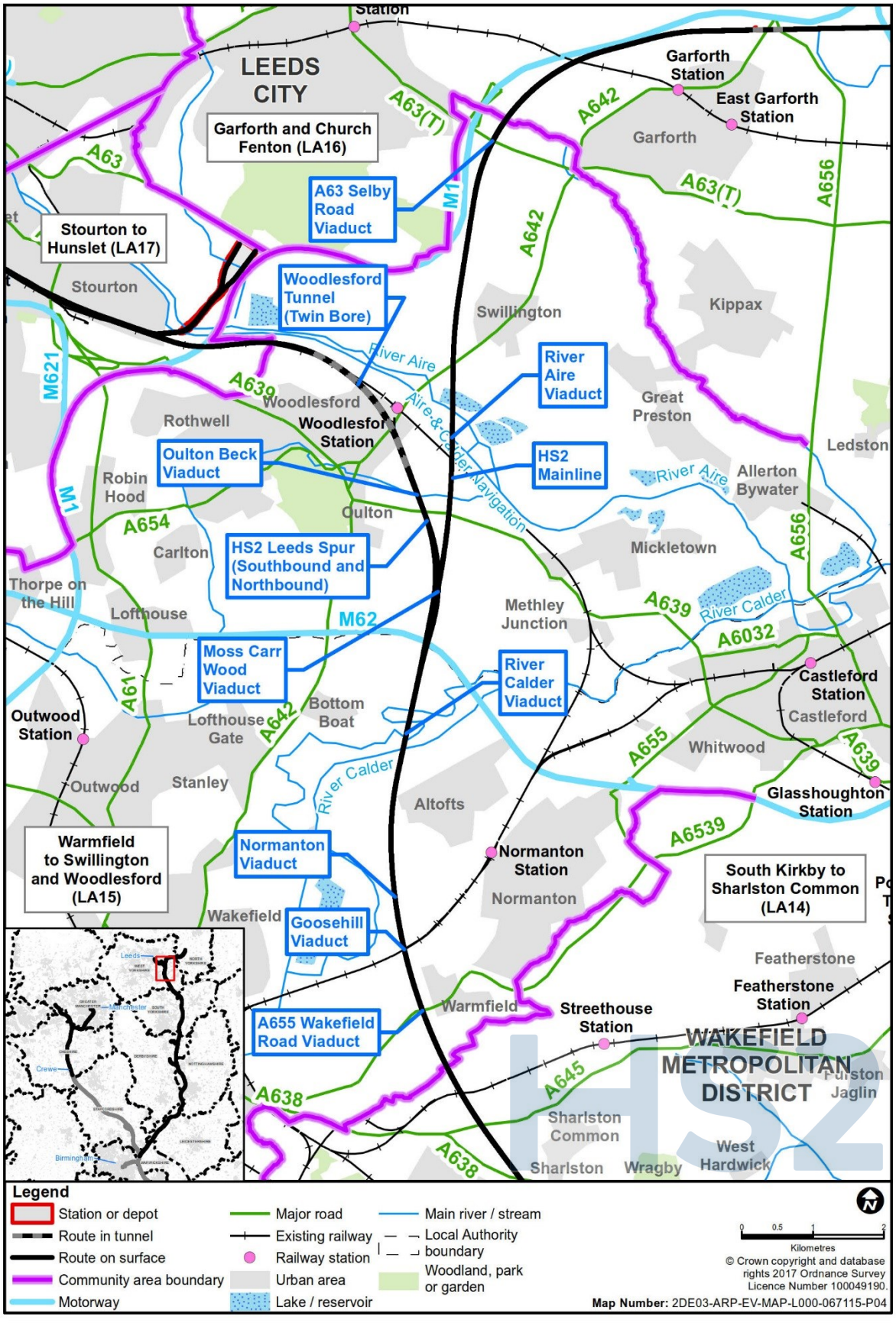
2.1.5 As shown in Figure 3, the South Kirkby to Sharlston Common area (LA14) lies to the south of the Warmfield to Swillington and Woodlesford area. The Garforth and Church Fenton area (LA16) lies to the north-east on the HS2 main line. The Stourton to Hunslet area (LA17) lies to the north-west on the Leeds spur.

Settlement, land use and topography

2.1.6 The Warmfield to Swillington and Woodlesford area is located within the rural/urban fringe surrounding the settlements of Wakefield, Normanton, Altofts, Oulton, Woodlesford, Rothwell and Swillington. These larger settlements are interspersed with isolated dwellings and farmhouses and the villages of Kirkthorpe, Warmfield, Goosehill, Bottom Boat, Methley Lanes, Scholey Hill, Hollinthorpe and Swillington Common.

2.1.7 Land use within the Warmfield to Swillington and Woodlesford area is characterised by farmland, parkland, historic coal mining and sand and gravel extraction (including degraded and derelict workings and occasional spoil heaps) and historic landfill areas. Other land uses present within the area include operational landfill such as Welbeck landfill site, and a wastewater treatment works at Lemonroyd Sewage Treatment Works.

Figure 3: Community area context map



2.1.8 Several linear infrastructure features cross the Warmfield to Swillington and Woodlesford area, including the Aire and Calder Navigation, M62, M1, existing Hallam Line (includes the Leeds to Castleford railway line and Thorpes Bridge Junction to Normanton railway line), and a dismantled railway at Warmfield.

2.1.9 The Warmfield to Swillington and Woodlesford area is situated within the river valleys of the River Aire and River Calder. The land undulates across the river valleys, comprising moderate and regular slopes and flatter areas along the floodplains of the river corridors. Ground levels range between 15m above Ordnance Datum (AOD)[4] at the River Calder and 90m AOD near Swillington Common. Ground levels in the southern part of the Warmfield to Swillington and Woodlesford area, around Altofts, are lower than in the north (50m to 55m AOD).

Key transport infrastructure

2.1.10 The M62 passes west to east and the M1 passes south to north through the Warmfield to Swillington and Woodlesford area. The A655 Wakefield Road, the A639 Methley Lane/Leeds Road, the A642 Aberford Road/ Wakefield Road, and the A63 Selby Road also pass through the area. Local roads include Hell Lane, Kirkthorpe Lane/Warmfield Lane, Croft Head Lane, Newland Lane, Birkwood Road, the B6135 Newmarket Lane, Fleet Lane, Eshald Lane, Swillington Lane, Bullerthorpe Lane, Jinny Moor Lane, and Leeds Lane.

2.1.11 The Warmfield to Swillington and Woodlesford area is crossed by the existing Hallam Line. Rail services are accessible at Normanton, Wakefield Kirkgate, Wakefield Westgate and Woodlesford stations. The Warmfield to Swillington and Woodlesford area is served by several bus routes. There are four navigable waterways in this area, the River Aire, the River Calder, the Aire and Calder Navigation (Wakefield branch) and the Aire and Calder Navigation (main line).

2.1.12 Within this area there are a number of footpaths, cycle routes and other routes used by non-motorised users, including those associated with the Aire and Calder Navigation (Wakefield branch and main line), the Trans Pennine Trail and the Leeds Country Way. Both the Trans Pennine Trail and the Leeds Country Way are known promoted routes[5]. National Route 67, which is part of the National Cycle Network, follows part of the Aire and Calder Navigation (Wakefield branch and main line) to the east of Wakefield and forms part of the Trans Pennine Trail.

Socio-economic profile

2.1.13 Within the WMDC area, retail and construction accounts for the largest proportion of businesses (12%) followed by professional, scientific and technical activities (10%). In the LCC area, the professional, scientific and technical sector accounts for the largest

[4] In the British Isles, an Ordnance Datum or OD is a vertical datum used by an ordnance survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD for "above ordnance datum". Usually mean sea level is used for the datum.
[5] Promoted route refers to those PRoW which are "promoted" destinations in their own right as a recreational resource.

proportion of businesses (16%) followed by construction (10%) and business administration and support services (10%)[6].

2.1.14 According to the Annual Population Survey (2016)[7], the employment rate[8] within the WMDC and LCC areas was 73% (152,000 people) and 74% (376,000 people) respectively. In 2016, the unemployment rate was 5% for the WMDC area, and 5% for the LCC area.

2.1.15 According to the Annual Population Survey (2016)[9], 25% of WMDC's residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) or above, whilst 11% of residents had no qualifications. In the LCC area, 34% of residents aged 16-64 were qualified to NVQ4 or above, whilst 10% of residents had no qualifications.

Notable community facilities

2.1.16 Within the Warmfield to Swillington and Woodlesford area, the main concentrations of community facilities (such as GP surgeries, schools, and community meeting places) are located in the settlements of Normanton, Altofts, Oulton and Woodlesford, Rothwell and Swillington.

2.1.17 Normanton is a town located approximately 3.5km to the east of Wakefield. Notable community facilities include: the Ellin's Terrace Allotments; Yorkshire Field Sports Ltd offering activities such as fishing and clay pigeon shooting; and Birkwood Fisheries.

2.1.18 Altofts is a village located approximately 0.5km to the north-west of Normanton. Community facilities in this area include: infant, nursery and junior schools; Altofts Community Sports Club; the Brigg Community Hub; Patience Lane surgery; allotments; care homes; Altofts post office; places of worship; convenience stores; and public houses.

2.1.19 Oulton and Woodlesford are two adjoined villages located approximately 6km to the south-east of Leeds city centre. Community facilities in this area include: four public houses; Oulton Manor Care Home; sports and leisure facilities; places of worship; medical facilities; primary schools; the Oulton Institute Village Hall; All Saint's Parish Hall; and a number of convenience stores.

2.1.20 Rothwell is located approximately 4km south-east of Leeds city centre. Community facilities in this area include: Rothwell Day Services; LCC Adult Social Care; Rothwell Labour Club; Rothwell Post Office; The Rose Lund Community Centre; John O'Gaunts Recreation Ground; Rothwell Juniors Football Club; Rothwell Haigh Road Infant School; and a number of convenience stores.

2.1.21 Swillington is a village located approximately 1.8km to the south-west of Garforth. Community facilities in this area include: Swillington post office; Swillington Health Practice; Swillington Primary School; Swillington Pre-School; Swillington Village Hall;

[6] Office for National Statistics (2017). UK Business Count. Local Units 2017. Available online at https://www.nomisweb.co.uk
[7] Office for National Statistics (2016). Annual Population Survey 2016. Available online at https://www.nomisweb.co.uk
[8] The proportion of working age (16-64 year olds) residents that is in employment.
[9] Office for National Statistics (2016). Annual Population Survey 2016. Available online at https://www.nomisweb.co.uk

social clubs; St. Mary's Church; The Pacey's Care Home; The Mistals Livery Stables; and a number of convenience stores.

2.1.22 The smaller villages and hamlets of Kirkthorpe, Warmfield, Bottom Boat, Methley Lanes, Hollinthorpe and Swillington Common are predominantly residential in nature, although some provide a small number of local services such as Kirkthorpe Post Office and the Plough Inn public house in Warmfield.

Recreation, leisure and open space

2.1.23 The Warmfield to Swillington and Woodlesford area is located within the rural/urban fringe and includes open space, woodland and farmland. The area is crossed by several public rights of way (PRoW) and long distance trails, including: the Trans Pennine Trail; the Paulinus Pilgrimage and Heritage Way; St. Bernard's Way; the Leeds Country Way; Wakefield Way (all promoted routes); and National Route 67, part of the National Cycle Network. The Aire and Calder Navigation interfaces with both the River Aire and River Calder.

2.1.24 Notable recreation, leisure and open space within the Normanton and Altofts area includes: fishing facilities such as Birkwood Fisheries; Yorkshire Field Sports Ltd; Pylon Angling Club; and the Aire and Calder Navigation and associated paths.

2.1.25 Notable recreation, leisure and open space within the Rothwell area includes Rothwell Country Park and Skelton Lake.

2.1.26 Notable recreation, leisure and open space within Oulton and Woodlesford includes: Water Haigh Woodland Park (south of Woodlesford); and Rothwell Country Park (north of Woodlesford), which forms part of a corridor of green spaces in the Lower Aire Valley; West Riding County Football Association; Rothwell Juniors Football Club; Oulton Hall Golf Club; outdoor playing fields and sports facilities at Oulton and Woodlesford Sports Club; Moss Carr Wood; and Winter Woods/Clumpcliffe Woods.

2.1.27 Notable recreation, leisure and open space within the Swillington area includes the RSPB's St Aidan's Nature Reserve, which features 12km of trails, plus a section of the Trans Pennine Trail long distance footpath.

2.1.28 Other recreational facilities in the Warmfield to Swillington and Woodlesford area include features such as canal towpaths, Swillington Park fishing lakes, the Lemonroyd Marina and Skelton Park, the Yorkshire Scare Grounds Scream Park and local sports facilities.

Policy and planning context

Planning framework

2.1.29 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.

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

- Leeds Core Strategy (2014)[10];
- Natural Resources and Waste Local Plan (2013 and 2015)[11];
- Policies Map for Leeds (2016)[12];
- Aire Valley Leeds Area Action Plan (2017)[13];
- Saved Policies of the Leeds Unitary Development Plan (2001) and Unitary Development Plan Review (2006)[14];
- Wakefield District Local Development Framework Core Strategy (2009)[15];
- Wakefield District Local Development Framework Development Policies Development Plan Document (2009)[16];
- Wakefield District Local Development Framework Waste Development Plan Document (2009)[17];
- Wakefield District Local Development Framework Site Specific Policies Local Plan (2012)[18];
- Policies Map (latest version adopted 18 January 2017)[19];
- Central Wakefield Area Action Plan Development Plan Document (2009)[20];
- Leisure, Recreation and Open Space Local Plan (2017)[21];

[10] Leeds City Council, (2014), Leeds Core Strategy. Available online at: http://www.leeds.gov.uk/council/Pages/Core-Strategy-Introduction-Page.aspx
[11] Leeds City Council, (2013 and 2015), Natural Resources and Waste Local Plan. Available online at: http://www.leeds.gov.uk/council/Pages/Natural%20Resources%20and%20Waste%20Local%20Plan.aspx
[12] Leeds City Council, (2016), Local Development Framework Policies Map Incorporating saved UDP Review Policies & Adopted Natural Resources & Waste Plan. Available online at: http://www.leeds.gov.uk/council/Pages/Policies-map.aspx
[13] Leeds City Council, (2017), Air Valley Leeds Area Action Plan. Available online at: http://www.leeds.gov.uk/council/Pages/Aire-Valley-Leeds-Area-Action-Plan.aspx
[14] Leeds City Council, (2001 and 2006), Leeds Unitary Development Plan (2001) and Unitary Development Plan Review (2006). Available online at: http://www.leeds.gov.uk/council/Pages/Unitary-Development-Plan.aspx
[15] Wakefield Metropolitan District Council, (2009), Wakefield District Local Development Framework Core Strategy. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/core-strategy
[16] Wakefield Metropolitan District Council, (2009), Wakefield District Local Development Framework Development Policies Development Plan Document. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/development-policies
[17] Wakefield Metropolitan District Council, (2009), Wakefield District Local Development Framework Waste Development Plan Document. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/waste-our-local-plan
[18] Wakefield Metropolitan District Council, (2012), Wakefield District Local Development Framework Site Specific Policies Local Plan. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/site-specific-policies
[19] Wakefield Metropolitan District Council, (2017), Policies Map. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/site-specific-policies
[20] Wakefield Metropolitan District Council, (2009), Central Wakefield Area Action Plan Development Plan Document. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/central-wakefield
[21] Wakefield Metropolitan District Council, (2017), Leisure, Recreation and Open Space Local Plan. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/leisure-recreation-open-spaces

- Retail and Town Centre Local Plan (2017)[22]; and
- West Yorkshire Transport Strategy 2014 (2017)[23].

2.1.31 Emerging policies are not generally included within this report unless a document has been submitted for examination to the Secretary of State. This is the case with the Leeds Site Allocations Plan, which was submitted to the Secretary of State on 5 May 2017.

Committed development

2.1.32 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.

2.1.33 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.

2.1.34 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.

2.1.35 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.

Ongoing design development

2.1.36 Design development continues on this section of the 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 area;
- identification of temporary and permanent utility diversions;
- refinement of the realignment of road and PRoW crossing the route of the Proposed Scheme;

[22] Wakefield Metropolitan District Council, (2017), Retail and Town Centre Local Plan. Available online at: http://www.wakefield.gov.uk/planning/policy/local-plan/retail-town-centres
[23] West Yorkshire Combined Authority, (2017), Transport Strategy 2040. Available online at: https://www.westyorks-ca.gov.uk/transport/transport-strategy/

- refinement of drainage features required for rail and modified highways;
- refinement of maintenance access routes, access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of grid supply point, auto-transformer stations and auto-transformer feeder station locations.

2.1.37 A power supply required to operate the Proposed Scheme would come from the national transmission network and connect to the Proposed Scheme via an auto-transformer feeder station. Connections from the network to the auto-transformer feeder station would require new transmission lines; these would be buried or overhead lines, or a combination of both. In the Warmfield to Swillington and Woodlesford area, an auto-transformer feeder station is proposed to the west of the route of the Proposed Scheme, north of the B6135 Newmarket Lane. It is currently anticipated that the transmission lines to connect to the network could extend for up to 500m between the network and the auto-transformer feeder station. Further studies to consider the route and design of these transmission lines are ongoing, informed by continued engagement with the statutory provider, and will be reported in the formal ES.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Warmfield to Swillington and Woodlesford 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: LA15 Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: LA15 Map Series CT-05.

2.2.3 In general, features are described from south to north along the route of the Proposed Scheme and east to west for features that cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA15 Map Book

2.2.4 All dimensions in the sections below are approximate.

Overview

2.2.5 The Proposed Scheme within the Warmfield to Swillington and Woodlesford area has two main components (as shown within Figure 4):

- the HS2 main line (13.6km in length): continuing from the northern boundary of the South Kirkby to Sharlston Common area (LA14) northwards towards the boundary with the Garforth and Church Fenton area (LA16); and
- the Leeds spur (4.4km in length): at the northern end of the River Calder viaduct, the Leeds spur would diverge from the HS2 main line and continue north-west towards Leeds City centre and the existing Leeds Station. The M1 and Rothwell Country Park form the northern boundary with the Stourton to Hunslet area (LA17).

2.2.6 Each of these components and their key features are set out in the following sections. Where key features are associated with more than one component of the Proposed Scheme, they are described within the section they are first associated with. Where reference is made to the Proposed Scheme, this includes the two components collectively.

2.2.7 This section of the route is illustrated on maps CT-06-486b to CT-06-495a and maps CT-06-621 to CT-06-623a in the Volume 2: LA15 Map Book.

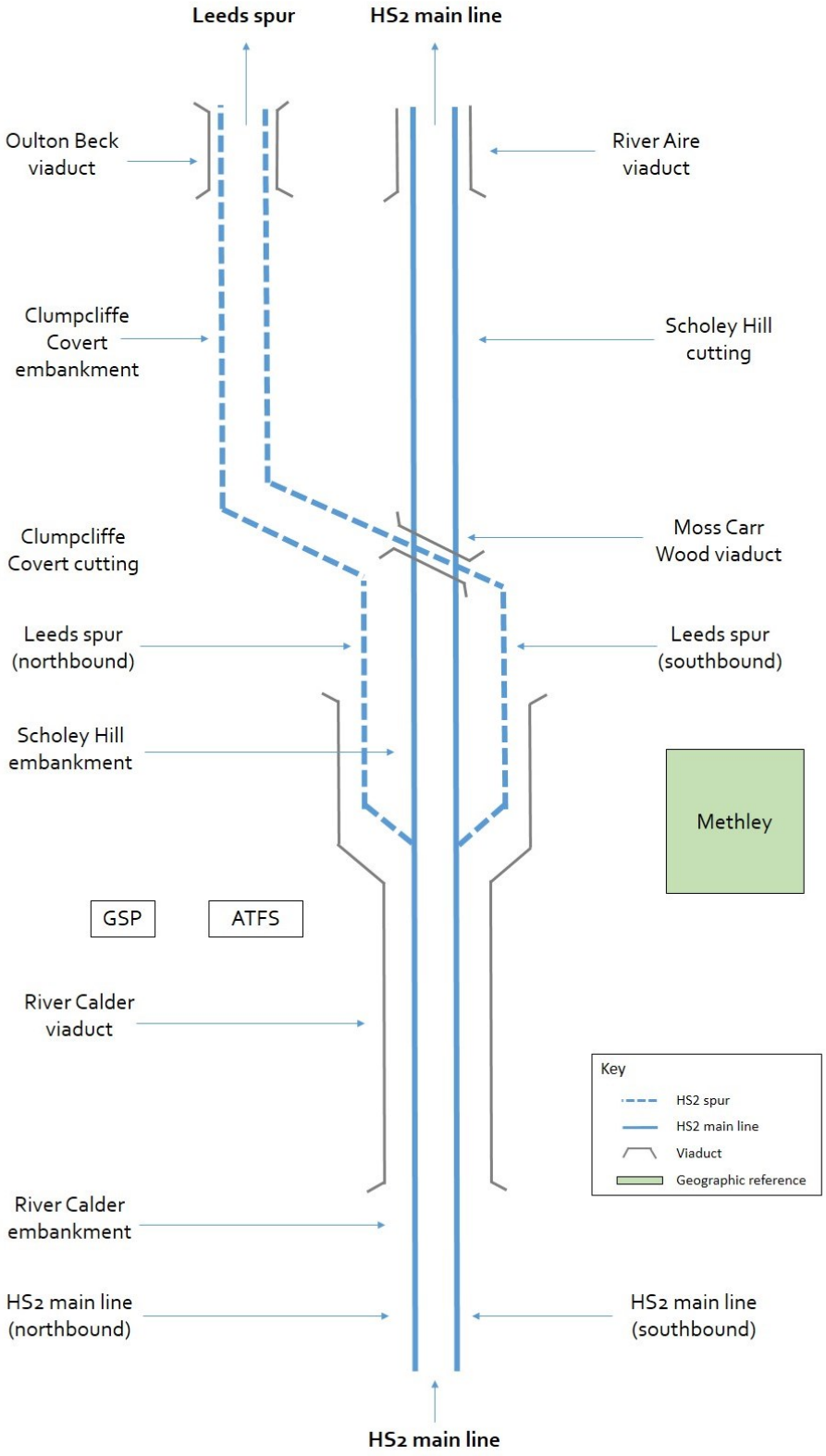
HS2 main line

2.2.8 In the Warmfield to Swillington and Woodlesford area, the HS2 main line would be carried on the following features:

- viaducts for a total length of 4.8km (A655 Wakefield Road, Goosehill, Normanton, River Calder, River Aire and A63 Selby Road);
- cuttings for a total length of 4.1km (New Sharlston, Kirkthorpe, Normanton, Scholey Hill and Swillington); and
- embankments for a total length of 4.7km (New Sharlston, Warmfield, Kirkthorpe, Goosehill, Normanton, River Calder, Scholey Hill, River Aire, Swillington, West Garforth South and West Garforth North).

2.2.9 The HS2 main line is described in five separate sections below.

Figure 4: HS2 main line and Leeds spur separation on the River Calder viaduct



Hell Lane to Goosehill viaduct

2.2.10 From the boundary with the South Kirkby to Sharlston Common area (LA14) the HS2 main line would continue northwards within the New Sharlston cutting before passing onto New Sharlston embankment, A655 Wakefield Road viaduct and Warmfield embankment, before entering Kirkthorpe cutting. The HS2 main line would then continue onto the Kirkthorpe embankment before crossing the existing Hallam Line via the Goosehill viaduct.

2.2.11 This section of the route is illustrated on maps CT-06-486b to CT-06-487 in the Volume 2: LA15 Map Book.

2.2.12 Key features of this 1.9km section would include:

- a section of New Sharlston cutting, 258m in length, up to 10m in depth and 85m in width, which would continue from the South Kirkby to Sharlston Common area (LA14). There would be landscape mitigation planting, adjacent to the cutting on both sides of the route, to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-486b, E6 to Map CT-06-486b, G5);
- Hell Lane overbridge, 92m in length, to carry Hell Lane over the HS2 main line at existing ground level and 11m above track level (see Volume 2: Map CT-06-486b, F6);
- New Sharlston embankment, 552m in length and up to 12m in height, with landscape earthworks and landscape mitigation planting, on both sides of the route, to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-486b, G5 to Map CT-06-487, C6);
- a balancing pond for railway drainage, within areas of landscape mitigation planting, to the west of the HS2 main line, 260m north of Hell Lane. Access to the balancing pond would be from Hell Lane (see Volume 2: Map CT-06-486b, G4 to G6);
- realignment of Red Lane, 120m east of its existing alignment for 420m, with associated landscape mitigation planting in the proximity of the northern junction with the A655 Wakefield Road (see Volume 2: Map CT-06-486b, F7 to Map CT-06-487, C7);
- Red Lane culvert, 230m south of the A655 Wakefield Road, to carry an unnamed tributary of Oakenshaw Beck 3 under the HS2 main line (see Volume 2: Map CT-06-486b, I5 to I6);
- an area of woodland habitat creation to the north-western side of New Sharlston embankment along the southern side of the A655 Wakefield Road, to provide habitat connectivity (see Volume 2: Map CT-06-486b, J5 to J3);
- closure of Warmfield-cum-Heath Bridleway 14 where it would cross the HS2 main line south of the A655 Wakefield Road. Users would be diverted to the east for 290m along the A655 Wakefield Road to the realigned Red Lane (see Volume 2: Map CT-06-487, B5 to C4);

- Warmfield auto-transformer station, 49m by 24m, on the western side of the HS2 main line and 40m south of the A655 Wakefield Road. There would be landscape earthworks and associated landscape mitigation planting, to help integrate the Proposed Scheme into the landscape. Access would be provided from the A655 Wakefield Road (see Volume 2: Map CT-06-487, B2);
- A655 Wakefield Road viaduct, 78m in length and up to 10m in height (see Volume 2: Map CT-06-487, B6 to C6);
- Warmfield embankment, 60m in length and up to 12m in height with landscape mitigation planting, to both sides of the route, to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-487, C6);
- Kirkthorpe cutting, 341m in length, up to 121m in width and up to 24m in depth, with associated landscape mitigation planting adjacent to the cutting, on both sides of the route to help integrate the HS2 main line into the surrounding landscape. A noise fence barrier, located at the base of the cutting, west of the HS2 main line, up to 3m in height above rail, starting 130m south of Warmfield Lane and continuing onto Kirkthorpe embankment, to provide acoustic screening for properties in Kirkthorpe (see Volume 2: Map CT-06-487, C6 to E6);
- realignment of Warmfield-cum-Heath Bridleway 14 and the Trans Pennine Trail (Bridleway), 100m south of its current alignment for 290m, crossing the HS2 main line on Warmfield-cum-Heath Bridleway 14 overbridge, 58m in length (see Volume 2: Map CT-06-487, D5 to E6);
- closure of Warmfield Lane where it would cross the HS2 main line. Users would be diverted via Croft Head Lane, the A655 Wakefield Road and diverted Kirkthorpe Lane (see Volume 2: Map CT-06-487, E5 to E6);
- diversion of Kirkthorpe Lane for 870m to join the A655 Wakefield Road, 750m to the south of its existing alignment and 450m to the west of the HS2 main line. There would be an area of woodland habitat creation, on both sides of the diversion to provide habitat connectivity, and landscape mitigation planting at the northern and southern ends of the diversion to provide visual screening for properties in Kirkthorpe (see Volume 2: Map CT-06-487, B2 to F4);
- a balancing pond for highway drainage, located at the junction of the diverted Kirkthorpe Lane and A655 Wakefield Road, to the east of the diverted Kirkthorpe Lane. Access would be from the diverted Kirkthorpe Lane (see Volume 2: Map CT-06-487, B2);
- an area of landscape mitigation planting to the south of Kirkthorpe, to provide screening for properties in Kirkthorpe (see Volume 2: Map CT-06-487, E1 to E2);
- Kirkthorpe embankment, 357m in length and up to 17m in height, with landscape mitigation planting on both sides, to help integrate the HS2 main line into the surrounding landscape. A noise fence barrier, to the western side of the HS2 main line, up to 3m in height above rail, to provide acoustic screening for properties in Kirkthorpe (see Volume 2: Map CT-06-487, E5 to G6);

- an area of woodland habitat creation to the eastern side of Kirkthorpe embankment, to provide habitat connectivity along the dismantled railway cutting (see Volume 2: Map CT-06-487, E6 to G7);
- Marshall Hill culvert, located 215m north of the Warmfield-cum-Heath Bridleway 14 overbridge. The culvert would allow surface water flow through Kirkthorpe Embankment (see Volume 2: Map CT-06-487, E5 to F6);
- a balancing pond for highway drainage, within an area of landscape mitigation planting, located to the west of the HS2 main line, to the north of Kirkthorpe Lane. Access to the balancing pond would be from the existing Kirkthorpe Lane (see Volume 2: Map CT-06-487, E4);
- a balancing pond for railway drainage, within an area of landscape mitigation planting, located to the west of the HS2 main line, to the north of Kirkthorpe Lane. Access to the balancing pond would be from Kirkthorpe Lane (see Volume 2: Map CT-06-487, F4 to F5);
- two ecological mitigation ponds, within an area of landscape mitigation planting, to the west of HS2 main line, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-487, G4 to G5);
- diversion of the tributary of the River Calder 2, into the tributary of the River Calder 1, under Goosehill viaduct and around the southern end of Goosehill embankment (see Volume 2: Map CT-06-487, H5 to H6);
- Goosehill viaduct, 207m in length and up to 20m in height. A noise fence barrier, to the west of the HS2 main line, up to 2m in height above rail, to provide acoustic screening for properties in Kirkthorpe (see Volume 2: Map CT-06-487, G5 to H6); and
- three ecological mitigation ponds, within an area of landscape mitigation planting, east of Goosehill viaduct, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-487, G6 to G7).

2.2.13 This section of the route would include two maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and 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 New Sharlston cutting, New Sharlston embankment and Kirkthorpe embankment satellite compounds). These compounds are described in Section 2.3 and shown on map CT-05-486b and map CT-05-487 in the Volume 2: LA15 Map Book.

Goosehill viaduct to River Calder embankment

2.2.15 The HS2 main line would continue north on Goosehill embankment and onto the Normanton viaduct to cross over the Welbeck Landfill access road and Flooded Brickpit. The HS2 main line would then pass onto the Normanton embankment before

entering the Normanton cutting, which would be crossed by Birkwood Road overbridge to the west of Altofts.

2.2.16 This section of the route is illustrated on maps CT-06-487 to CT-06-489 in the Volume 2: LA15 Map Book.

2.2.17 Key features of this 2.5km section would include:

- Goosehill embankment, 461m in length and up to 19m in height, with associated landscape earthworks and landscape mitigation planting to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-487, H6 to Map CT-06-488, C5);
- realignment of Welbeck Landfill access road, 240m to the north of its existing alignment for 450m, crossing under the Normanton viaduct (see Volume 2: Map CT-06-487, I7 to Map CT-06-488, I7);
- Normanton viaduct, 344m in length and up to 21m in height (see Volume 2: Map CT-06-488, C6 to D6);
- a balancing pond for railway drainage would be located to the east of the HS2 main line, adjacent to the realigned Welbeck Landfill access road, with an area of landscape mitigation planting to the south. Access to the balancing pond would be from the realigned Welbeck Landfill access road (see Volume 2: Map CT-06-487, I7 to Map CT-06-488, B7);
- a replacement floodplain storage area would be located to the east of the HS2 main line, adjacent to the realigned Welbeck Landfill access road. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-488, B7 to C6);
- Normanton embankment, 321m in length and up to 10m in height, with associated landscape mitigation planting on both sides, to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-488, D6 to F6);
- realignment of Newland with Woodhouse Moor Footpath 6 and the access to the Former Newland Hall, 25m south of existing alignment for 270m, crossing the HS2 main line on Newland with Woodhouse Moor Footpath 6 accommodation overbridge, 50m in length (see Volume 2: Map CT-06-488, E5 to E7);
- an area of grassland habitat creation to the west and east of the HS2 main line, to provide habitat replacement and connectivity (see Volume 2: Map CT-06-488, E7 to G4);
- an ecological mitigation pond to the west of the HS2 main line, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-488, E5);
- an ecological mitigation pond to the east of HS2 main line, within an area of grassland habitat creation, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-488, E7 to F8);

- Newland Lane culvert, 60m north of Newland with Woodhouse Moor Footpath 6 accommodation overbridge, for surface water drainage under the HS2 main line (see Volume 2: Map CT-06-488, E5 to E6);
- Normanton cutting, 970m in length, up to 200m in width and up to 28m in depth. There would be landscape mitigation planting adjacent to the cutting on both sides of the HS2 main line, with grassland and woodland habitat creation to western side of the route, to help integrate the HS2 main line into the surrounding landscape and provide habitat connectivity. A noise fence barrier, at the base of the cutting to the east of the HS2 main line, 140m in length and up to 3m in height above rail, to provide acoustic screening for properties in Altofts and users of the River Calder (see Volume 2: Map CT-06-488, F6 to Map CT-06-489, C4);
- an ecological mitigation pond within an area of woodland habitat creation to the east of HS2 main line, to provide replacement habitat for great crested newts and habitat connectivity (see Volume 2: Map CT-06-488, F7 to F8);
- diversion of Normanton Footpath 29, 115m south of its current alignment for 370m, crossing the HS2 main line on the Normanton Footpath 29 overbridge, 91m in length (see Volume 2: Map CT-06-488, F6 to G5);
- closure of Newland with Woodhouse Moor Footpath 5 where it would cross the HS2 main line to the west. Users would be diverted along the realigned Normanton Footpath 29 overbridge (see Volume 2: Map CT-06-488, G5);
- diversion of Normanton Bridleway 2, 105m to the north-east of its current alignment for 325m, to join Birkwood Road to the east of the HS2 main line (see Volume 2: Map CT-06-488, H7 to I6);
- Birkwood Road overbridge, 115m in length, to carry Birkwood Road on its existing alignment over the HS2 main line at existing ground level and 13m above track level (see Volume 2: Map CT-06-489, B3 to B6);
- diversion of Normanton Footpath 1, 115m south-west of its current alignment for 170m, to join Birkwood Road west of the HS2 main line. Normanton Footpath 1 would also then be realigned for two short sections to the west of the River Calder embankment: the realignment of Normanton Footpath 1 (a), 15m west of its current alignment for 55m and Normanton Footpath 1 (b), 30m west of its current alignment for 60m (see Volume 2: Map CT-06-489, B5 to C4, and Map CT-06-489, D4);
- River Calder embankment, 432m in length and up to 15m in height. There would be landscape mitigation planting to the east of the HS2 main line and grassland habitat creation, to both sides of the route, to help integrate the HS2 main line into the surrounding landscape. A noise fence barrier, to the east of the HS2 main line, up to 3m in height above rail, to provide acoustic screening for properties in Altofts (see Volume 2: Map CT-06-489, C4 to E4);
- a balancing pond for railway drainage, within an area of landscape mitigation planting, to the east of the HS2 main line with access from Birkwood Road (see Volume 2: Map CT-06-489, E5 to E6); and

- two ecological mitigation ponds, within an area of landscape mitigation planting, to the east of the HS2 main line, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-489, F5 to F6).

2.2.18 This section of the route would include two maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and 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 Normanton embankment main compound and the Goosehill embankment, Normanton cutting and River Calder embankment satellite compounds. The compounds are described in Section 2.3 and shown on map CT-05-487 and map CT-05-489 in the Volume 2: LA15 Map Book.

River Calder embankment to Scholey Hill embankment

2.2.20 To the north of Altofts the HS2 main line would continue from the River Calder embankment onto the River Calder viaduct. The viaduct would cross several features, including the River Calder, the Aire and Calder Navigation and the M62. At the northern end of the viaduct, after crossing the M62, tracks to form the Leeds spur would diverge from the HS2 main line as it passes onto Scholey Hill embankment.

2.2.21 This section of the route is illustrated on maps CT-06-489 to CT-06-490 in the Volume 2: LA15 Map Book.

2.2.22 Key features of this 2.7km section would include:

- River Calder viaduct, 1.9km in length and up to 23m in height. The Leeds spur (southbound and northbound tracks) would begin to diverge from the HS2 main line 1.2km along the viaduct (see Volume 2: Map CT-06-489, E4 to Map CT-06-490, G5);
- an area of grassland habitat creation under the southern section of the River Calder viaduct for habitat replacement (see Volume 2: Map CT-06-489, E4 to G6);
- diversion of a tributary of River Calder 4, under the southern end of the River Calder viaduct and around the northern end of the River Calder embankment (see Volume 2: Map CT-06-489, E4 to F5);
- an ecological mitigation pond to the west of the HS2 main line, to the south of the Aire and Calder Navigation, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-489-L1, E8);
- a replacement floodplain storage area, 800m to the west of the HS2 main line, north of the River Calder and south of Bottom Boat Road. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-489-L1, F3 to H6);
- Bottom Boat auto-transformer feeder station, 200m by 135m, to the west the River Calder embankment, and north of the B6135 Newmarket Lane. There would be landscape mitigation planting and grassland habitat creation to help landscape

integration. Access to the auto-transformer feeder station would be from the B6135 Newmarket Lane (see Volume 2: Map CT-06-490, F3 to G4);

- a grid supply point, to the west of the Bottom Boat auto-transformer feeder station, and north of the B6135 Newmarket Lane. There would be landscape mitigation planting and grassland habitat creation to help landscape integration. Access to the grid supply point would be from the B6135 Newmarket Lane (see Volume 2: Map CT-06-490, E2 to Map CT-06-490-L1, F8);
- Scholey Hill embankment, 798m in length and up to 18m in height. There would be landscape mitigation planting and woodland habitat creation to both sides of the HS2 main line would provide visual screening for properties on Newmarket Lane, provide ecological connectivity, and help integrate the HS2 main line into the surrounding landscape. At the northern end, the embankment would diverge into the following three components (see Volume 2: Figure 4 and Map CT-06-490, G5 to Map CT-06-491, D5):
  - the HS2 main line would exit the embankment, to enter the Scholey Hill cutting, passing under the Moss Carr Wood viaduct (see Volume 2: Figure 4 and Map CT-06-490, G5 to Map CT-06-491, D5);
  - the Leeds spur (northbound) would exit the embankment to enter Clumpcliffe Covert cutting to the west of the HS2 main line (see Volume 2: Figure 4 and Map CT-06-490, G5 to Map CT-06-491, D5); and
  - the Leeds spur (southbound) would exit the embankment and transition onto the Moss Carr Wood viaduct to cross over the HS2 main line, before entering into Clumpcliffe Covert cutting (see Volume 2: Figure 4 and Map CT-06-490, G5 to Map CT-06-491, D5).
- a replacement floodplain storage area to the west of the HS2 main line, and north of the M62. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-490, G3 to H2);
- an ecological mitigation pond to the west of the HS2 main line, and north of the M62, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-490, G4);
- realignment of Definitive Footpath Rothwell 38 and the Trans Pennine Trail (Footpath), 350m south of its current alignment for 730m, to pass beneath the River Calder viaduct and re-join its current alignment on Hungate Lane (see Volume 2: Map CT-06-490, G5 to I4);
- a balancing pond and pumping station for railway drainage, within an area of landscape mitigation planting, located to the east of the HS2 main line. Access to the balancing pond would be from Hungate Lane (see Volume 2: Map CT-06-490, H7 to I6);
- realignment of Rothwell Footpath 83, 18m east of its current alignment, for 90m, to divert around a balancing pond for railway drainage (see Volume 2: Map CT-06-490, H7 to I7);

- three ecological mitigation ponds, within an area of landscape mitigation planting, to the east of the HS2 main line, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-490, H6 to Map CT-06-491, B6); and
- Moss Carr Wood drop inlet culvert[24], to carry the diverted tributary of navigation Beck 2 under the Scholey Hill embankment (see Volume 2: Map CT-06-491, C5 to C6).

2.2.23 This section of the route would include two maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and 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 River Calder embankment, River Calder viaduct and Scholey Hill embankment satellite compounds, which are described in Section 2.3, and shown on map CT-05-489 and map CT-05-490 in the Volume 2: LA15 Map Book.

Scholey Hill embankment to River Aire viaduct

2.2.25 The HS2 main line would exit the Scholey Hill embankment and pass under the Moss Carr Wood viaduct into Scholey Hill cutting, before transitioning onto the River Aire embankment (south of the A639 Methley Lane) to then cross the River Aire Valley on the River Aire viaduct.

2.2.26 This section of the route is illustrated on maps CT-06-491 to CT-06-493 in the Volume 2: LA15 Map Book.

2.2.27 Key features of this 3.1km section would include:

- Scholey Hill cutting, 582m in length, up to 140m in width and up to 15m in depth. There would be woodland habitat creation adjacent to the cutting on both sides of the HS2 main line, to provide habitat connectivity, visual screening for properties at Oulton and Methley Park Estate, and help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-491, D6 to G6);
- two ecological mitigation ponds within an area of woodland habitat creation, to the east of the HS2 main line, would provide replacement habitat for great crested newts (see Volume 2: Map CT-06-491, D6 to E6);
- River Aire embankment, 245m in length and up to 10m in height. Woodland habitat creation to both sides of the HS2 main line would provide habitat connectivity, visual screening for properties at Oulton and Methley Estate and help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-491, G5 to H6);

[24] A drop inlet culvert comprises a circular pipe or rectangular box culvert, usually with an inlet weir and open stepped 'cascade' on the upstream side to dissipate energy. Drop inlet culverts are used when a watercourse (or dry valley) crosses the route or road in cutting or close to existing ground level.

- three ecological mitigation ponds within an area of woodland habitat creation to the east of the HS2 main line, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-491, G6 to H7);
- River Aire viaduct, 2.3km in length and up to 28m in height. A noise fence barrier, to the west of the HS2 main line, 770m in length and up to 2m in height above rail, to provide acoustic screening for receptors along the River Aire (see Volume 2: Map CT-06-491, H5 to Map CT-06-493, D6);
- diversion of Almhouses Wood Drain , along the western side of the River Aire embankment, under the River Aire viaduct (see Volume 2: Map CT-06-491, F5 to H6);
- a replacement floodplain storage area underneath the River Aire viaduct to the south-west of Lemonroyd Sewage Treatment Works and to the north of the A639 Methley Lane. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-491, H4 to Map CT-06-492, B6); and
- a balancing pond for highway drainage, within an area of landscape mitigation planting, to the west of the HS2 main line. Access to the balancing pond would be from Fleet Lane to the north (see Volume 2: Map CT-06-492, C5).

2.2.28 This section of the route would include three maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and 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 Scholey Hill embankment River Aire embankment and Swillington cutting satellite compounds, which are described in Section 2.3, and shown on map CT-05-491 and map CT-05-493in the Volume 2: LA15 Map Book.

River Aire viaduct to Carr Wood South culvert

2.2.30 The HS2 main line would continue north from the River Aire viaduct onto Swillington embankment and then into Swillington cutting as it passes to the east of the M1. Following Swillington cutting, the HS2 main line would rise onto West Garforth South embankment, cross over the A63 Selby Road viaduct, and then onto West Garforth North embankment to the end of the Warmfield to Swillington and Woodlesford area.

2.2.31 This section of the route is illustrated on maps CT-06-493 to CT-06-495a in the Volume 2: LA15 Map Book.

2.2.32 Key features of this 3.5km section would include:

- a replacement floodplain storage area, to the west of the HS2 main line, and north of A642 Aberford Road. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-493, C3 to E1 to Map CT-06-493-L1, C9 to E5);

- two ecological mitigation ponds, under the northern end of the River Aire viaduct, within an area of woodland habitat creation, and south of the A642 Aberford Road, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-493, C5 to D6);
- an area of landscape mitigation planting and grassland habitat creation to the east of the HS2 main line, to provide visual screening properties in Swillington and habitat replacement (see Volume 2: Map CT-06-493, D6 to F10);
- Swillington embankment, 900m in length and up to 10m in height, with associated landscape mitigation planting and grassland habitat creation, to both sides of the route, to help integrate the HS2 main line into the surrounding landscape and provide visual screening for properties in Swillington and habitat connectivity. A noise fence barrier, to the east of the HS2 main line, up to 2m in height above rail, to provide acoustic screening for properties in Swillington (see Volume 2: Map CT-06-493, D6 to I6);
- a balancing pond for railway drainage within an area of grassland habitat creation, to the east of the HS2 main line and north of the A642 Aberford Road. Access to the balancing pond would be from the A642 Aberford Road (see Volume 2: Map CT-06-493, D7 to E6);
- diversion of Swillington Footpath 21, 150m east of its current alignment for 210m, to divert around a balancing pond for railway drainage (see Volume 2: Map CT-06-493, D6 to E7);
- the Swillington South culvert, located 170m south of Swillington Footpath 21 underbridge to prevent the ponding of surface water on the west side of the Swillington Embankment (see Volume 2: Map CT-06-493, F5 to F6);
- realignment of Swillington Footpath 21, 100m north of its current alignment, for 190m, crossing under the HS2 main line via the Swillington Footpath 21 underbridge, 13m in length (see Volume 2: Map CT-06-493, F6 to G5);
- the Swillington Central culvert, located 26m north of the Swillington Footpath 21 underbridge and the Swillington North culvert located 200m north of the Swillington Footpath 21 underbridge to carry the tributary of River Aire 7 under the Swillington Embankment (see Volume 2: Map CT-06-493, G5 to G6 and H5 to H6);diversion of Swillington Footpath 20, 105m south of its current alignment, for 105m, to join the realigned Swillington Footpath 21 east of the HS2 main line (see Volume 2: Map CT-06-493, G5 to G6);
- Swillington cutting, 1.9km in length, up to 97m in width and up to 14m in depth, with grassland habitat creation and woodland habitat creation adjacent to the cutting on both sides of the HS2 main line, to provide habitat connectivity and replacement. There would be landscape mitigation planting located on both sides of the route to provide visual screening for several farm properties near Swillington. A noise fence barrier, located at the base of the cutting, to the east of the HS2 main line, 110m in length and up to 2m in height above rail, to provide

acoustic screening for properties in Swillington (see Volume 2: Map CT-06-493, I6 to Map CT-06-495a, C5);

- two ecological mitigation ponds, within an area of grassland habitat creation, to the east of the HS2 main line, to provide replacement habitat for great crested newts and habitat connectivity (see Volume 2: Map CT-06-493, I6);
- Parkinson's Wood South inverted siphon, 50m south of the Swillington Footpath 14 overbridge, to carry the tributary of the River Aire 8 under Swillington Cutting (see Volume 2: Map CT-06-494, C5 to C6);
- realignment of Swillington Footpath 14, 55m north of its current alignment, for 230m, crossing the HS2 main line on the Swillington Footpath 14 overbridge, 48m in length (see Volume 2: Map CT-06-494, C5 to C6);
- Swillington auto-transformer station, 49m by 24m, on the western side of the HS2 main line, 10m north of Swillington Footpath 14 overbridge. Access would be provided from Bullerthorpe Lane (see Volume 2: Map CT-06-494, C6 to D6);
- Parkinson's Wood North inverted siphon, 140m north of the Swillington Footpath 14 overbridge, to carry the tributary of the River Aire 5 under the HS2 main line. Surface water drainage would be diverted along the eastern edge of Swillington cutting and through the inverted siphon to the western side of the HS2 main line (see Volume 2: Map CT-06-494, D5 to D6);
- realignment of Swillington Bridleway 11, 60m south of its current alignment for 195m, crossing the HS2 main line on the Swillington Bridleway 11 accommodation overbridge, 55m in length (see Volume 2: Map CT-06-494, G5 to G6);
- an area of landscape mitigation planting to the east of the HS2 main line, to provide visual screening for several farm properties near Swillington (see Volume 2: Map CT-06-494, F6 to Map CT-06-495a, C6);
- realignment of Swillington Footpath 1, 40m north of its current alignment for 125m, crossing the HS2 main line via the Swillington Footpath 1 overbridge, 50m in length (see Volume 2: Map CT-06-495a, B6 to C5);
- West Garforth South embankment, 306m in length and up to 12m in height, with associated landscape mitigation planting on both sides, grassland habitat creation to the west and woodland habitat creation to the east, to help integrate the HS2 main line into the surrounding landscape and provide habitat connectivity (see Volume 2: Map CT-06-495a, C5 to E5);
- A63 Selby Road viaduct, 104m in length and up to 12m in height to carry the HS2 main line over the A63 Selby Road (see Volume 2: Map CT-06-495a, E5);
- Carr Wood South culvert, 360m north of the A63 Selby Road viaduct, to carry The Beck beneath the HS2 main line (see Volume 2: Map CT-06-495a, G5 to G6); and
- West Garforth North embankment, approximately 886m in length, of which 300m would be in Warmfield to Swillington and Woodlesford area. The embankment would be up to 14m in height within this area. There would be associated landscape

mitigation planting to both sides of the route and woodland habitat creation to the east, to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-495a, E5 to I6).

2.2.33 This section of the route would include four maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and 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 Swillington embankment, Swillington cutting and West Garforth South embankment satellite compounds, and West Garforth cutting north main compound (located in the Garforth and Church Fenton (LA16) area), which are described in Section 2.3, and shown on map CT-05-493 and 495a in the Volume 2: LA15 Map Book.

Leeds spur

2.2.35 In the Warmfield to Swillington and Woodlesford area, the Leeds spur would be carried on the following features:

- viaducts for a total length of 362m (Moss Carr Wood and Oulton Beck viaducts);
- cuttings for a total length of 1.3km (Clumpcliffe Covert, Woodlesford and Rothwell Country Park cuttings);
- embankments for a total length of 840m (Clumpcliffe Covert and Oulton Beck embankments); and
- tunnels (including porous portal) for a total length of 1.9km (Woodlesford tunnel comprising a southern porous portal, southern cut and cover, twin bore[25], northern cut and cover and northern porous portal).

2.2.36 The Leeds spur is described in two separate sections below.

Scholey Hill embankment to Woodlesford tunnel (southern cut and cover)

2.2.37 North of the M62 and adjacent to Methley Park, the Leeds spur (northbound) would exit Scholey Hill embankment into Clumpcliffe cutting. The Leeds spur (southbound) would exit Scholey Hill embankment onto Moss Carr Wood viaduct before entering Clumpcliffe cutting to join with the Leeds spur (northbound). The Leeds spur would continue onto Clumpcliffe embankment, before entering the Woodlesford cutting to the east of Oulton. From the Woodlesford cutting the Leeds spur would enter the Woodlesford southern cut and cover tunnel.

2.2.38 This section of the route is illustrated on maps CT-06-491 to CT-06-492 and CT-06-621 in the Volume 2: LA15 Map Book.

[25] A bored tunnel is a tunnel constructed using a tunnel boring machine. Twin bore is formed of two separate bored tunnels.

2.2.39 Key features of this 2.2km section would include:

- Moss Carr Wood viaduct, 232m in length and up to 13m in height above the HS2 main line and 19m above existing ground level, would carry the Leeds spur (southbound) over the HS2 main line (see Volume 2: Map CT-06-491, C5 to D6);
- Clumpcliffe Covert cutting, 390m in length, and up to 87m in width and up to 12m in depth. The Leeds spur (northbound and southbound tracks) would converge in the cutting (see Volume 2: Map CT-06-491, D5 to G4);
- two ecological mitigation ponds within an area of woodland habitat creation, and one ecological pond within an area of grassland habitat creation, to the west of the Leeds spur, to provide replacement habitat for great crested newts and habitat connectivity (see Volume 2: Map CT-06-491, D4 to D5 and Map CT-06-491, E4);
- Clumpcliffe Covert embankment, 740m in length and up to 12m in height, with associated landscape mitigation planting to both sides of the route, to help integrate the Leeds spur into the surrounding landscape and provide habitat connectivity (see Volume 2: Map CT-06-491, F5 to H2);
- an area of woodland habitat creation to the east and west of the Leeds spur, to provide habitat connectivity (see Volume 2: Map CT-06-491, F5 to H4);
- an area of landscape mitigation planting, to the west of the Leeds spur, and to the east of properties at Oulton, to provide visual screening for properties in Oulton (see Volume 2: Map CT-06-491-L1, E4 to H6);
- three ecological mitigation ponds, within an area of woodland habitat creation to the east of the Leeds spur, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-491, H4);
- realignment of the A639 Methley Lane, 50m north of its current alignment for 770m. The realigned A639 Methley Lane would cross the Leeds spur in the A639 Methley Lane underbridge. The underbridge would carry the realigned road, at existing ground level and 13m below the track level. The existing Methley Lane alignment would be closed where it would cross the Leeds spur, with a short section retained for maintenance access to the east (see Volume 2: Map CT-06-491, H3 to I2);
- Winter Wood culvert would be located 200m south of the A639 Methley Lane underbridge. The culvert would carry flows from Methley Lane Drain 1 beneath the Leeds spur to maintain flow to the ponds located to the west of the embankment (see Volume 2: Map CT-06-491, E5 to H6);
- a balancing pond for railway drainage, within an area of wetland habitat creation to the east of the Leeds spur. Access to the balancing pond would be from the realigned A639 Methley Lane (see Volume 2: Map CT-06-491, 13);
- an area of wetland habitat creation, to the west of Clumpcliffe Covert embankment and Oulton Beck viaduct, to provide habitat replacement and connectivity (see Volume 2: Map CT-06-491-L1, H8 to I9);

- Oulton Beck viaduct, 130m in length and up to 8m in height, to carry the Leeds spur over Oulton Beck (see Volume 2: Map CT-06-621, B6 to C6);
- a replacement floodplain storage area, to the north of the A639 Methley Lane, and to the west of the Leeds spur. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-621, B4 to C3);
- Oulton Beck embankment, 100m in length and up to 6m in height, with landscape mitigation planting on both sides of the route, to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-491-L1, J9 to Map CT-06-621, C5 to D6);
- realignment of Fleet Lane, 55m south of its current alignment for 900m, with associated landscape mitigation planting. The realigned Fleet Lane would cross the Leeds spur on Fleet Lane overbridge, 115m in length, 9m above existing ground level and 11m above track level. Access to areas to the east of the Leeds spur, including the West Riding Football Association, would be retained via the realigned Fleet Lane and Fleet Lane overbridge. The Trans Pennine Trail, which currently follows Fleet Lane in this location, would also be accommodated via the Fleet Lane overbridge. Rothwell Footpath 35, to the west of the Leeds spur, would join the realigned Fleet Lane (see Volume 2: Map CT-06-621, C9 to E4);
- a balancing pond for railway drainage, within an area of landscape mitigation planting, to the west of the Leeds spur, and to the south of the realigned Fleet Lane. Access to the balancing pond would be from the realigned Fleet Lane (see Volume 2: Map CT-06-621, C5 to D4);
- a balancing pond for highway drainage, within an area of landscape mitigation planting, to the west of the Leeds spur, and to the south of the realigned Fleet Lane. Access to the balancing pond would be from Fleet Lane (see Volume 2: Map CT-06-621, C5 to D4);
- an area of woodland habitat creation, to the west of the route of the Leeds spur, to provide replacement habitat (see Volume 2: Map CT-06-621, D5 to G6);
- Woodlesford cutting, 335m in length, up to 77m in width and up to 9m in depth (see Volume 2: Map CT-06-621, D6 to F6);
- Fleet Lane retaining wall, 63m in length and up to 5m in height, located to the east of the Leeds spur, within Woodlesford cutting (see Volume 2: Map CT-06-621, E6);
- a tunnel portal building[26] and rescue area[27] at the southern end of Woodlesford tunnel and to the west of the Leeds spur. A pumping station would be located within the portal building. Access would be provided from the realigned Fleet Lane (see Volume 2: Map CT-06-621, E5 to E6);

[26] Tunnel portal building houses equipment, such as control equipment for the tunnel and ventilation fans for rail tunnel operations.
[27] The rescue area would be used to accommodate passengers during an emergency evacuation and would include vehicular access for emergency services and HS2 maintenance.

- Woodlesford tunnel southern porous portal, 150m in length, at the southern end of the Woodlesford tunnel (see Volume 2: Map CT-06-621, E6 to F6);
- Woodlesford tunnel southern cut and cover section, 222m in length and up to 20m in depth (see Volume 2: Map CT-06-621, F6 to G6);
- closure of Eshald Lane where it would cross the Leeds spur, with access retained to the east, and a diversion via A642 Aberford Road (see Volume 2: Map CT-06-621, F7); and
- a diversion of the tributary of River Aire 2, to the north of Eshald Lane (see Volume 2: Map CT-06-621, F6).

2.2.40 This section of the route would include one maintenance access point allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.41 Construction of this section would be managed from the Scholey Hill embankment, Clumpcliffe Covert embankment and Woodlesford cutting satellite compounds, which are described in Section 2.3 and shown on map CT-05-209b and map CT-05-212 in the Volume 2: LA15 Map Book.

Woodlesford tunnel (southern cut and cover) to Rothwell Country Park cutting

2.2.42 The Leeds spur would continue into Woodlesford tunnel (twin bore) to pass under Woodlesford, where it would exit into the Woodlesford tunnel northern cut and cover section. The Leeds spur would continue in the Rothwell Country Park cutting to the end of the Warmfield to Swillington and Woodlesford area.

2.2.43 This section of the route is illustrated on maps CT-06-621 to CT-06-623a in the Volume 2: LA15 Map Book.

2.2.44 Key features of this 2.2km section would include:

- twin bore section of Woodlesford tunnel, 1km in length and up to 38m in depth, passing under Woodlesford. The top of the bored tunnel would be up to 31m below existing ground level and track level would be up to 38m below ground level (see Volume 2: Map CT-06-621, F6, Map CT-06-622, D6);
- an area of landscape mitigation planting and grassland habitat creation on the top of the Woodlesford tunnel, to provide visual screening of the tunnel portal for properties in Woodlesford and users of Water Haigh Park and habitat replacement (see Volume 2: Map CT-06-622, C6 to F3);
- Woodlesford tunnel northern cut and cover section, 520m in length and up to 28m in depth (see Volume 2: Map CT-06-622, D6 to E6);
- Woodlesford northern portal retaining wall, 240m in length, and up to 5m in height (see Volume 2: Map CT-06-622, G6);

- Woodlesford tunnel northern porous portal, 150m in length, at the northern end of the Woodlesford tunnel (cut and cover) (see Volume 2: Map CT-06-622, G6);
- a tunnel portal building and rescue area at the northern end of Woodlesford tunnel (porous portal), to the north of the Leeds spur, with landscape mitigation planting to help integrate the Leeds spur into the surrounding landscape. A pumping station would be located within the portal building. Access would be provided from The Locks (see Volume 2: Map CT-06-622, G6);
- an upgrade of an existing access track from The Locks to Fishpond Lock House, north of the Leeds spur, parallel to the Aire and Calder Navigation, to provide access to the portal building and rescue area (see Volume 2: Map CT-06-622, A7 to I6);
- realignment of the existing Hallam Line, to the south of its existing alignment, for a total length of 2.5km, with 655m in this section (see Volume 2: Map CT-06-622, G6 to Map CT-06-623a, I6);
- Rothwell Country Park cutting, 1.7km in total length, of which 580m would be in the Warmfield to Swillington and Woodlesford area. Within the Warmfield to Swillington and Woodlesford area the cutting would be up to 5m in depth and 75m in width, with landscape mitigation planting on both sides of the route, to help integrate the Leeds spur into the surrounding landscape (see Volume 2: Map CT-06-622, G6 to Map CT-06-623a, I6);
- Bullough Lane auto-transformer station, 49m by 24m, 20m north of the Leeds spur, and to the west of the portal building and rescue area, with landscape mitigation planting to help integrate into the surrounding landscape. Access would be provided from Bullough Lane (see Volume 2: Map CT-06-622, H6); and
- closure of Bullough Lane (private road), to the south of the Leeds spur, to vehicular access, with pedestrian and cyclist access maintained. Bullough Lane would cross under the Leeds spur, on its existing alignment, in the Bullough Lane underbridge, with a height clearance of 2m. The underbridge would also provide a crossing point for an unnamed watercourse under the Leeds spur (see Volume 2: Map CT-06-623a, C7).

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

2.2.46 Construction of this section would be managed from the Woodlesford cutting, Woodlesford Tunnel and Rothwell Country Park satellite compounds, which are described in Section 2.3, and shown on map CT-05-621, map CT-05-622 and map CT-05-623a in the Volume 2: LA15 Map Book.

Demolitions

2.2.47 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.

2.2.48 At this stage of the design development, it is anticipated that demolition of five residential properties, two commercial/business properties (including farm outbuildings) and 12 other structures would be required to construct the Proposed Scheme in the Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford 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 planning 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[28] 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; tunnelling; 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.

[28] 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

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:

- 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 mitigation 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 tunnels, 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.

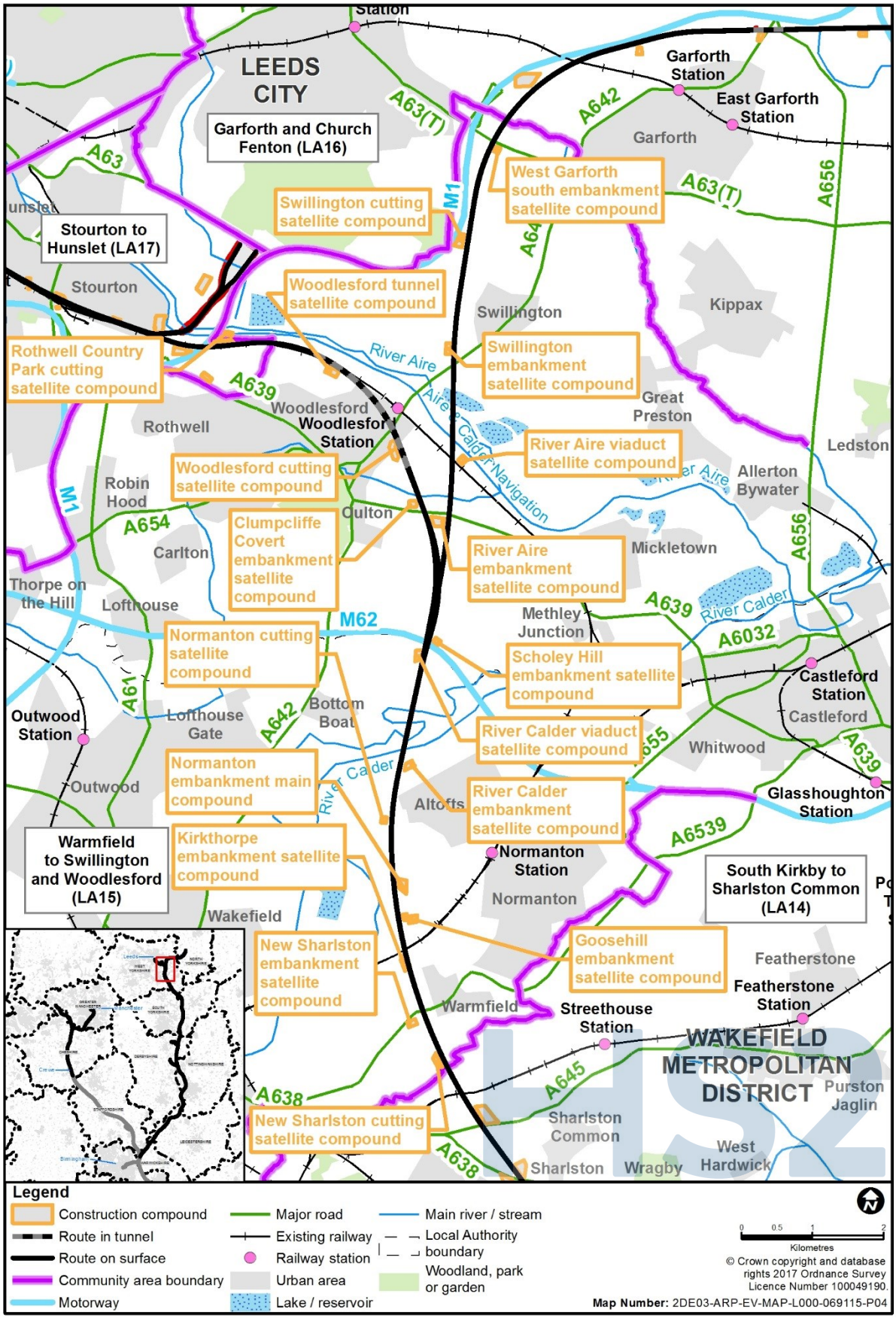
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.18 One main civil engineering compound, the Normanton embankment main compound, would be located in the Warmfield to Swillington and Woodlesford area. This would manage 17 civil engineering satellite compounds within this area. Some works within the Warmfield to Swillington and Woodlesford area would be managed from a main civil engineering compound, West Garforth cutting north main embankment compound, located in Garforth and Church Fenton area (LA16) and M1 crossing satellite compound, located in the Stourton to Hunslet area (LA17).

2.3.19 Following the completion of civil engineering works, six of the compounds located in the Warmfield to Swillington and Woodlesford area would remain and be used for railway installation works. These compounds for railway systems works would be managed from the Sherburn railhead main compound in the Garforth and Church Fenton area (LA16) (see Volume 2: Community area report LA16 Garforth and Church Fenton).

2.3.20 The location of construction compounds in the Warmfield to Swillington and Woodlesford area is shown on Figure 5. Map Series CT-05 (in the Volume 2: LA15 Map Book) show in detail the locations of the construction compounds described below.

Figure 5: Location of construction compounds in the LA15 Warmfield to Swillington and Woodlesford area



2.3.21 Figure 6 shows the management relationship for civil engineering works compounds and Figure 7 shows the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.22 Accommodation for the construction workforce in the Warmfield to Swillington and Woodlesford area will be provided at the Normanton embankment main compound. 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 topsoil and subsoil 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-05-486b to CT-05-495a and maps CT-05-621 to CT-05-623a, in the Volume 2: LA15 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 Warmfield to Swillington and Woodlesford 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 maps CT-05-486b to CT-05-495a and maps CT-05-621 to CT-05-623a in the Volume 2: LA15 Map Book.

Construction compounds

2.3.29 This section provides a summary of the civil engineering works to be managed from the construction compounds in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6, and railway system works as illustrated Figure 7. 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 6: Construction compounds for civil engineering works

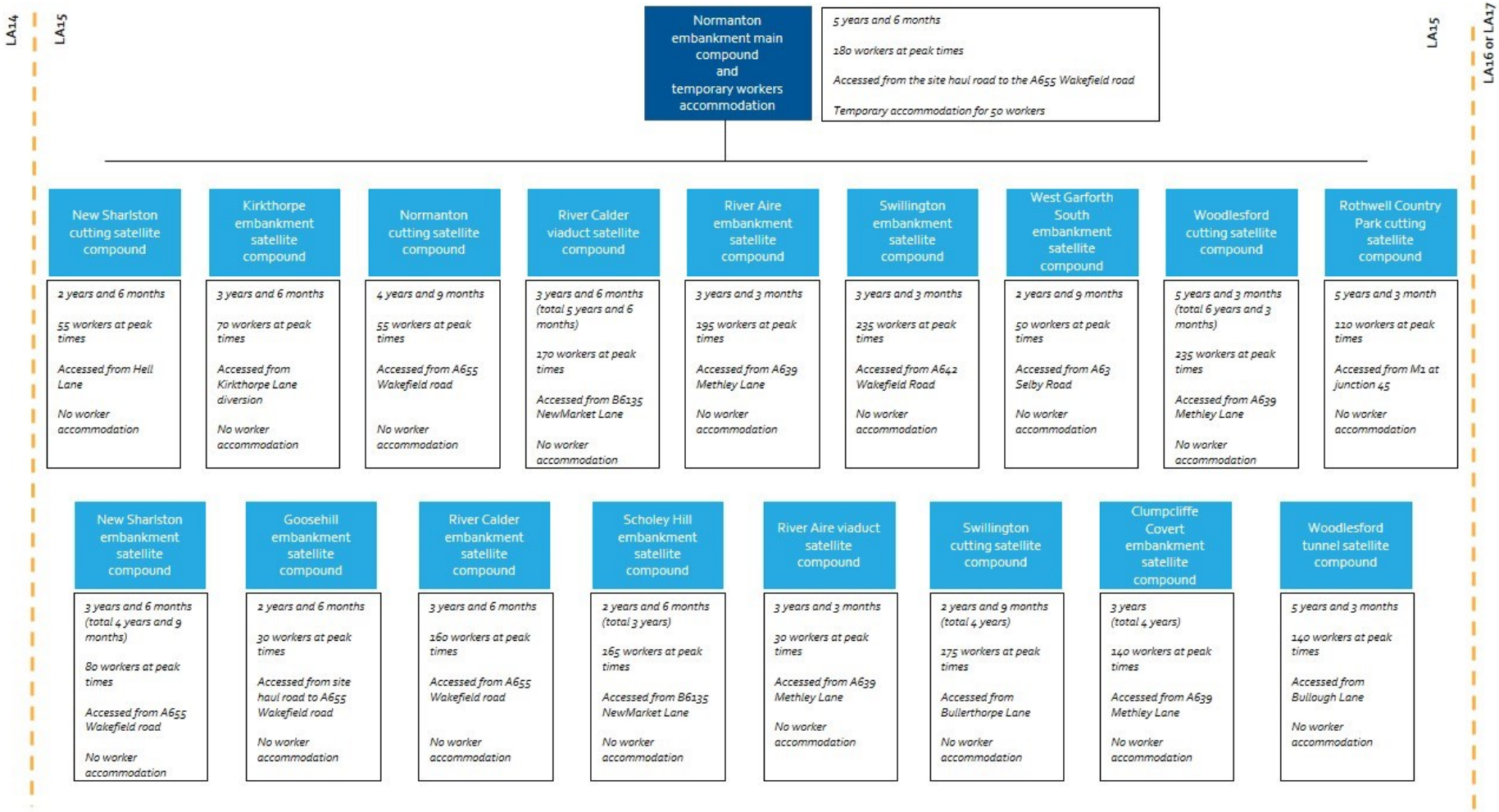
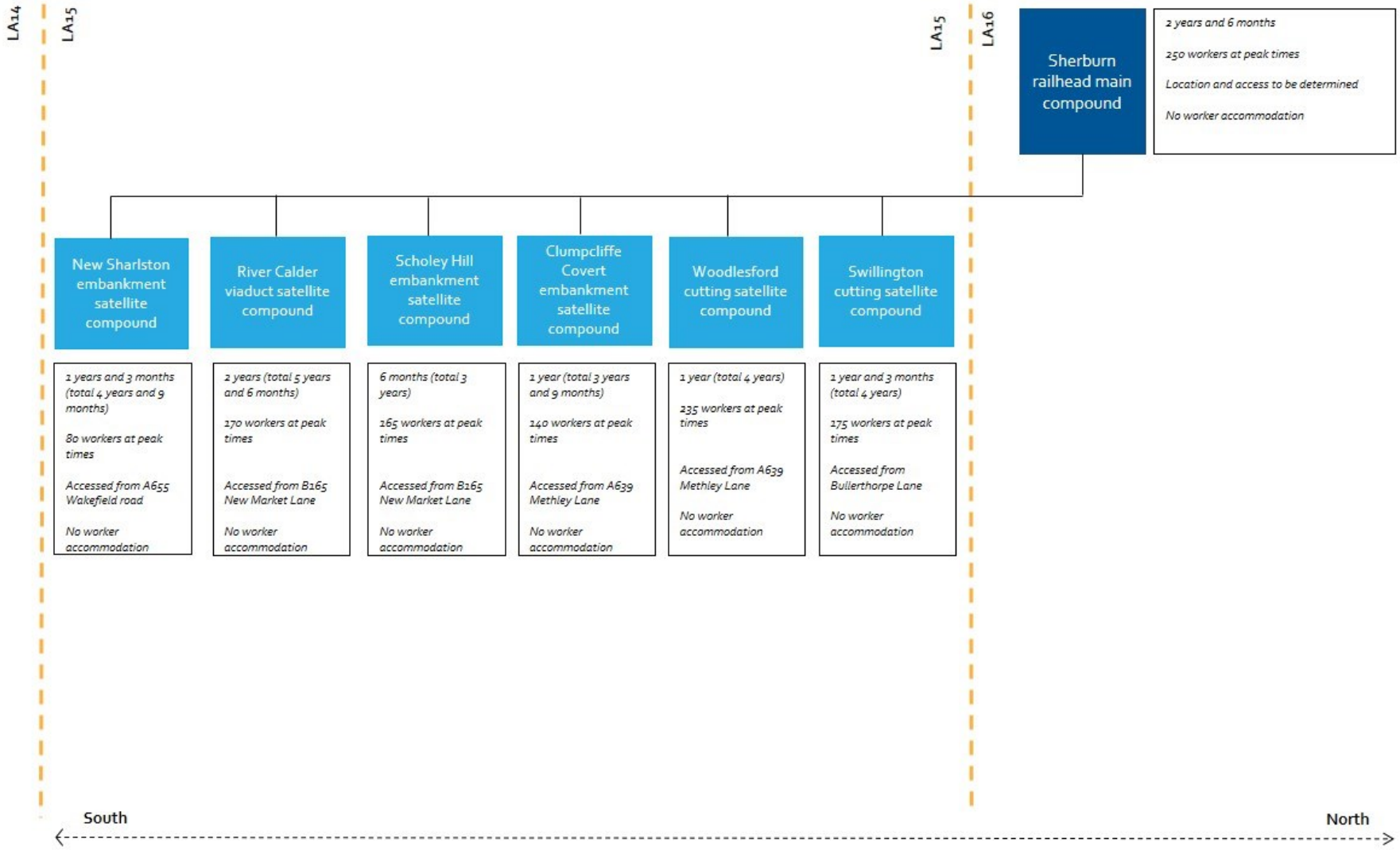


Figure 7: Construction compounds for rail systems engineering works



Normanton embankment main compound and temporary workers accommodation

2.3.30 The Normanton embankment main compound would be used to manage civil engineering works and provide main compound support to 17 satellite compounds in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-488, D7 to E6).

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

2.3.32 This compound would provide temporary workers accommodation for 50 workers including welfare facilities and parking.

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

- Normanton viaduct, which would take two years and nine months to complete; and
- Newland with Woodhouse Moor Footpath 6 accommodation overbridge, which would take one year to complete.

2.3.34 The compound would be used to manage the construction of Normanton embankment, which would take six months to complete.

2.3.35 The works to be managed from this compound would require the permanent realignment of a private access road to Welbeck Landfill, north of its existing alignment to cross the route of the Proposed Scheme under Normanton viaduct. During construction short-term closure of the access road, over the weekend and evenings, would be required, this would be for a period of up to 3 months.

2.3.36 The works to be managed from this compound would require the temporary closure of Newland with Woodhouse Moor Footpath 6 where it crosses the route of the Proposed Scheme, with users diverted along Newland with Woodhouse Moor Bridleway 1 and Warmfield-cum-Heath Footpath 11, for a period of seven months. On completion of construction, the PRoW would be permanently realigned to cross the route of the Proposed Scheme via Newland with Woodhouse Moor Footpath 6 accommodation overbridge.

2.3.37 This compound would manage the construction of Newland Lane culvert, to prevent ponding of surface water on the east side of Normanton embankment, this would take six months to complete.

2.3.38 It is expected that a number of utilities works would be required and managed from this compound.

New Sharlston cutting satellite compound

2.3.39 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-486b, F5 to G4).

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

2.3.41 The compound would be used to manage the construction of Hell Lane overbridge, which would take one year to complete.

2.3.42 The compound would be used to manage the construction of New Sharlston cutting, which would take one year to complete.

2.3.43 The compound would be used to manage temporary material stockpile areas.

2.3.44 The works to be managed from this compound would require the temporary diversion of Hell Lane, 50m to the south of its existing alignment for a period of nine months. During this time, the Hell Lane overbridge would be constructed. On completion of construction, the road would be reinstated on its existing alignment.

2.3.45 It is expected that a number of utilities works would be required and managed from this compound.

New Sharlston embankment satellite compound

2.3.46 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-487, B4 to B5) for a period of three years and six months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation for a period of one year and three months.

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

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

- A655 Wakefield Road viaduct, which would take nine months to complete; and
- Warmfield-cum-Heath Bridleway 14 overbridge, which would take nine months to complete.

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

- New Sharlston embankment, which would take two years to complete;
- Warmfield embankment, which would take one year and three months to complete; and
- Kirkthorpe cutting, which would take one year to complete.

2.3.50 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 be accessed from A655 Wakefield Road and via site haul routes (see Volume 2: Map CT-05-486b, H5 to Map CT-05-487, B5).

2.3.51 The compound would be used to manage temporary material stockpile areas.

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

- permanent realignment of Red Lane, to the east of its existing alignment, which would take one month to complete and would be constructed offline[29];
- temporary closure of the A655 Wakefield Road, during overnight or weekend periods, with short term diversions along A645 Weeland Road (to the south) and the B6133 Common Side Lane; and
- permanent diversion of Kirkthorpe Lane, to the south of its existing alignment and west of the HS2 main line, which would take one year to complete. The diversion would be completed prior to the closure of the existing alignment.

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

- permanent closure of Warmfield-cum-Heath Bridleway 14, to the south of A655 Wakefield Road, users would be diverted via A655 Wakefield Road;
- permanent closure of Kirkthorpe Lane, with access for non-motorised users temporarily diverted along the route of the permanent Kirkthorpe Lane diversion. The diversion would be completed prior to the closure of the existing alignment. On completion of construction, access for non-motorised users would be permanently realigned via Warmfield-cum-Heath Bridleway 14 overbridge to cross the route of the HS2 main line;
- temporary diversion of Warmfield-cum-Heath Bridleway 14 via Goosehill Lane, Croft Head Lane and A655 Wakefield Road for a period of nine months. On completion of construction, the Warmfield-cum-Heath Bridleway 14 would be permanently realigned to cross the route of the HS2 main line on the Warmfield-cum-Heath Bridleway 14 overbridge; and
- temporary diversion of the Trans Pennine Trail (Bridleway), via Goosehill Lane, Croft Head Lane, the A655 Wakefield Road and the diverted Kirkthorpe Lane for a period of nine months. On completion of construction, the Trans Pennine Trail (Bridleway) would be permanently realigned to cross the HS2 main line on the Warmfield-cum-Heath Bridleway 14 overbridge.

2.3.54 The works to be managed from this compound would require the construction of Red Lane culvert, to carry an unnamed tributary of Red Beck 3 under the HS2 main line, which would take six months to complete.

2.3.55 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

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

2.3.56 Key railway systems installation works to be managed from this compound would include the Warmfield auto transformer station works which would take one year and three months to complete.

Kirkthorpe embankment satellite compound

2.3.57 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-487, F5 to G5).

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

Table 1: Demolitions to be managed from the Kirkthorpe embankment satellite compound

Description	Location	Feature resulting in the demolition
Other		
Outbuilding	East of Kirkthorpe, on track off Kirkthorpe Lane/Warmfield Lane	Kirkthorpe embankment

2.3.59 The compound would be used to manage the construction of Goosehill viaduct, which would take one year and six months to complete.

2.3.60 The compound would be used to manage the construction of Kirkthorpe embankment, which would take one year and nine months to complete.

2.3.61 The compound would be used to manage temporary material stockpile areas.

2.3.62 The works to be managed from this compound would require the construction of Marshall Hill culvert, to allow the flow of surface water through Kirkthorpe embankment and would take six months to complete.

2.3.63 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Goosehill embankment satellite compound

2.3.64 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-487, I7 to Map CT-05-488, B6).

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

2.3.66 The compound would be used to manage the construction of the Goosehill embankment, which would take one year and three months to complete.

2.3.67 A temporary batching plant would be located adjacent to this compound, Goosehill Embankment batching plant, this would provide concrete supply to the construction works across the route of the Proposed Scheme (see Volume 2: Map CT-05-487, I7 to Map CT-05-488, B8).

2.3.68 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 be accessed from A655 Wakefield Road and via site haul routes (see Volume 2: Map CT-05-487, I9 to Map CT-05-488, C7).

2.3.69 The compound would be used to manage temporary material stockpile areas.

2.3.70 The works to be managed from this compound would require the temporary diversion of Warmfield-cum-Heath Bridleway 12, with users diverted to the east of the land required for construction to join Newland with Woodhouse Bridleway 1, for a period of four years. On completion of construction, Warmfield-cum-Heath Bridleway 12 would be reinstated to its existing alignment.

2.3.71 The works to be managed from this compound would require the permanent diversion of a tributary of the River Calder 2, into a second unnamed tributary of River Calder 1, to pass under the HS2 main line.

2.3.72 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Normanton cutting satellite compound

2.3.73 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-488, I5).

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

Table 2: Demolitions to be managed from the Normanton cutting satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Farm outbuildings	Top Farm, Birkwood Road, Normanton	Normanton cutting
Other		
Pylon	South of Birkwood Road	Normanton cutting

2.3.75 The compound would be used to manage the construction of the following bridges:

- Normanton Footpath 29 overbridge, which would take nine months to complete; and
- Birkwood Road overbridge, which would take one year to complete.

2.3.76 The compound would be used to manage the construction of Normanton cutting, which would take three years to complete.

2.3.77 The compound would be used to manage temporary material stockpile areas.

2.3.78 The works to be managed from this compound would require the permanent realignment of Birkwood Road immediately to the south of its current alignment, which would take six months to complete and would be constructed offline.

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

- temporary closure of Normanton Footpath 29, with users diverted via Normanton Bridleway 2, Newland with Woodhouse Moor Bridleway 1 and Warmfield-cum-Heath Footpath 11 for a period of one year. On completion of construction, Normanton Footpath 29 would be permanently realigned to cross the route of the HS2 main line on Normanton Footpath 29 overbridge;
- permanent closure of Newland with Woodhouse Moor Footpath 5, where it joins Normanton Footpath 29, with users to be temporarily diverted south via Warmfield-cum-Heath Footpath 11, Newland with Woodhouse Moor Bridleway 1 and Normanton Bridleway 2 for a period of 10 months. On completion of construction, users would be permanently diverted via Normanton Footpath 29, to cross the route of the HS2 main line via Normanton Footpath 29 overbridge; and
- permanent diversion of Normanton Bridleway 2 for to the east of its current alignment. The construction of the diversion would be completed offline.

2.3.80 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

River Calder embankment satellite compound

2.3.81 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-489, E5 to F6).

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

2.3.83 The compound would be used to manage the construction of the River Calder viaduct, which would take two years and six months to complete.

2.3.84 The compound would be used to manage the construction of the River Calder embankment, which would take nine months to complete.

2.3.85 The compound would be used to manage temporary material stockpile areas.

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

- temporary diversion of Normanton Footpath 1 to the west of the land required for construction, for a period of four years. On completion of construction, there would be a permanent diversion of Normanton Footpath 1 south-west of its current alignment, to join Birkwood Road;
- temporary diversion of Normanton Footpath 1 (a) to the west of the land required for construction, for a period of four years. On completion of construction, a short section of the footpath would be permanently realigned west of its current alignment;

- temporary diversion of Normanton Footpath 1 (b) to the west of the land required for construction, for a period of four years. On completion of construction, a short section of the footpath would be permanently realigned west of its current alignment; and
- Aire and Calder Navigation (waterway and towpath) would remain open on its existing alignment with short term closures during the construction of the River Calder viaduct.

2.3.87 The works to be managed from this compound would require a permanent diversion of a tributary of River Calder 3, to pass under the HS2 main line.

2.3.88 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

River Calder viaduct satellite compound

2.3.89 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-490, E5 to F4), for a period of three years and six months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation for a period of two years.

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

Table 3: Demolitions to be managed from the River Calder viaduct satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Saville Park Farm, Newmarket Lane, Methley	River Calder viaduct
Commercial		
Farm outbuildings	Saville Park Farm, Newmarket Lane, Methley	River Calder viaduct
Other		
Two pylons	North of Newmarket Lane, Methley Lanes	River Calder viaduct

2.3.91 The compound would be used to manage the construction of the River Calder viaduct, which would take two years and six months to complete.

2.3.92 A temporary batching plant would be located adjacent to this compound, River Calder batching plant, this would provide concrete supply to the construction works across the Proposed Scheme (see Volume 2: Map CT-05-490, E3 to F2).

2.3.93 Standard construction techniques would be deployed where the route of the Proposed Scheme crosses the M62 at the northern end of the River Calder Viaduct. To maintain safe operation of the M62 it would be necessary to undertake the works under traffic management. The construction of the M62 crossings in this area would

be coordinated to reduce the overall duration of disruption to the M62. The traffic management would operate for a period of two years over this length of the M62. Night-time closures are also likely to be required to enable installation of the viaduct deck over the carriageways.

2.3.94 In addition, the works to be managed from this compound would require the following works to public roads:

- temporary closure of a section of Bottom Boat Road, with a diversion to the west of the construction works, for a period of three years and six months;
- temporary closure of B6135 Newmarket Lane, for overnight and weekend periods, with a diversion via the A642 Wakefield Road and A639 Methley Lane; and
- temporary closures of Hungate Lane, for set periods over three years and six months, with a diversion via B6135 Newmarket Lane.

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

- Normanton Footpath 4 would be kept open on existing alignment with short-term closures during the construction of the River Calder viaduct;
- Rothwell Footpath 39 would be kept open on existing alignment with short-term closures during the construction of the River Calder viaduct;
- Rothwell Footpath 41 would be kept open on existing alignment with short-term closures during the construction of the River Calder viaduct; and
- Trans Pennine Trail (footpath, cycleway and Bridleway) would be kept open on existing alignment with short-term closures during the construction of the River Calder viaduct.

2.3.96 This compound would manage the diversion of tributary of River Calder 4, under the southern end of the River Calder viaduct, and would take three months to complete.

2.3.97 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.98 Key railway systems installation works to be managed from this compound would include the Bottom Boat auto transformer feeder station and grid supply point works which would take two years to complete.

Scholey Hill embankment satellite compound

2.3.99 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-490, G6), for a period of two years and six months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation for a period of six months.

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

Table 4: Demolitions to be managed from the Scholey Hill embankment satellite compound

Description	Location	Feature resulting in the demolition
Other		
Two outbuildings	Adjacent to Hungate Lane, Scholey Hill	Scholey Hill embankment

2.3.101 The compound would be used to manage the construction of the Moss Carr Wood viaduct, which would take one year and nine months to complete.

2.3.102 The compound would be used to manage the construction of the Scholey Hill embankment, which would take one year to complete.

2.3.103 The compound would be used to manage temporary material stockpile areas.

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

- permanent realignment of Rothwell Footpath 38 (and the Trans Pennine Trail footpath) south of its current alignment, to pass under the River Calder Viaduct. The construction of the permanent realignment would be completed prior to the closure of the existing alignment; and
- permanent realignment of Rothwell Footpath 83 east of its current alignment. The construction of the permanent realignment would be completed prior to the closure of the existing alignment.

2.3.105 The works to be managed from this compound would require the construction of Moss Carr Wood drop inlet culvert, to carry the diverted tributary of navigation Beck 2 under Scholey Hill embankment, which would take six months to complete.

2.3.106 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.107 Key railway systems installation works to be managed from this compound would include the build-up and installation of crossovers, the works would take 6 months to complete.

River Aire embankment satellite compound

2.3.108 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-491, G5 to H3).

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

2.3.110 The compound would be used to manage the construction of the River Aire viaduct, which would take two years and six months to complete.

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

- Scholey Hill cutting, which would take one year to complete; and
- River Aire embankment, which would take six months to complete.

2.3.112 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 be accessed from A639 Methley Road and via site haul routes (see Volume 2: Map CT-05-491, E5 to G4).

2.3.113 The compound would be used to manage temporary material stockpile areas.

2.3.114 The works to be managed from this compound would require permanent diversion of Almhouses Wood Drain, along the western side of the River Aire embankment and under the River Aire viaduct.

2.3.115 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

River Aire viaduct satellite compound

2.3.116 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-492, D7 to E6).

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

2.3.118 The compound would be used to manage the construction of the River Aire viaduct, which would take two years and six months to complete.

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

- Rothwell Footpath 24, Aire and Calder Navigation (waterway and towpath) and the Trans Pennine Trail (footpath) would be kept open on existing alignment with short term closures during the construction of the River Aire viaduct; and
- Definitive Footpath Rothwell Footpath 80 would be kept open on existing alignment with short term closures during the construction of the River Aire viaduct.

2.3.120 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Swillington embankment satellite compound

2.3.121 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-493, E5).

2.3.122 The works to be managed from this compound would require demolition of the buildings and structures described in Table 5.

Table 5: Demolitions to be managed from the Swillington embankment satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Jinny Moor Lane, Swillington	Swillington embankment
Residential property	Blacksmith's Cottage, Wakefield Road, Swillington	River Aire viaduct
Other		
Outbuildings	Adjacent to the junction between the A642 Aberford Road and Jinny Moor Lane	Swillington embankment

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

- River Aire viaduct, which would take two years and six months to complete; and
- Swillington Footpath 21 underbridge, which would take nine months to complete.

2.3.124 The compound would be used to manage the construction of the Swillington embankment, which would take six months to complete.

2.3.125 The compound would be used to manage temporary material stockpile areas.

2.3.126 The works to be managed from this compound would require the temporary closure of A642 Wakefield Road/Aberford Road, for overnight or weekend periods, with users diverted via Bullerthorpe Lane and A63 Selby Road.

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

- Swillington Bridleway 25 would be kept open on existing alignment with short-term closures during the construction of the River Aire viaduct;
- permanent diversion of Swillington Footpath 21 east of existing alignment. The permanent diversion would be completed prior to the closure of the existing alignment. In addition, there would be a permanent realignment of Swillington Footpath 21, crossing the HS2 main line via the Swillington Footpath 21 underbridge. The permanent realignment would be completed prior to the closure of the existing alignment; and
- permanent diversion of Swillington Footpath 20, south of its current alignment, to join Swillington Footpath 21, crossing the route of the Proposed Scheme via the Swillington Footpath 21 underbridge. The permanent realignment would be completed prior to the closure of the existing alignment.

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

- the construction of Swillington south culvert, to prevent the ponding of surface water on the west side of the Swillington embankment, which would take six months to complete;

- the construction of Swillington central culvert, to carry the tributary of River Aire 7 under Swillington embankment, which would take six months to complete; and
- the construction of Swillington north culvert, to carry the tributary of River Aire 7 under Swillington embankment, which would take six months to complete.

2.3.129 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Swillington cutting satellite compound

2.3.130 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-494, E5 to F4), for a period of two years and nine months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation for a period of one year and three months.

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

2.3.132 The compound would be used to manage the construction of the following bridges:

- Swillington Footpath 14 overbridge, which would take nine months to complete;
- Swillington Bridleway 11 accommodation overbridge, which would take six months to complete; and
- Swillington Footpath 1 overbridge, which would take nine months to complete.

2.3.133 The compound would be used to manage the construction of the Swillington cutting, which would take one year and six months to complete.

2.3.134 A temporary batching plant would be located adjacent to this compound, Swillington cutting batching plant, this would provide concrete supply to the construction works across the Proposed Scheme (see Volume 2: Map CT-05-494, E4 to E5).

2.3.135 The compound would be used to manage temporary material stockpile areas.

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

- temporary closure of Swillington Footpath 14, with users diverted via Swillington Lane, Swillington Footpath 20 and Bullerthorpe Lane for a period of six months. On completion of construction, Swillington Footpath 14 would be permanently realigned north of its current alignment, to cross the HS2 main line on Swillington Footpath 14 overbridge;
- temporary closure of Swillington Bridleway 11, with users diverted via Swillington Lane, A63 Selby Road and Bullerthorpe Lane for a period of six months. On completion of construction, Swillington Bridleway 11 would be permanently realigned south of its current alignment, to cross the HS2 main line on Swillington Bridleway 11 overbridge; and

- temporary closure of Swillington Footpath 1, with users diverted via Swillington Lane and A63 Selby Road for a period of six months. On completion of construction, Swillington Footpath 1 would be permanently realigned north of its current alignment, to cross the HS2 main line on Swillington Footpath 1 overbridge.

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

- the construction of Parkinson's Wood south inverted siphon, to realign a tributary of the River Aire 8, to pass under the HS2 main line which would take six months to complete; and
- the construction of Parkinson's Wood north inverted siphon, to realign a tributary of the River Aire 7 to pass under the HS2 main line, which would take six months to complete.

2.3.138 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.139 Key railway systems installation works to be managed from this compound would include the Swillington auto transformer station works which would take one year and three months to complete.

West Garforth South embankment satellite compound

2.3.140 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-495a, D6 to E6).

2.3.141 The works to be managed from this compound would require demolition of the buildings and structures described in Table 6.

Table 6: Demolitions to be managed from the West Garforth South embankment satellite compound

Description	Location	Feature resulting in the demolition
Other		
Two outbuildings	North side of Selby Road, west of Swillington Common	West Garforth North embankment

2.3.142 The compound would be used to manage the construction of the A63 Selby Road viaduct, which would take one year and six months to complete.

2.3.143 The compound would be used to manage the construction of the following embankments:

- West Garforth South embankment, which would take one year and six months to complete; and
- West Garforth North embankment, which would take one year and six months to complete.

2.3.144 This compound would manage the West Garforth South embankment 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 be accessed from A63 Selby Road/Leeds Lane and via site haul routes (Volume 2: Map CT-05-495a, C5 to E4).

2.3.145 The compound would be used to manage temporary material stockpile areas.

2.3.146 The works to be managed from this compound would require the temporary closure of the A63 Selby Road, for overnight and weekend periods, during the construction of the A63 Selby Road viaduct.

2.3.147 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Clumpcliffe Covert embankment satellite compound

2.3.148 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-491-L1, H9 to I8), for a period of three years. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation for a period of one year.

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

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

- Oulton Beck viaduct, which would take one year and six months to complete; and
- A639 Methley Lane underbridge, which would take one year to complete.

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

- Clumpcliffe Covert cutting, which would take six months to complete;
- Clumpcliffe Covert embankment, which would take one year and six months to complete; and
- Oulton Beck embankment, which would take three months to complete.

2.3.152 This compound would manage the Clumpcliffe Covert embankment 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 be accessed from A639 Methley Road and via site haul routes (see Volume 2: Map CT-05-491-L1, H8 to I9).

2.3.153 The compound would be used to manage temporary material stockpile areas.

2.3.154 The works to be managed from this compound would require the permanent realignment of the A639 Methley Lane to the north of its existing alignment, which would take six months to complete and would be constructed offline.

2.3.155 The works to be managed from this compound would require the construction of Winter Wood culvert, to carry the Methley Lane Drain 1 under the Leeds spur, which would take six months to complete.

2.3.156 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.157 Key railway systems installation works to be managed from this compound would include track laying which would take one year.

Woodlesford cutting satellite compound

2.3.158 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-621, E5 to F6), for a period of five years and three months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation for a period of one year.

2.3.159 The works to be managed from this compound would require demolition of the buildings and structures described in Table 7.

Table 7: Demolitions to be managed from the Woodlesford cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Sydney Street, Woodlesford	Woodlesford tunnel southern cut and cover
Other		
Garage	Bernard Street, Woodlesford	Woodlesford tunnel southern cut and cover
Electricity Sub-station	Off Eshald Lane, Woodlesford, close to junction with Fleet Lane	Woodlesford cutting

2.3.160 The compound would be used to manage the construction of Fleet Lane overbridge, which would take one year to complete.

2.3.161 The compound would be used to manage the construction of the Woodlesford cutting, which would take one year and three months to complete.

2.3.162 The compound would be used to manage the construction of the Woodlesford tunnel (including porous portals, cut and cover sections, and bored sections), which would take four years and nine months to complete.

2.3.163 A tunnelling facility and logistics area would occupy land within the Woodlesford cutting satellite compound and be operational for five years (see Volume 2: Map CT-05-621, E5 to F6). This would provide an area for the storage of bulk materials (aggregates, structural steel and steel reinforcement) and for transfer of materials associated with the tunnelling works. The tunnel boring machine for construction of Woodlesford twin bore tunnel would be driven from this facility. This area would be managed from the Woodlesford cutting satellite compound and accessed from the Fleet Lane and the site haul route.

2.3.164 The compound would be used to manage the construction of Fleet Lane retaining wall, which would take three months to complete.

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

- permanent realignment of Fleet Lane to the south of its existing alignment, which would take six months to complete. The construction of the permanent realignment would be completed prior to the closure of the existing alignment. Access to the east of Fleet Lane would be retained for all users, including users of the football ground and Lemonroyd Marina; and
- permanent closure of Eshald Lane, either side of the Leeds spur. Users would be diverted via A642 Aberford Road.

2.3.166 The works to be managed from this compound would require the Trans Pennine Trail (footpath) to be permanently realigned, crossing the route of the Leeds spur via Fleet Lane overbridge. The construction of the permanent realignment would be completed prior to the closure of the existing alignment.

2.3.167 The works to be managed from the compound would require the diversion of the tributary of River Aire 2, to the north of Eshald Lane, which would take 3 months to complete.

2.3.168 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.169 Key railway systems installation works to be managed from this compound would include the construction and fit out of the tunnel portal building which would take one year.

Woodlesford tunnel satellite compound

2.3.170 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6 (see Volume 2: Map CT-05-622, E5 to F5).

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

2.3.172 The compound would be used to manage the construction of Woodlesford tunnel, which comprises the tunnel portal building and rescue area, southern porous portal, southern cut and cover section, twin bore tunnel, northern cut and cover section and northern porous portal, which would take four years and nine months to complete. A number of closures and possessions of the Hallam Line would be required during this period, due to the work associated with the construction of the Woodlesford tunnel.

2.3.173 The compound would be used to manage the construction of Woodlesford northern retaining wall, which would be completed during the Woodlesford tunnel construction duration.

2.3.174 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Rothwell Country Park cutting satellite compound

2.3.175 This compound would be used to manage civil engineering works in the Warmfield to Swillington and Woodlesford area, as illustrated in Figure 6. This compound consists of two units split either side of the Aire and Calder Navigation. It is also split across the boundary with the Stourton to Hunslet (LA17) area (see Volume 2: Map CT-05-623a-L1, F8 to G6).

2.3.176 The works to be managed from this compound would require demolition of the buildings and structures described in Table 8.

Table 8: Demolitions to be managed from the Rothwell Country Park cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Fishpond Lock House, Canal Side, Pottery Lane, Woodlesford	Works associated with Woodlesford tunnel and Rothwell Country Park cutting
Other		
Two outbuildings	South of Fishpond Lock House, Rothwell	Works associated with Woodlesford Tunnel and Rothwell Country Park cutting

2.3.177 The compound would be used to manage the construction of Woodlesford tunnel, which would take four years and nine months to complete.

2.3.178 The compound would be used to manage the construction of Rothwell Country Park cutting, which would take four years and one month to complete.

2.3.179 The compound would be used to manage the construction of Bullough Lane underbridge, which would take one year and nine months to complete.

2.3.180 The works to be managed from this compound would require the permanent closure of Bullough Lane to vehicular traffic with pedestrian and cyclist access maintained across the route of the Leeds spur via Bullough Lane underbridge.

2.3.181 The works to be managed from this compound would require the temporary closure of the existing Bullough Lane underbridge for non-motorised users during periods of construction, for a period of four years, with users diverted via Rothwell Country Park, Rothwell Bridleway 74, Church Street, Pottery Lane and The Locks, to join the River Aire and Calder Navigation tow path and the Trans Pennine Trail. Following the completion of construction, non-motorised users would return to existing alignment to cross the route of the Leeds spur via Bullough Lane underbridge.

2.3.182 The works to be managed from this compound would require the retention and modification of an existing culverted surface watercourse, to pass beneath the route of the Leeds spur, via the shared crossing with Bullough Lane underbridge, which would take three months to complete.

2.3.183 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

M1 Crossing satellite compound

2.3.184 This satellite compound would be located within Stourton to Hunslet (LA17) area (see Map CT-05-623a, G2 to H3). It is described in Volume 2 Community Area report, Stourton to Hunslet (LA17). The compound would be used to manage key railway systems works that include Bullough Lane auto transformer station works within the Warmfield to Swillington and Woodlesford area, for a period of two years.

West Garforth cutting north main compound

2.3.185 This main compound (see Map CT-05-495b, I3 to Map CT-05-496, C5) would be located within the Garforth and Church Fenton (LA16) area. It is described in Volume 2: Community Area report, LA16: Garforth and Church Fenton. The compound would be used to manage the permanent realignment of The Beck, to pass under the HS2 main line, via Carr Wood South culvert, which would take six months to complete.

Construction waste and material resources

2.3.186 Excavated material (defined as excluding topsoil and subsoil) generated across the route of 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.

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

2.3.188 Local excess or shortfall of excavated material within the Warmfield to Swillington and Woodlesford area would be managed through the integrated 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.

2.3.189 Forecasts of the amount of waste generated at temporary worker accommodation sites will be reported in the formal ES.

Commissioning of the railway

2.3.190 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

2.3.191 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 8. Construction durations referred to in the following sections of this report are based on this indicative programme.

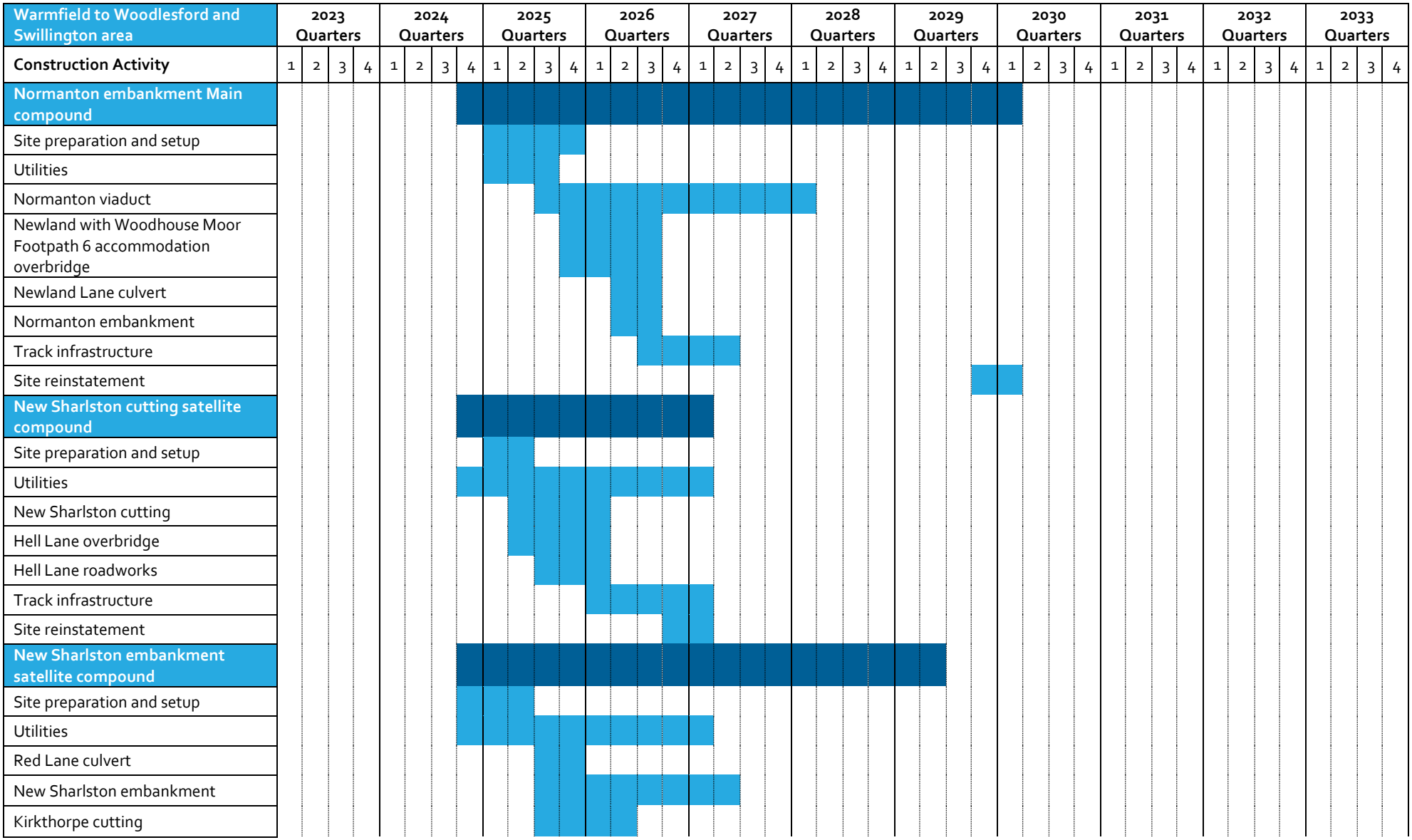
Monitoring during construction

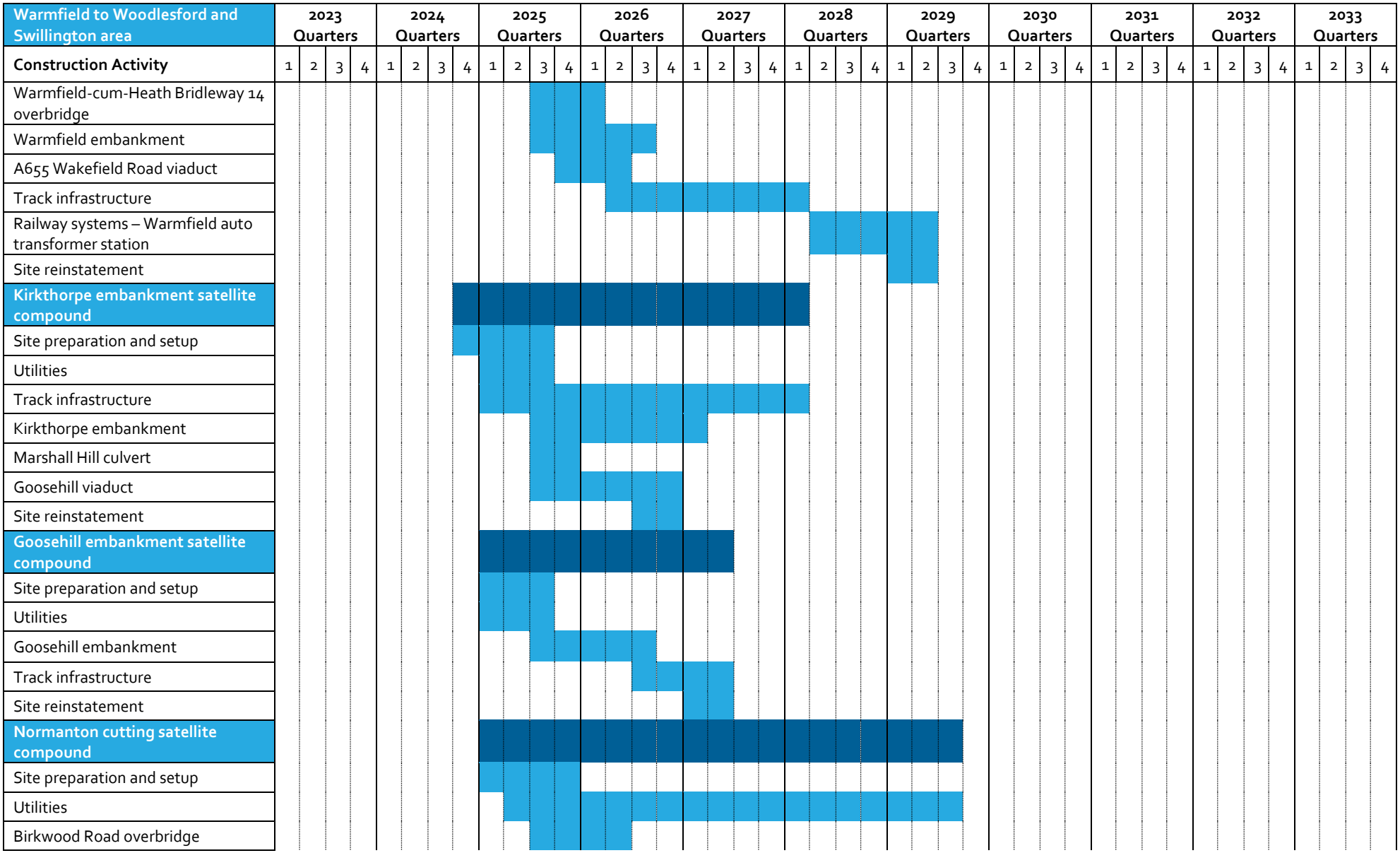
2.3.192 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be

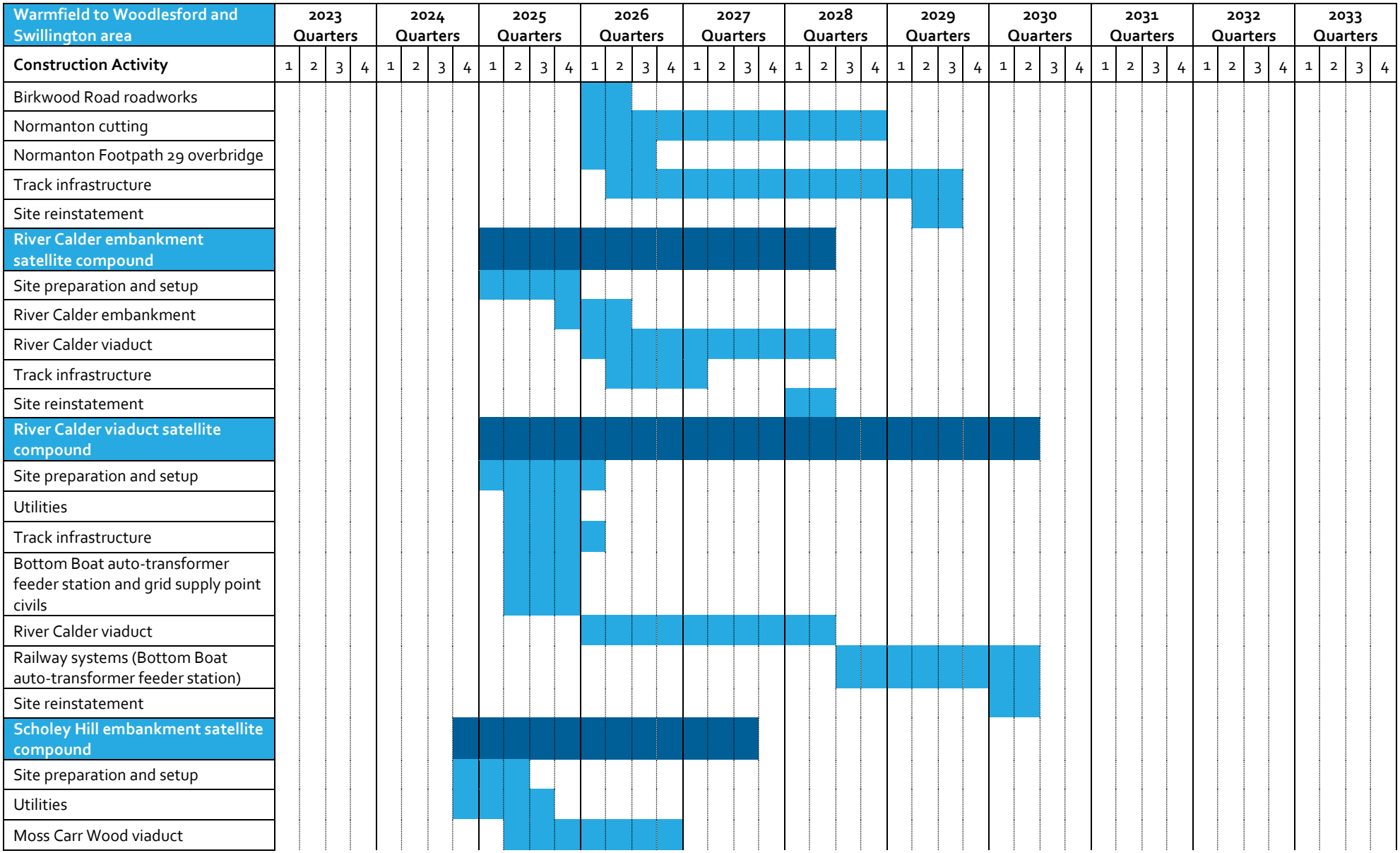
necessary for compliance would be reported to the nominated undertaker and remedial action identified.

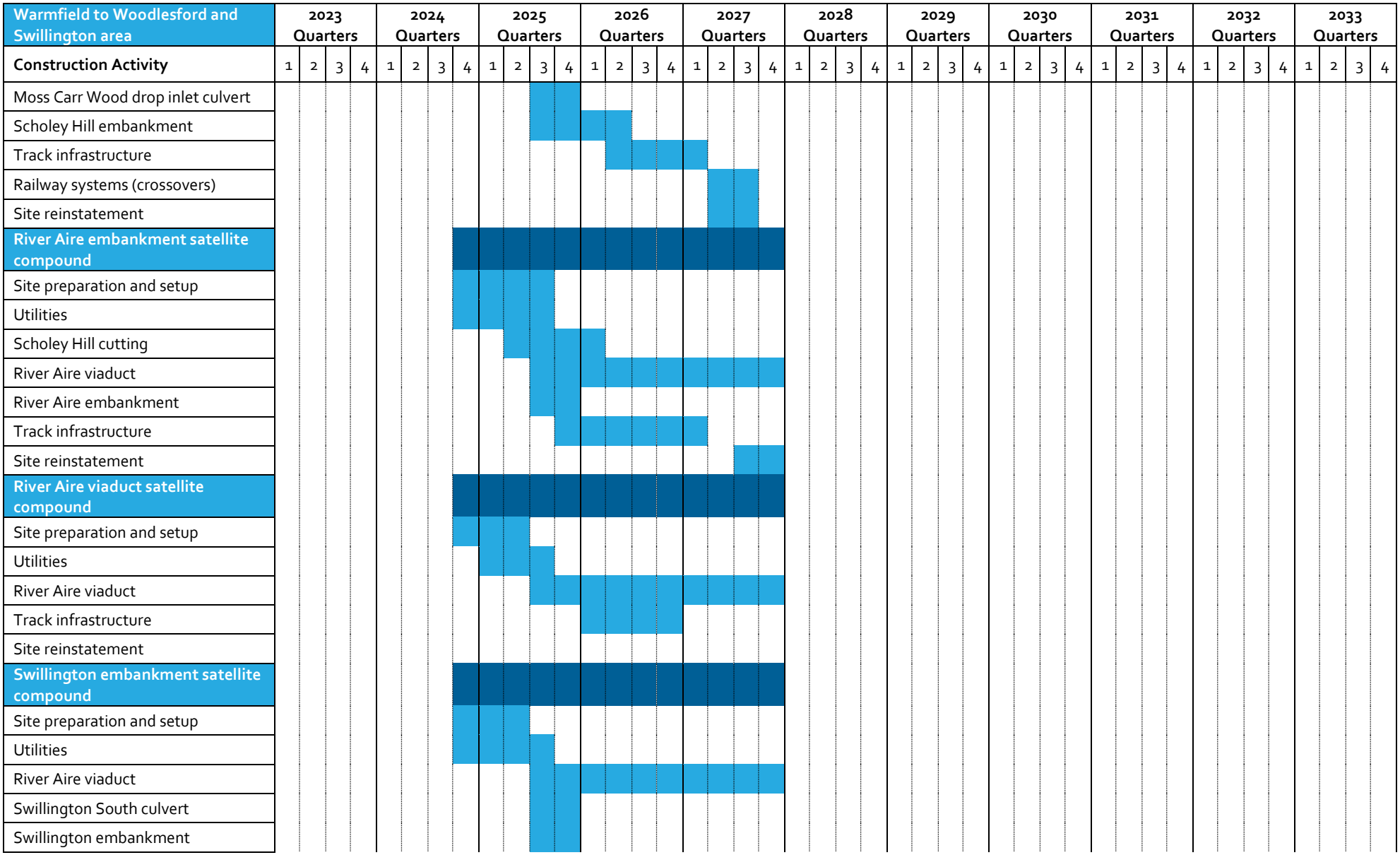
2.3.193 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on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

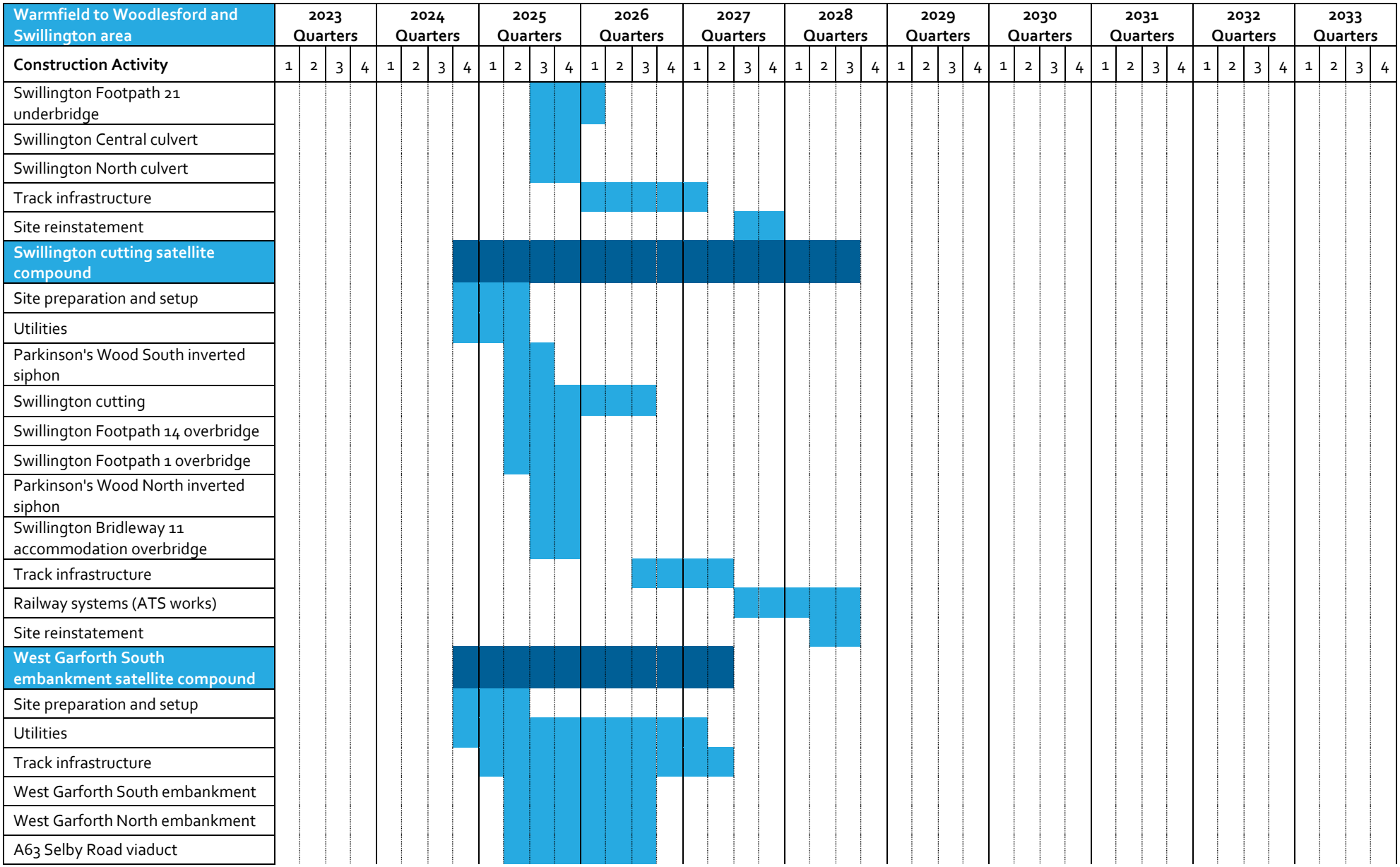
Figure 8: Indicative construction programme between 2023 and 2033

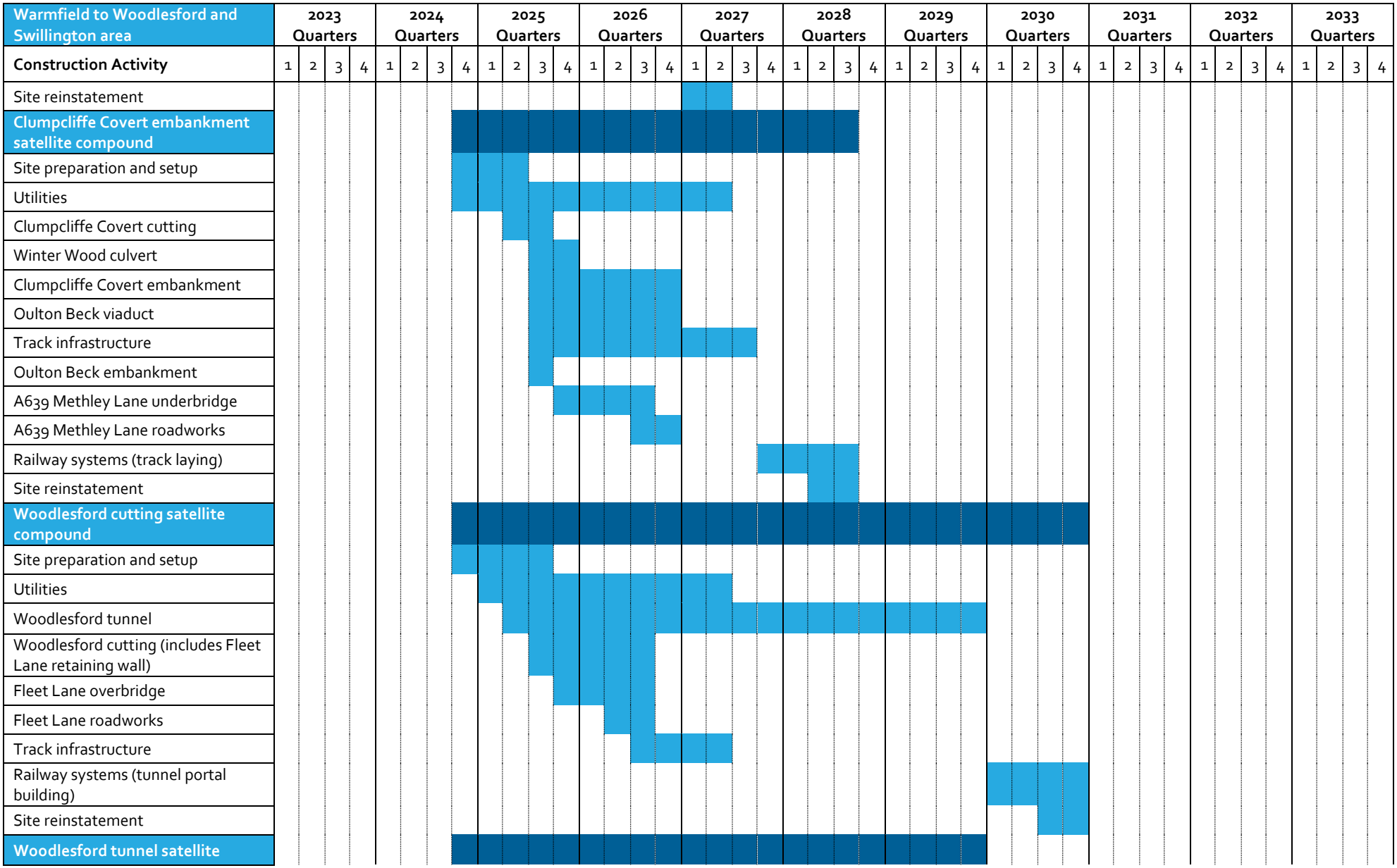


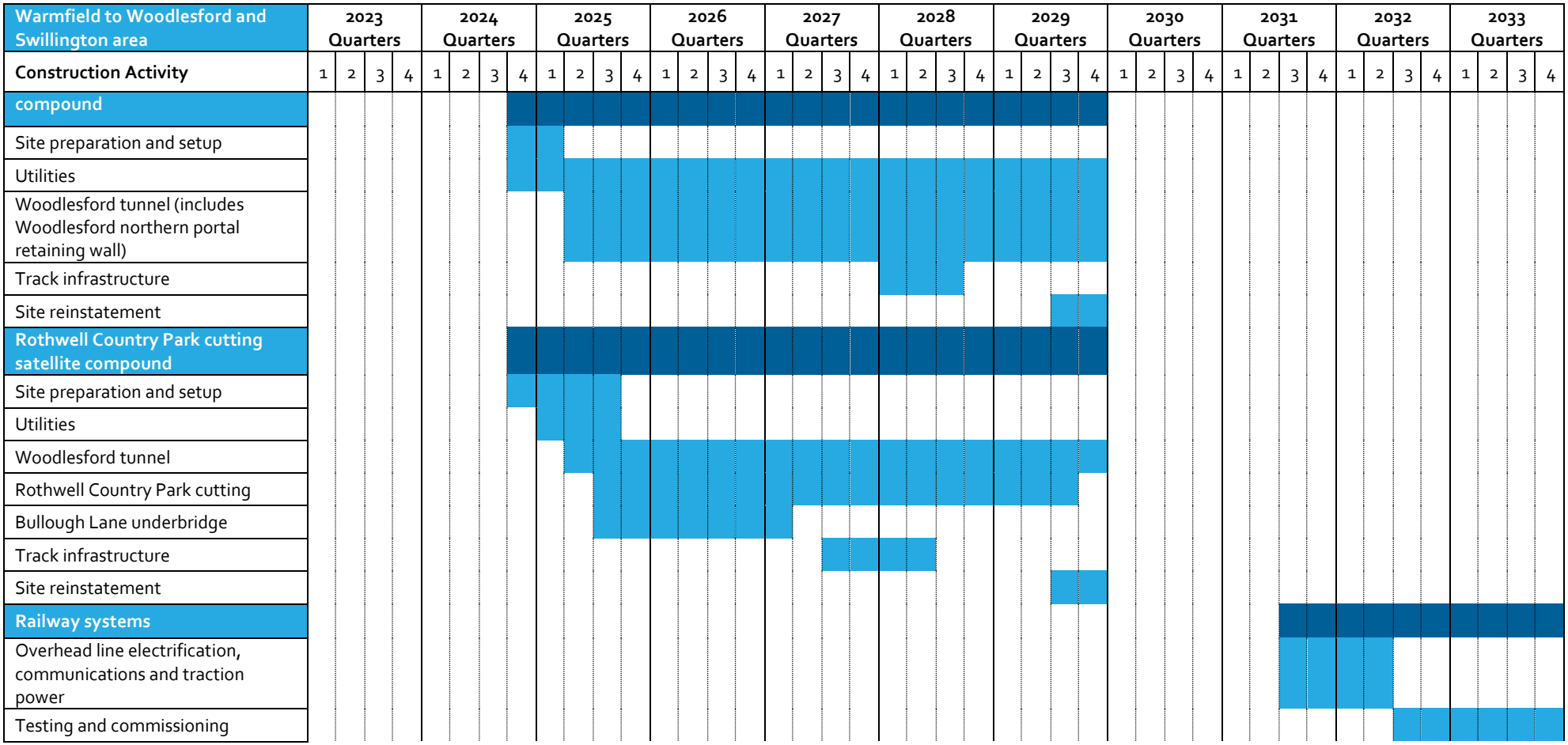

Warmfield to Woodlesford and Swillington area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
Warmfield-cum-Heath Bridleway 14 overbridge
Warmfield embankment
A655 Wakefield Road viaduct
Track infrastructure
Railway systems – Warmfield auto transformer station
Site reinstatement
Kirkthorpe embankment satellite compound
Site preparation and setup
Utilities
Track infrastructure
Kirkthorpe embankment
Marshall Hill culvert
Goosehill viaduct
Site reinstatement
Goosehill embankment satellite compound
Site preparation and setup
Utilities
Goosehill embankment
Track infrastructure
Site reinstatement
Normanton cutting satellite compound
Site preparation and setup
Utilities
Birkwood Road overbridge


Warmfield to Woodlesford and Swillington area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
Birkwood Road roadworks
Normanton cutting
Normanton Footpath 29 overbridge
Track infrastructure
Site reinstatement
River Calder embankment satellite compound
Site preparation and setup
River Calder embankment
River Calder viaduct
Track infrastructure
Site reinstatement
River Calder viaduct satellite compound
Site preparation and setup
Utilities
Track infrastructure
Bottom Boat auto-transformer feeder station and grid supply point civils
River Calder viaduct
Railway systems (Bottom Boat auto-transformer feeder station)
Site reinstatement
Scholey Hill embankment satellite compound
Site preparation and setup
Utilities
Moss Carr Wood viaduct


Warmfield to Woodlesford and Swillington area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
Moss Carr Wood drop inlet culvert
Scholey Hill embankment
Track infrastructure
Railway systems (crossovers)
Site reinstatement
River Aire embankment satellite compound
Site preparation and setup
Utilities
Scholey Hill cutting
River Aire viaduct
River Aire embankment
Track infrastructure
Site reinstatement
River Aire viaduct satellite compound
Site preparation and setup
Utilities
River Aire viaduct
Track infrastructure
Site reinstatement
Swillington embankment satellite compound
Site preparation and setup
Utilities
River Aire viaduct
Swillington South culvert
Swillington embankment


Warmfield to Woodlesford and Swillington area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
Swillington Footpath 21 underbridge
Swillington Central culvert
Swillington North culvert
Track infrastructure
Site reinstatement
Swillington cutting satellite compound
Site preparation and setup
Utilities
Parkinson's Wood South inverted siphon
Swillington cutting
Swillington Footpath 14 overbridge
Swillington Footpath 1 overbridge
Parkinson's Wood North inverted siphon
Swillington Bridleway 11 accommodation overbridge
Track infrastructure
Railway systems (ATS works)
Site reinstatement
West Garforth South embankment satellite compound
Site preparation and setup
Utilities
Track infrastructure
West Garforth South embankment
West Garforth North embankment
A63 Selby Road viaduct


Warmfield to Woodlesford and Swillington area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
Site reinstatement
Clumpcliffe Covert embankment satellite compound
Site preparation and setup
Utilities
Clumpcliffe Covert cutting
Winter Wood culvert
Clumpcliffe Covert embankment
Oulton Beck viaduct
Track infrastructure
Oulton Beck embankment
A639 Methley Lane underbridge
A639 Methley Lane roadworks
Railway systems (track laying)
Site reinstatement
Woodlesford cutting satellite compound
Site preparation and setup
Utilities
Woodlesford tunnel
Woodlesford cutting (includes Fleet Lane retaining wall)
Fleet Lane overbridge
Fleet Lane roadworks
Track infrastructure
Railway systems (tunnel portal building)
Site reinstatement
Woodlesford tunnel satellite


Warmfield to Woodlesford and Swillington area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
compound
Site preparation and setup
Utilities
Woodlesford tunnel (includes Woodlesford northern portal retaining wall)
Track infrastructure
Site reinstatement
Rothwell Country Park cutting satellite compound
Site preparation and setup
Utilities
Woodlesford tunnel
Rothwell Country Park cutting
Bullough Lane underbridge
Track infrastructure
Site reinstatement
Railway systems
Overhead line electrification, communications and traction power
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 Warmfield to Swillington and Woodlesford 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 nine trains per hour each way on the HS2 main line, south of the Leeds spur passing through the Warmfield to Swillington and Woodlesford area. North of Leeds spur, it is anticipated that there would be up to four trains per hour each way on the HS2 main line. On the Leeds spur towards the Stourton to Hunslet area, it is anticipated that there would be up to five trains per hour each way. 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 infrastructure maintenance depot (IMD) in the Staveley to Aston area (LA11). Further information on the Staveley IMD can be found in Volume 2: Community area report LA11: Staveley to Aston.

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

Proposed auto-transformer feeder station and grid supply point locations

2.5.1 During the design development process since the announcement of the preferred route in July 2017, consideration has been given to the location of an auto-transformer feeder station at Bottom Boat, which would supply electrical power from the National Grid network to the Proposed Scheme. The auto-transformer feeder station would house the electrical equipment that would protect and control the power supply to the Proposed Scheme. The auto-transformer feeder station would be located at the start of a neutral section[30] along the route of the Proposed Scheme, at a location with a potential grid supply point to provide grid connection to existing electrical infrastructure.

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

- Option 1A – Bottom Boat A: the auto-transformer feeder station would be located to the east of the HS2 main line and south of the M62 and the B6135 Newmarket Lane at Methley Lanes. The grid supply point would be located on Saville Park Farm to the west of the proposed River Calder viaduct and south of the M62 and to the north of the B6135 Newmarket Lane. Access to both of these sites would be taken from the B6135 Newmarket Lane. Both the auto-transformer feeder station and the grid supply point would be located adjacent to the proposed River Calder Viaduct. The auto-transformer feeder station would provide power supply to both the HS2 main line and the Leeds spur;
- Option 1B – Bottom Boat B: the auto-transformer feeder station would be located to the west of the proposed Scholey Hill embankment and north of the M62. The grid supply point would be in the same location as for Option A. Access to the auto-transformer feeder station would be taken from Hungate Lane, and for the grid supply point from the B6135 Newmarket Lane. The auto-transformer feeder station would provide power supply to both the HS2 main line and the Leeds spur;
- Option 1C – Bottom Boat C (the Proposed Scheme): the auto-transformer feeder station and grid supply point would be located to the west of the proposed River

[30] A neutral section is an insulated section that prevents two differing electrical from touching, by introducing an electrical clearance (an earth section)

Calder viaduct, south of the M62 and north of the B6135 Newmarket Lane. Access to both of these sites would be from the B6135 Newmarket Lane. Both the auto-transformer feeder station and the grid supply point would be located adjacent to the proposed River Calder viaduct. The auto-transformer feeder station would provide power supply to both the HS2 main line and the Leeds spur;

- Option 2A – Altofts A: the auto-transformer feeder station and grid supply point would be located to the south-west and west of Altofts respectively, and to the west of the proposed Normanton embankment. The auto-transformer feeder station would be located on agricultural land east of the River Calder, adjacent to Newland Hall and close to Newland Lane. The grid supply point would be located on agricultural land adjacent, and to the south of Birkwood Road. Access to both of these sites would be from Birkwood Road;
- Option 2B – Altofts B: the auto-transformer feeder station and grid supply point would be located to the south-west of Altofts and east of the proposed Normanton embankment. The auto-transformer feeder station would be located on agricultural land to the east of the River Calder, adjacent to Newland Hall and to the north of Newland Lane. The grid supply point would be located on agricultural land adjacent to some woodland to the north of Newland Lane. Access to both of these sites would be from Birkwood Road; and
- Option 3 – Swillington: the auto-transformer feeder station and grid supply point would be located on the site of a disused landfill site north of Jinny Moor Lane and east of Bullerthorpe Lane. Both sites would be located to the west of Swillington, and the proposed Swillington embankment. Access to both of these sites would be from Bullerthorpe Lane.

2.5.3 Table 9 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 9: Consideration of local alternatives for Bottom Boat auto-transformer feeder station and grid supply point

Option	Outcome of analysis	Further action/considerations
Option 1A	Greater landscape and visual impacts on views from the Trans Pennine Trail and Leeds Country Way compared to the Proposed Scheme. No impact on non-designated and designated heritage assets as for the Proposed Scheme. Greater water resources and flood risk impacts compared to the Proposed Scheme. Similar ecology, water resources and flood risk, air quality, traffic and transport, health, socio-economic, agriculture, forestry and soils, land quality and waste and material resources impacts to the Proposed Scheme. Greater noise impacts on properties at Methley Lanes compared to the Proposed Scheme. Marginally more construction complexity compared to the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Marginally longer construction programme to the Proposed Scheme. Lower cost compared to the Proposed Scheme.	
Option 1B	Greater landscape and visual impacts on views from the Trans Pennine Trail, Leeds Country Way and Moss Carr Wood compared to the Proposed Scheme. No impact on non-designated and designated heritage assets as for the Proposed Scheme. Similar ecology and biodiversity, water resources and flood risk, air quality, sound noise and vibration, community, traffic and transport, health, socio-economic, agriculture, forestry and soils, land quality and waste and material resources impacts to the Proposed Scheme. Marginally more construction complexity compared to the Proposed Scheme. Marginally longer construction programme to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	This option will not be subject to further consideration.
Option 1C (the Proposed Scheme)	Lower landscape and visual impacts compared to alternative options. No impact on non-designated and designated heritage assets. Similar ecology and biodiversity, water resources and flood risk, air quality, sound noise and vibration, community, traffic and transport, health, socio-economic, agriculture, forestry and soils, land quality and waste and material resources impacts to alternative options. Marginally less construction complexity compared to the Proposed Scheme. Marginally shorter construction programme to the alternative options. Higher cost compared to Option 1A, but reduced cost compared to alternative options.	This is the selected option taken forward into the Proposed Scheme.
Option 2A	Greater landscape and visual impacts on the Newland Park estate and Newland Hall compared to the Proposed Scheme. Greater impacts to scheduled monuments (Newland Preceptory and Henge on Birkwood Common) and listed buildings at Newland Hall compared to the Proposed Scheme. Similar ecology and biodiversity, water resources and flood risk, air quality, sound noise and vibration, community, traffic and transport, health, socio-economic, agriculture, forestry and soils, land quality and waste and material resources impacts to the Proposed Scheme. More construction complexity to the Proposed Scheme. Longer construction programme to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
Option 2B	Greater landscape and visual impacts on the Newland Park estate and Newland Hall and longer distance views from Normanton compared to the Proposed Scheme. Greater impacts to a scheduled monument (Newland Preceptory) and listed buildings at Newland Hall compared to the Proposed Scheme. Similar ecology and biodiversity, water resources and flood risk, air quality, noise, community, traffic and transport, health, socio-economic, agriculture, forestry and soils, land quality and waste and material resources impacts to the Proposed Scheme. More construction complexity to the Proposed Scheme. Longer construction programme to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	This option will not be subject to further consideration.
Option 3	Greater landscape and visual impacts on Gamblethorpe Farm compared to the Proposed Scheme. Greater impacts to a scheduled monument near Gamblethorpe Cottage and Grade II* listed Leventhorpe Hall compared to the Proposed Scheme. Similar ecology and biodiversity, water resources and flood risk, air quality, sound noise and vibration, community, traffic and transport, health, socio-economic, agriculture, forestry and soils, land quality and waste and material resources impacts to the Proposed Scheme. More construction complexity compared to the Proposed Scheme. Longer construction programme to the Proposed Scheme. Greater cost compared to the Proposed Scheme.	This option will not be subject to further consideration.

2.5.4 Option 1C was taken forward into the Proposed Scheme. Overall, Option 1C was the preferred option because, compared to the other options, the auto-transformer station and grid supply point components would have lower landscape and visual impacts compared to alternative options. Option 1C would have no impact on scheduled monuments and listed buildings compared to Options 2A, 2B and 3. Option 1C would have higher costs than Option 1A, but fewer construction complexities and a shorter construction programme compared to alternative options.

Review of the Woodlesford tunnel southern portal location

2.5.5 During the design development process since the announcement of the route in July 2017, further consideration has been given to the location of the Woodlesford tunnel southern portal and its interaction with the historical landfill site at Armitage Quarry. The route of the Proposed Scheme would pass through the historical landfill at Armitage Quarry. This route could not be constructed without excavating large volumes of potentially hazardous material from the landfill. Design options were considered for the relocation of the Woodlesford tunnel southern portal to reduce the risks associated with disturbance and removal of landfill material.

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

- Option O: the southern portal of the bored tunnel would start in natural ground at the assumed boundary of the landfill, with the approach to the tunnel being in a 70m long cut and cover section and a 150m long porous portal. Given the potentially hazardous nature of the materials in the landfill, Option O assumes that the whole landfill would need to be excavated, dewatered and backfilled with suitable material to ensure structural stability; and
- Option 1: a horizontal shift of the southern portal of the Woodlesford tunnel towards the east by 50m to avoid the deep hazardous landfill. The portal would include the addition of a cut and cover tunnel to the southern portal to make tunnelling viable; and modification to the vertical and horizontal alignment at the northern end of the Woodlesford tunnel to provide sufficient vertical clearance for the HS2 main line below the Hallam Line.

2.5.7 Table 10 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 10: Consideration of local alternatives for the location of the Woodlesford tunnel southern portal

Option	Outcome of analysis	Further action/considerations
Option O	Greater potential for contaminated land impacts compared to the Proposed Scheme. Potential for greater construction air quality impacts due to the removal of hazardous landfill material. Greater operational noise impacts on residents in Woodlesford due to the proximity of the tunnel portal. Larger area of woodland lost at Water Haigh woodland. Water Haigh Woodland Park would be partly reinstated by backfilling of the top of the cut and cover tunnel, thus moving the open section of the route further from Woodlesford community. Potential for greater impacts to water resources compared to the Proposed Scheme as wider area would require drainage. No demolitions would be required. Greater traffic movements and higher emissions from construction vehicles required to transport hazardous waste from the landfill compared to the Proposed Scheme. Similar access impacts to marina on Fleet Lane and waste water treatment works to the Proposed Scheme. More technical and engineering complexity compared to the Proposed Scheme. Shorter construction programme compared to the Proposed Scheme. Overall higher cost compared to the Proposed Scheme due to more hazardous landfill material needing removal.	This option will not be subject to further consideration

Option	Outcome of analysis	Further action/considerations
Option 1 (the Proposed Scheme)	Lower potential for contaminated land impacts compared to Option O. Lower operational air quality and noise impacts compared to Option O. Smaller loss of woodland at Water Haigh Woodland Park and less visual impacts compared to Option O. Greater environmental impacts on mature woodland to the east of Eshald Lane, the Woodlesford Conservation Area, access on Fleet Lane and the West Riding County Football Association grounds, compared to Option O. Some construction activities may be closer to residential buildings and construction noise affect a greater number of properties, compared to Option O. Less risk of impacts to water resources as smaller area would require drainage compared to Option O. Demolition of two buildings would be required compared to none for Option O. Fewer traffic movements and lower emissions from construction vehicles required to transport waste from the landfill compared to Option O. Similar access impacts to marina on Fleet Lane and waste water treatment works compared to Option O. Less technical and engineering complexity to the Proposed Scheme. Longer construction programme compared to the Proposed Scheme. Overall cost would be lower compared to Option O due to less landfill material needing removal.	This is the selected option taken forward into the Proposed Scheme

2.5.8 Option 1 was taken forward into the Proposed Scheme. Option 1 would avoid the hazardous landfill at Armitage Quarry and overall give rise to slightly lower environmental impacts. Option 1 would also cost less than Option O. Option 1 would also result in less hazardous waste material being excavated from the landfill with reductions in associated environmental issues such as landfill gas and leachate, litter, odour and air quality. The demolition of two properties would be required to construct the Proposed Scheme. However, the options will be revisited when the exact boundary of the landfill site has been determined from detailed ground investigations.

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 Whilst 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 11.

Table 11: Mechanisms and timeline of stakeholder engagement since route announcement

Engagement activity	Dates
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

Engagement activity	Dates
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 to December 2018. A parallel consultation on the working draft 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 Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- temporary and permanent land required 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 PRoW including the Wakefield and Leeds area including cycleway and bridleways;
- temporary or permanent changes to road access including Fleet Lane and Warmfield Lane/Kirkthorpe Lane;

- impacts on access to local community facilities, including schools, care facilities, sports and leisure facilities and cultural facilities including in Kirkthorpe, Warmfield, Methley Lanes and Woodlesford;
- impacts to local businesses;
- potential impacts on the usage of community facilities and heritage assets, including Water Haigh Park, Newland Hall, and Clumpcliffe;
- potential impacts on ecology and biodiversity and opportunities for environmental mitigation including at St Aidan's Nature Reserve, Swillington Ings, Moss Carr Wood and the Aire and Calder Navigation;
- tunnelling activities including noise, vibration and historical coal mining in the area of Woodlesford; and
- consideration of mining and geotechnical factors within design development including in Woodlesford and Swillington.

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 Warmfield to Swillington and Woodlesford area include a range of local interest groups, local facility and service providers, schools and educational establishments. Engagement on the Proposed Scheme has been undertaken with West Riding County Football Association; Rothwell Tenants and Residents Association; Leeds Local Access Forum (LLAF); Leeds Ramblers; Leeds Cycling Campaign; LLAF Equestrian representatives; Swillington, Oulton, Woodlesford, HS2 Action Together (SOWHAT) Action Group; and Oulton and Woodlesford Neighbourhood Forum.

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, whilst 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 12 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 12: Engagement to date with communities

Stakeholder	Area of focus
Alec Shelbrooke, MP for Elmet and Rothwell	Meeting with MP for Elmet and Rothwell to discuss HS2 Ltd's information events programme and feedback, Northern Powerhouse Rail, and construction and logistics.
Wakefield District Biodiversity Group	Meeting to discuss ecological data and reporting impacts on biodiversity in the area.
Wakefield District Cycling Forum	Meeting to discuss public rights of way surveys.
West Riding County Football Association	Meeting to discuss route design and impact on their property at Fleet Lane.
Rothwell Tenants and Residents Association	Meeting to discuss the Proposed Scheme, construction and logistics, and impacts around Rothwell.
Leeds Local Access Forum (LLAF)	Meeting to discuss local public rights of way and access, and the scheduling of engagement.
Leeds Ramblers	Meeting to discuss local footpaths and access, and the scheduling of engagement.
Leeds Cycling Campaign	Meeting to discuss local public rights of way and access, and the scheduling of engagement.
LLAF Equestrian representatives	Meeting to discuss local public rights of way and access, and the scheduling of engagement.
Swillington, Oulton, Woodlesford, HS2 Action Together (SOWHAT)	Monthly meetings to discuss various topics including tunnelling activities, environmental mitigation and topics, historical coal mining in the area, Community Impact Appraisal, Equality Impact Assessment and impact on local community facilities.
Oulton and Woodlesford Neighbourhood Forum	Meeting to discuss route design in relation to Neighbourhood Plan.

Local authorities and parish councils

3.4.6 Direct engagement has been undertaken with county, borough, district and parish councils within the Warmfield to Swillington and Woodlesford 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 others topics.

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 13.

Table 13: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
West Yorkshire Combined Authority	Transport Assessment scoping and autumn traffic survey, and the transport assessment modelling working group
Wakefield Metropolitan District Council	General introductory and project update meetings, including briefings to Council leaders. Discussion on the needs of the local authority, including approach to engagement with stakeholders.
	Meeting with technical leads to collate data and discuss key assessment topics including: air quality; community and equality issues; ecology; flood risk; drainage and water; historic environment; landscape and visual issues; land quality; road diversions and realignments; socio-economics; sound, noise and vibration; traffic and transport; utilities; and waste and material resources.
	In addition to the above, particular topics discussed in terms of environment include local conditions and concerns regarding heritage impact, community impact, public rights of way, and trees through the area and at Welbeck Landfill, Former Newland Hall parkland, Kirkthorpe, and Calder River Valley.
	Engagement to agree an engagement approach with parish councils.
	Seeking information related to planned and committed developments.
Leeds City Council	General introductory and project update meetings, including briefings to Council leaders. Discussion on the needs of the local authority, including approach to engagement with stakeholders.
	Meeting with technical leads to collate data and discuss key assessment topics including: air quality; community and equality issues; ecology; flood risk; drainage and water; historic environment; landscape and visual issues; land quality; road diversions and realignments; socio-economics; sound, noise and vibration; traffic and transport; utilities; and waste and material resources.
	Transport Assessment Scoping Report and Modelling.
	Seeking information related to planned and committed developments.
	Discussion on urban design and planning.
Warmfield-cum-Heath Parish Council	Engagement to understand local concerns, to discuss the design processes, and establish a schedule for focused engagement on environmental and engineering issues.
	Further discussion included construction disruption.
Swillington Parish Council	Engagement to understand local concerns, to discuss the design processes, and establish a schedule for focused engagement on environmental and engineering issues. Further discussion included construction disruption and gathering information on potential contamination of local sites.
Normanton Town Council	Engagement to understand local concerns, to discuss the design processes, and establish a schedule for focused engagement on environmental and engineering issues.
	Further discussions included: local conditions and concerns regarding community impact and benefits; gathering information on community facilities in the area; gathering information on historical coal mining in the area and potential contamination of local sites; and heritage impact.

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)[31].

[31] Supporting document: Draft Code of Construction Practice

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;
- Biological Records Centre;
- British Geological Survey;
- Canal & River Trust;
- Coal Authority;
- The Country Land and Business Association;
- Department for Environment, Food and Rural Affairs;
- emergency services;
- English Heritage;
- Environment Agency;
- Equality and Human Rights Commission;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Homes England;
- Inland Waterways Association;
- Leeds City Region Local Enterprise Partnership;
- Leeds South and East Clinical Commissioning Group;
- National Farmers' Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- The Ramblers;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;

- Royal Society of Wildlife Trusts;
- Trans Pennine Trail;
- utility companies relevant to this area;
- Wakefield Clinical Commissioning Group;
- West Yorkshire Archaeology Advisory Services;
- West Yorkshire Health Protection team;
- West Yorkshire Bat Group;
- Yorkshire Wildlife Trust; and
- Woodland 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 BT Openreach; CityFibre; Level 3; National Grid; Northern Gas Networks; Northern Powergrid; Virgin Media; and Yorkshire Water to establish what infrastructure exists in the Warmfield to Swillington and Woodlesford area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals and major asset owners

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Warmfield to Swillington and Woodlesford 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 16 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 Warmfield to Swillington and Woodlesford area, information events were held at The Oulton Institute on 4 July 2018 and Normanton Golf Club on 11 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 Engagement has been undertaken with Yorkcourt Properties, Swillington Organic Farm and Harworth Estates.

3.4.20 HS2 Ltd is continuing to engage with directly affected individuals and major asset owners 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 Warmfield to Swillington and Woodlesford 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[32].

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: LA15 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)[33].

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)[34] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land.

[32] 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
[33] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[34] 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.*

Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of 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 on this feature have been calculated quantitatively in terms of the physical extent of commercial 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 Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford area is provided in Section 10, Land quality and Section 15, Water resources and flood risk. The underlying geology of the study area is mapped by the British Geological Survey (BGS)[35]. Within two broad valleys, between Stanley and Methley Junction, and between Mickletown and Woodlesford, superficial deposits of alluvium are associated with the Rivers Calder and Aire, and with Oulton Beck. These deposits may comprise clay, silt, sand and gravel. River Terrace Deposits of sand and gravel are mapped across the valley footslopes.

4.3.3 A small isolated pocket of peat is mapped within a wooded area to the south of the Aire and Calder Navigation.

4.3.4 Superficial deposits of glaciofluvial sand and gravel are mapped across the higher ground in the proximity of Clumpcliffe Covert.

4.3.5 The bedrock geology in this study area is broadly of Carboniferous-age interbedded grey mudstone, siltstone and pale grey sandstone, predominantly of the Pennine Middle Coal Measures Formation. Coal seams are common in this formation. Interspersed within the bedrock is a variant of the formation dominated by sandstone, and includes Ackton Rock, Woolley Edge Rock, Oaks Rock and Thornhill Rock.

4.3.6 In the north of the study area is an outcrop of the Pennine Lower Coal Measures Formation, which also includes greyish mudstone, siltstone and sandstone, and is distinguished from the Pennine Middle Coal Measures by more numerous and thicker coal seams. A sandstone-dominant variant of the Pennine Lower Coal Measures Formation is mapped to the north of Swillington.

Topography and drainage

4.3.7 The main topographical features in the study area are the broad valleys of the River Calder and the River Aire.

4.3.8 The land undulates on the valley sides, comprising moderate gradients of up to 7 degrees with shallower gradients along the floodplains of the river corridors. Ground levels range between 15m above Ordnance Datum (AOD) (at the River Calder) and 90m AOD (near Swillington Common). Ground levels in the southern part of the Warmfield to Swillington and Woodlesford area, around Altofts, are lower than in the north (50m to 55m AOD).

4.3.9 The River Calder valley is broad with shallow gradients. The south-facing valley side has shallow footslopes and gentle gradients reaching around 50m AOD at Moss Carr Wood. North of the wood, the River Aire has cut a second broad and shallow valley, also at around 15m AOD. The Oulton Beck feeds into the River Calder from the west.

[35] British Geological Survey (2017). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

4.3.10 The Environment Agency's Flood Map for Planning (rivers and sea)[36] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. Land within each of the valleys is significantly affected by flooding, classified predominantly as Flood Zone 3[37] or as flood storage areas[38].

4.3.11 To the west and north of Swillington area, the landform plateaus at 70m and 90m AOD respectively, with generally shallow to moderate and irregular slopes. A narrow valley system flows southward to the River Aire.

Description and distribution of soil types

4.3.12 The broad characteristics of the soils likely to be present in this study area are described by the Soil Survey of England and Wales[39] and their general distribution is shown on the National Soil Map[40]. Soils possessing similar characteristics are amalgamated into associations.

4.3.13 There are two known groups of soil associations in this study area. The presence of each has been confirmed in parts of the study area by published soil survey data.

4.3.14 The most prevalent group comprises poorly drained fine loamy and clayey textures of the Dale, Bardsey and Dunkeswick associations. The Dale soils are common throughout the area, while Bardsey soils are mapped in the south around Sharlston and Warmfield. Dunkeswick soils are mapped only in a small pocket to the west of Methley Lanes. This group of soil associations is characterised by either stoneless or slightly stony clay loam, clay, or sandy clay loam topsoils overlying grey clay subsoils. The subsoils of each association within this soil group are slowly permeable. Profiles of the Dale association are typically of Wetness Class[41] (WC) IV. Bardsey and Dunkeswick soils may also be of WC IV, though are also commonly better drained, of WC III.

4.3.15 The fine loamy over clayey profiles characteristic of this group have been identified in surveys undertaken by the Ministry of Agriculture, Fisheries and Food (MAFF) at Bottom Boat[42], Methley Lanes[43] and to the west of Garforth[44] between 1991 and 1996, and in other surveys undertaken in the south of the area, west of Sharlston[45].

4.3.16 The next most prevalent group of associations includes well drained coarse loamy profiles of the Rivington 1 and Wick 1 associations. The Rivington 1 association

[36] Environment Agency (2018). Flood Map for Planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[37] The Environment Agency defines Flood Zone 3 as land having a 1 in 100 or greater annual probability of river flooding, or where water has to flow or be stored in times of flood. Flood Zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.
[38] Flood storage areas recognised by the Environment Agency generally lie within the floodplain but are isolated by purpose-built walls or embankments
[39] 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.
[40] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.
[41] 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.
[42] MAFF (1992). Agricultural Land Classification; Leeds Unitary Development Plan, Junction 30 M62. Project No 51/92.
[43] ADAS (1991). Agricultural Land Classification and Statement of Physical Characteristics; Methley Lane, Methley, West Yorkshire, Proposed Opencast Extraction of Coal.
[44] ADAS (1992). Agricultural Land Classification, Barrowby Hall and Swillington Common Farms, Garforth, West Yorkshire. Proposed Golf Course Development, Job No 32/92.
[45] Signet Planning Ltd (2012). Deanfield Surface Mine Scheme Environmental Statement - Chapter 11.

develops in outcrops of sandstone within the coal measures, and is mapped to the south-east of Oulton and west of Swillington. Profiles comprise sandy loam or sandy silt loam topsoil overlying sandstone or extremely stony sandy loam.

4.3.17 The Wick 1 association is developed in the River Terrace Deposits around Methley Lanes and Oulton and includes either sandy loam or sandy silt loam topsoils, overlying sandy loam or loamy sand subsoil. Profiles of both associations are well drained, of WC I, limited slightly by droughtiness[46].

4.3.18 This group of soil associations has been identified at Sharlston, Methley Lanes and to the west of Garforth over sandstone outcrops. Profiles comprise either sandy clay loam, or sandy loam topsoils over similar or medium loamy sandy subsoils. Occasionally heavy lower subsoil horizons are present. To the west of Garforth, sandstone bedrock was found to be present within around 60cm depth in some areas. The profiles are of WC I or II.

Soil and land use interactions

Agricultural land quality

4.3.19 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.

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

4.3.21 Climate within this study area does not in itself place limitations on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[47] limitations of the land.

4.3.22 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[48] for four representative points within the study area. The data show the area to have a relatively cool and dry climate. The number of Field Capacity Days (FCDs), when the moisture deficit[49] is zero, ranges from 128 to 132 days, which is lower than average for lowland England (150 days), and generally favourable for providing opportunities for agricultural cultivations and soil handling. Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately large.

4.3.23 Site factors such as flood risk are likely to affect the agricultural land quality in much of the area within the broad river valleys, limiting land quality to Subgrade 3b. Further details on flood risk within the study area are provided in Section 15, Water resources

[46] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[47] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[48] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[49] 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.

and flood risk. There are no gradient limitations to agricultural land quality in this study area.

4.3.24 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness and soil droughtiness. 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.

4.3.25 The poorly drained fine loamy over clayey profiles of the most prevalent group of soil associations are affected mostly by wetness and workability. The profiles identified at Sharlston, Bottom Boat, Methley Lanes and to the west of Garforth, are of WC III or IV depending on the depth to the slowly permeable layer. Where the slowly permeable layer occurs within 30 to 35cm of the soil surface, profiles with fine loamy topsoils are of WC IV, and classified as Subgrade 3b under the local climatic conditions.

4.3.26 Where the slowly permeable layer occurs at depths between 40 and 70cm, the profiles are slightly better drained, of WC III. Under the climatic conditions of the study area, these profiles are limited by wetness and workability to Subgrade 3a.

4.3.27 The second most prevalent group of soil associations, comprising well or moderately well-drained and generally coarse loamy textures, may be limited by droughtiness or wetness, depending on the lower subsoil characteristics. Published survey data from the Methley Lanes and Garforth localities confirm that either medium sandy loam or medium clay loam topsoils over similar or loamy medium sand subsoils are limited by droughtiness to Grade 2. Sandstone is occasionally found at depth where profiles are of the Rivington 1 association.

4.3.28 A soil wetness limitation occurs in some profiles in the second group of soils within which subsoils are gleyed, and/or where slowly permeable layers occur at depth. These profiles are of WC II and limited slightly by wetness to Grade 2.

4.3.29 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 study area, set as a 4km corridor centred on the route of the Proposed Scheme, and with reference to Department for Environment, Food and Rural Affairs (Defra) predictive mapping[50]. This 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.

4.3.30 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.

[50] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

Other soil interactions

4.3.31 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[51] and the Government's White Paper, The Natural Choice: securing the value of nature[52], 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.

4.3.32 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.

4.3.33 The soil resource within ancient woodlands, such as Moss Carr Wood, also provides additional ecological habitat and carbon storage capacity.

4.3.34 The floodplains of the River Calder, the River Aire and Oulton Beck 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.

Land use

Land use description

4.3.35 Land in this study area is primarily in arable cultivation, with pockets of pasture south of the River Calder Valley, and to the west of Swillington. Arable fields are typically large and regular in shape, with much of the land being farmed remotely (i.e. having no association with nearby farm buildings). Pastoral land uses include dairy farming, small areas of beef cattle and sheep grazing, and a large number of equestrian holdings, both commercial and non-commercial, especially in the north of the study area.

[51] Defra (2009), *Soil Strategy for England.*
[52] HM Government (2011), *The Natural Choice: securing the value of nature.*

4.3.36 Woodland is concentrated in three areas: to the north-east of Kirkthorpe, to the west of Methley Lanes, and to the east of Woodlesford. The woodland north of Kirkthorpe is primarily located on the restored Welbeck Landfill, and comprises a number of newly-planted, unnamed woodlands. There are also small unnamed woods as part of the adjacent Newland Hall/ Newland Park. On the Methley Estate, to the west of Methley Lanes, there are large areas of mature woodland and also some areas of restored open cast mining planted with trees. The woodlands here include Moss Carr Wood (an ancient woodland), Almshouses Wood, Clumpcliffe Covert, Clumpcliffe Wood, Winter Wood and The Rookery, all of which are commercially managed through the rotational thinning of hardwoods. Finally, at Water Haigh Woodland Park, a site jointly managed by Yorkshire Wildlife Trust and Leeds City Council (LCC), there are a number of small blocks of woodland, which have been planted as part of a mining restoration scheme or are associated with the nearby Swillington Park Lakes/Cockpit Round.

4.3.37 A number of environmental designations influence land use within the study area. Parts of the Warmfield to Swillington and Woodlesford area are designated as a nitrate vulnerable zone, where statutory land management measures apply. These measures limit 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.

4.3.38 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.

4.3.39 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 over the next few years. The higher tier and mid-tier options in the CSS are more focussed than Environmental Stewardship. Applications for CSS funding are competitive, and the area covered by the scheme is less than that covered under 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 the scheme to more farmers and land managers. Holdings that have land entered into an agri-environment scheme are identified in Table 14 .

Number, type and size of holdings

4.3.40 Table 14 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 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.

4.3.41 Table 14 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 14: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Commonside Farm	Arable	491	Horse livery and solar panels	None	Medium
Bridgeland Grange Farm	Arable and beef cattle	330	Horse livery, clay pigeon shoot, air rifle ranges, events	ELS	Medium
Land west of A655 Wakefield Road*	Arable	12	Not known	None	Medium
Lynfold Farm	Equestrian	6	Boarding kennels	None	Medium
Land south of Warmfield Lane (west)*	Equestrian (non-commercial)	1	Not known	None	Low
Land south or Warmfield Lane (centre)*	Equestrian (non-commercial)	1	Not known	None	Low
Land south or Warmfield Lane (east)*	Equestrian (non-commercial)	2	Not known	None	Low
Land north of Warmfield Lane*	Grassland	8	Not known	None	Medium
Land east of Kirkthorpe*	Arable	3	Not known	None	Medium
Land north of Kirkthorpe*	Equestrian (non-commercial)	1	Not known	None	Low
Land west of Goosehill Lane*	Rough grassland	5	Not known	None	Low
Land west of Altofts*	Arable	50	Not known	None	Medium
Hill Top Farm	Equestrian	18	None	None	Medium
Rose Farm	Dairy	106	None	None	High

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land south of Bottom Boat*	Arable	8	Not known	None	Medium
Hazel House Farm	Arable and sheep	166	None	HLS	Medium
Moss Carr Farm	Arable	171	None	None	Medium
Home Farm (Mexborough Estate)	Arable and sheep	374	Christmas trees, buildings let, shoot	ELS/HLS	Medium
Methley Bridge Farm	Arable	189	Horse livery, farm shop, commercial lets, grain storage, shoot	None	Medium
Castle Hill Farm*	Arable and livestock	164	Rabbit breeding	ELS	Medium
Water Haigh Farm	Arable and sheep	25	Haulage company, commercial lets	None	Medium
Green End Farm*	Arable, field scale horticulture, beef cattle, sheep, pigs	1,170	Vegetable packhouse, farm shop, butchery	None	Medium
Land at Bullough Farm*	Arable	10	Not known	None	Medium
Land east of Knowsthorpe Lane*	Arable	9	Not Known	None	Medium
Swillington Organic Farm	Pigs, beef cattle, sheep, chickens	182	Farm shop, fishery, caravan storage, Christmas trees, events and forest school	OELS and HLS	High
Mount Pleasant Farm	Arable, beef cattle and alpacas	532	Horse livery, commercial lets, dog grooming and land let to Northern Powergrid for cable training	None	Medium
Land south of Wakefield Road*	Equestrian (non-commercial)	<1	Not known	None	Low
Land north of Wakefield Road*	Equestrian (non-commercial)	<1	Not known	None	Low
Land at Newsam Green*	Arable	11	Not known	None	Medium
Land at Jinny Moor Lane*	Equestrian (non-commercial)	5	Not known	None	Low
Swillington	Arable and beef	142	None	ELS	Medium

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Common Farm	cattle				
Land off Swillington Lane*	Equestrian (non-commercial)	1	Not known	None	Low
Gamblethorpe Farm	Equestrian	32	Plant and vehicle dealership, vehicle repairs	None	Medium
The Mistals livery stables*	Equestrian	5	Not known	None	Medium
Springwell Farm	Equestrian (non-commercial)	2	Vehicle dealership	None	Low
Land west of Swillington*	Rough grassland	3	Not known	None	Low
Land north of Swillington*	Equestrian (non-commercial)	3	Not known	None	Low
Land west of Swillington Lane*	Rough grassland	4	Not known	None	Low
Templethorpe Farm	Equestrian	18	Caravan storage	None	Medium
Hollingthorpe Farm*	Arable, beef cattle	62	Cattery, mobile phone mast	None	Medium
Land south of Selby Road*	Arable	6	Not known	None	Medium
Land north of Selby Road*	Equestrian (non-commercial)	1	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 draft Code of Construction Practice (CoCP)[53] 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. Where they occur, there will be special provisions for handling peat and peaty soils (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).

[53] 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:

- Newland with Woodhouse Moor Footpath 6 accommodation overbridge to mitigate severance of agricultural land at Bridgeland Grange Farm (Map CT-06-488); and
- Swillington Bridleway 11 accommodation overbridge to mitigate severance of agricultural land at Hollinthorpe Farm (Map CT-06-494).

4.4.4 The effect of severance of agricultural land for Rose Farm, Hazel House Farm, Home Farm (Mexborough Estate), Water Haigh Farm, Swillington Organic Farm and Methley Bridge Farm is also reduced by the ability of agricultural machinery to pass under the River Calder viaduct, the River Aire viaduct and the Oulton Beck viaduct.

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

4.4.6 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.

4.4.7 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 or very poorly drained land, or land with heavier textured soils (such as the Dale, Bardsey 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

4.4.8 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.

4.4.9 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

4.4.10 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 457ha of agricultural land within the Warmfield to Swillington and Woodlesford area during the construction phase, of which approximately 105ha (23%) are likely to be classified as BMV land (Grades 2 and 3a). This is a medium magnitude of impact on BMV land.

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

4.4.12 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

4.4.13 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.

4.4.14 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[54]. These principles would be followed throughout the construction period.

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

4.4.15 Clayey and seasonally waterlogged soils of the Dale, Bardsey 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.

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

Impacts on holdings

4.4.17 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.

4.4.18 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.

4.4.19 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 15 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.

4.4.20 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 15: Summary of temporary effects on holdings from construction

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Commonside Farm Medium sensitivity	Medium	Medium	Moderate adverse
Bridgeland Grange Farm Medium sensitivity	Medium	Medium	Moderate adverse
Land west of A655 Wakefield Road	High	Negligible	Major/moderate adverse

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Medium sensitivity			
Lynfold Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Land south of Warmfield Lane (west) Low sensitivity	High	Negligible	Moderate adverse
Land south or Warmfield Lane (centre) Low sensitivity	High	Negligible	Moderate adverse
Land south or Warmfield Lane (east) Low sensitivity	High	Negligible	Moderate adverse
Land north of Warmfield Lane Medium sensitivity	High	Negligible	Major/moderate adverse
Land east of Kirkthorpe Medium sensitivity	High	Negligible	Major/moderate adverse
Land north of Kirkthorpe Low sensitivity	High	Negligible	Moderate adverse
Land west of Goosehill Lane Low sensitivity	High	Negligible	Moderate adverse
Land west of Altofts Medium sensitivity	High	Medium	Major/moderate adverse
Hill Top Farm Medium sensitivity	High	Low	Major/moderate adverse
Rose Farm High sensitivity	Medium	Negligible	Major/moderate adverse
Land south of Bottom Boat Medium sensitivity	High	Negligible	Major/moderate adverse
Hazel House Farm Medium sensitivity	Low	High	Major/moderate adverse
Moss Carr Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Home Farm (Mexborough Estate)	Medium	Medium	Moderate adverse

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Medium sensitivity			
Methley Bridge Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Castle Hill Farm Medium sensitivity	Low	Negligible	Minor adverse
Water Haigh Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Green End Farm Medium sensitivity	Negligible	Negligible	Negligible
Land at Bullough Lane Medium sensitivity	Medium	Negligible	Moderate adverse
Land east of Knowsthorpe Lane Medium sensitivity	High	Negligible	Major/moderate adverse
Swillington Organic Farm High sensitivity	Negligible	High	Major adverse
Mount Pleasant Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Land south of Wakefield Road Low sensitivity	High	Negligible	Moderate adverse
Land north of Wakefield Road Low sensitivity	High	Negligible	Moderate adverse
Land at Newsam Green Medium sensitivity	High	Negligible	Major/moderate adverse
Land at Jinny Moor Lane Low sensitivity	Low	Negligible	Negligible
Swillington Common Farm Medium sensitivity	Medium	Medium	Moderate adverse
Land off Swillington Lane Low sensitivity	High	Negligible	Moderate adverse
Gamblethorpe Farm Medium sensitivity	High	Negligible	Major/moderate adverse

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
The Mistals livery stables Medium sensitivity	High	Negligible	Major/moderate adverse
Springwell Farm Low sensitivity	Low	Negligible	Negligible
Land west of Swillington Low sensitivity	High	Negligible	Moderate adverse
Land north of Swillington Low sensitivity	High	Negligible	Moderate adverse
Land west of Swillington Lane Low sensitivity	High	Negligible	Moderate adverse
Templethorpe Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Hollingthorpe Farm Medium sensitivity	High	Medium	Major/moderate adverse
Land south of Selby Road Medium sensitivity	High	Negligible	Major/moderate adverse
Land north of Selby Road Low sensitivity	High	Negligible	Moderate adverse

4.4.21 Overall, the construction of the Proposed Scheme could potentially affect 42 holdings in the Warmfield to Swillington and Woodlesford area temporarily. On the basis of information currently available, 38 could experience moderate, major/moderate or major adverse temporary effects from construction, which would be significant for each holding.

4.4.22 Swillington Organic Farm, which is a high sensitivity receptor due to the large number of farm diversification enterprises which require continued access to the surrounding land, is currently anticipated to experience a major adverse effect during construction due to the severance of the holding.

4.4.23 Seventeen farm holdings are anticipated to experience major/moderate adverse temporary effects, largely due to the proportion of land required for construction of the Proposed Scheme. Twenty holdings are anticipated to experience moderate adverse effects, mostly due to a large proportion of land required from small holdings.

4.4.24 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

4.4.25 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 331ha of agricultural land permanently within the Warmfield to Swillington and Woodlesford area, of which approximately 83ha (25%) are likely to be classified as BMV land (Grades 2 and 3a). This is a medium magnitude of impact on BMV land.

4.4.26 As BMV land in this local area is a receptor of medium sensitivity, it is currently anticipated 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

4.4.27 It is currently anticipated that areas of commercial forestry land at Moss Carr Wood, Clumpcliffe Covert, Clumpcliffe Wood and Winter Wood, as well as a number of other unnamed and recently planted woodlands planted as part of land restoration schemes would be required for the Proposed Scheme. Moss Carr Wood, Clumpcliffe Covert, Clumpcliffe Wood and Winter Wood are managed for commercial forestry and the impacts on that resource would primarily relate to reduced timber revenues. 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

4.4.28 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 16 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.

4.4.29 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 16: 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
Commonside Farm Medium sensitivity	Low	Medium	Negligible	Moderate adverse
Bridgeland Grange Farm Medium sensitivity	Low	Low	Negligible	Minor adverse
Land west of A655 Wakefield Road Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse

Holding name/ sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential impact on farm infrastructure**	**Potential scale of effect**
Lynfold Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land south of Warmfield Lane (west) Low sensitivity	Negligible	Negligible	Negligible	Negligible
Land south of Warmfield Lane (centre) Low sensitivity	High	Negligible	High	Moderate adverse
Land south of Warmfield Lane (east) Low sensitivity	Negligible	Negligible	High	Moderate adverse
Land north of Warmfield Lane Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land east of Kirkthorpe Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land north of Kirkthorpe Low sensitivity	High	Negligible	Negligible	Moderate adverse
Land west of Goosehill Lane Low sensitivity	High	Negligible	Negligible	Moderate adverse
Land west of Altofts Medium sensitivity	High	Medium	Negligible	Major/moderate adverse
Hill Top Farm Medium sensitivity	High	Negligible	High	Major/moderate adverse
Rose Farm High sensitivity	Medium	Negligible	Negligible	Major/moderate adverse
Land south of Bottom Boat Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Hazel House Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Moss Carr Farm Medium sensitivity	Medium	Negligible	Negligible	Moderate adverse

Holding name/ sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential impact on farm infrastructure**	**Potential scale of effect**
Home Farm (Mexborough Estate) Medium sensitivity	Medium	High	Low	Major/moderate adverse
Methley Bridge Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Castle Hill Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Water Haigh Farm Medium sensitivity	Medium	Negligible	Negligible	Moderate adverse
Green End Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land at Bullough Lane Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land east of Knowsthorpe Lane Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Swillington Organic Farm High sensitivity	Negligible	Negligible	Negligible	Minor adverse
Mount Pleasant Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Land south of Wakefield Road Low sensitivity	High	Negligible	High	Moderate adverse
Land north of Wakefield Road Low sensitivity	High	Negligible	High	Moderate adverse
Land at Newsam Green Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land at Jinny Moor Lane Low sensitivity	Negligible	Negligible	Negligible	Negligible
Swillington Common Farm Medium sensitivity	Medium	Medium	Negligible	Moderate adverse
Land off Swillington	High	Negligible	Negligible	Moderate adverse

Holding name/ sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Lane Low sensitivity				
Gamblethorpe Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
The Mistals livery stables Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Springwell Farm Low sensitivity	Negligible	Negligible	Negligible	Negligible
Land west of Swillington Low sensitivity	High	Negligible	Negligible	Moderate adverse
Land north of Swillington Low sensitivity	Negligible	Negligible	Negligible	Negligible
Land west of Swillington Lane Low sensitivity	Medium	Negligible	Negligible	Minor adverse
Templethorpe Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Hollingthorpe Farm Medium sensitivity	High	Medium	Negligible	Major/moderate adverse
Land south of Selby Road Medium sensitivity	High	Negligible	High	Major/moderate adverse
Land north of Selby Road Low sensitivity	High	Negligible	High	Moderate adverse

4.4.30 Overall, the construction of the Proposed Scheme could potentially affect 42 holdings in the Warmfield to Swillington and Woodlesford area permanently. On the basis of information currently available, 27 could experience moderate or major/moderate permanent effects from construction, which would be significant for each holding.

4.4.31 Fourteen farm holdings are anticipated to experience major/moderate adverse permanent effects, largely due to the proportion of land required for construction of the Proposed Scheme. Thirteen farm holdings are currently anticipated to experience moderate permanent adverse effects.

4.4.32 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

4.4.33 Soils and their associated seed banks from the ancient woodlands would be stored separately and utilised in species translocation.

4.4.34 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.

4.4.35 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

4.4.36 Although the extent of land required permanently by ALC grade is not yet known in the Warmfield to Swillington and Woodlesford area, current indications based on publicly available information are that the effect on BMV agricultural land during construction would be moderate adverse temporarily during construction, which would be significant, and moderate adverse permanently from construction, which would be significant. The amount of land required by ALC grade will be assessed and reported in the formal ES.

4.4.37 Thirty-eight of the 42 farm holdings identified are anticipated to experience moderate, major/moderate or major adverse temporary effects during construction; with 27 anticipated to experience moderate or major/moderate adverse permanent effects of construction, which would be significant for each holding.

4.4.38 Effects on forestry land and soils to be disturbed will be reported in the formal ES.

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 Four sets of farm buildings at land south of Warmfield Lane (west), Water Haigh Farm, Gamblethorpe Farm and Hollingthorpe Farm lie within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive housed 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 Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter[55] (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 Wakefield Metropolitan District Council (WMDC) and Leeds City Council (LCC) 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 and the key construction and operational features of the Proposed Scheme can be found in the Volume 2: LA15 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)[56].

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[57]:

- from construction activities;
- 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; and
- 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

[55] 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.
[56] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[57] 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.

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 (2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from year 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 Warmfield to Swillington and Woodlesford area are emissions from road vehicles and agricultural activities. The main roads within the area are the M1, the M62, the A655 Wakefield Road, the A639 Methley Lane, the A642 Wakefield Road, and the A63 Selby Road.

5.3.2 There are four industrial installations (regulated by the Environment Agency) with permits for emissions to air, within the Warmfield to Swillington and Woodlesford area. These are Welbeck Landfill Site, Skelton Grange Landfill site, Lemonroyd Sludge Treatment Facility and Rocol House Swillington, a manufacturer of industrial lubricants. 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 Environment, Food and Rural Affairs (Defra)[58] 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 Warmfield to Swillington and Woodlesford area.

Local monitoring data

5.3.4 There are currently two local authority diffusion tube sites located within the Warmfield to Swillington and Woodlesford area for monitoring NO2 concentrations. These are located on the A655 Wakefield Road and B6135 Newmarket Lane (south of the M62). Measured concentrations in 2016 were within the NO2 air quality standard[59] at both sites.

[58] Department for Environment, Food and Rural Affairs (Defra) Defra Background Pollutant Concentration Maps. Available online at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015

[59] At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data.

Air quality management areas

5.3.5 There is one air quality management area (AQMA) within the Warmfield to Swillington and Woodlesford area, the M62 AQMA. This AQMA covers the M62 from Lofthouse to Knottingley, and was declared in March 2006 for exceedances of the annual mean NO_2 standard.

Receptors

5.3.6 Several locations in the Warmfield to Swillington and Woodlesford area have been identified 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 the construction or operation of the Proposed Scheme.

5.3.7 Most of the receptors that may be affected by the Proposed Scheme are in residential areas, including Normanton, Stanley, Oulton/Rothwell/Woodlesford and Swillington. Other receptors include educational facilities, care homes and hospitals across the area, including Pinderfields General Hospital, Waterloo Manor Hospital, and Spire Methley Park Hospital.

5.3.8 There are no statutory designated ecological sites identified within the Warmfield to Swillington and Woodlesford area. There is one non-statutory sensitive ecological site identified close to the Proposed Scheme, namely Moss Carr Wood ancient woodland. Further details of this ecological receptor 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)[60]. 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;

[60] Supporting documents: Draft Code of Construction Practice.

- 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.

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.

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 NO_2, 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[61], have been assessed for their effect on dust soiling, human health[62] and ecological sites. There are residential and ecological receptors located within the Warmfield to Swillington and Woodlesford area.

5.4.6 It has been identified that there would be a medium risk of dust effects and negligible to low risk of human health effects from demolition activities. For earthworks, there would be a medium to high risk of dust effects and a low to medium risk of human health effects. For construction, there would be a medium to high risk of dust and a low to medium risk of human health effects. For trackout, there would be a medium to high risk of dust effects and a low risk of human health effects. There would also be a low risk of ecological effects from all dust generating activities. No demolition activities would affect any ecological receptors.

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.

[61] 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.
[62] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

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 M62, the A655 Wakefield Road, the A642 Aberford Road, the A642 Wakefield Road, the A639 Methley Lane, the A63 Selby Road, the B6135 Newmarket Lane, Kirkthorpe Lane, Birkwood Road, Fleet Lane, Bullerthorpe Lane and Leeds Lane are likely to provide the primary HGV access routes for construction vehicles in this area. Hell Lane, Croft Head Lane, Warmfield Lane and Bullerthorpe Lane (south of the M1), and Swillington Lane may also be affected. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is expected on these routes. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

Permanent effects

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

Other mitigation measures

5.4.11 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

5.4.12 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 relate to 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 ecological habitats considered to be sensitive to changes in air quality. 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 Warmfield to Swillington and Woodlesford area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Wakefield Metropolitan District Council (WMDC); Leeds City Council (LCC); Normanton Town Council; Swillington, Oulton and Woodlesford HS2 Action Together (SOWHAT) Action Group; and West Riding County Football Association. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment 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: LA15 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 Volume 1, Section 8 and the Scope and Methodology Report (SMR)[63].

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 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

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

the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

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 the 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 yet to be determined. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Warmfield to Swillington and Woodlesford area would lie within the WMDC and LCC areas and consists of two main components: the HS2 main line and the Leeds spur. The HS2 main line would be approximately 13.6km in length. The Leeds spur would be approximately 4.4km in length. The HS2 main line would extend from Warmfield, in the south, passing close to the settlements of Kirkthorpe, Goosehill, Normanton, Altofts, Bottom Boat, Methley Lanes, Scholey Hill, Oulton and Woodlesford, Swillington, and Swillington Common in the north. The Leeds spur would extend north of Methley Lanes passing Oulton and Woodlesford and Rothwell in the west.

6.3.2 The Warmfield to Swillington and Woodlesford area is predominantly rural and urban fringe in nature with a few small settlements. In general, the majority of community facilities are located in the settlements of Normanton, Altofts, Oulton, Woodlesford, Rothwell and Swillington, which are partially within the study area. Kirkthorpe, Warmfield, Goosehill, Bottom Boat, Methley Lanes, Scholey Hill, Hollinthorpe and Swillington Common are villages and hamlets that are located within the study area. These settlements are predominantly residential in nature, although some provide a

small number of local services. Outside of the main settlements the area is characterised by small clusters of dwellings and individual dwellings within rural areas.

Kirkthorpe, Warmfield and Goosehill

6.3.3 This area covers the villages of Kirkthorpe, Warmfield and Goosehill. Together, these villages comprise approximately 250 residential properties.

6.3.4 In Kirkthorpe, the nearest residential properties would be located approximately 240m west of the HS2 main line. Community facilities in the village include St. Peter the Apostle Church and Kirkthorpe Post Office. Kirkthorpe Lane/ Warmfield Lane links Kirkthorpe to the village of Warmfield.

6.3.5 In Warmfield, the nearest residential properties would be located approximately 250m east of the HS2 main line. Community facilities in the village include the Plough Inn public house.

6.3.6 In Goosehill, the nearest residential properties would be located approximately 320m east of the HS2 main line.

Normanton, Altofts and surrounds

6.3.7 This area covers the town and village of Normanton, Altofts and surrounds.

6.3.8 In Normanton, the nearest residential properties would be located approximately 1.2km east of the HS2 main line. Normanton comprises approximately 9,000 residential properties. Within the study area, community facilities include Ellin's Terrace allotments.

6.3.9 In Altofts, the nearest residential properties would be located approximately 170m east of the HS2 main line. Altofts comprises approximately 2,500 residential properties. Within the study area, community facilities include: Lee Brigg Infant and Nursery School; Martin Frobisher Infant School; Altofts Junior School; Altofts Community Sports Club; the Brigg Community Hub; Patience Lane surgery; Lee Brigg allotment, Astingley allotment and Church Road allotment; the Robin Hood public house; Prospect House Care Home and Pegasus Lodge Care Home; Altofts Post Office; Altofts Methodist Church; and St. Mary Magdalene Church.

6.3.10 In the area surrounding the two settlements, there are several recreational facilities including Yorkshire Field Sports Ltd. and Birkwood Fisheries. Yorkshire Field Sports Ltd provides a range of outdoor field sport activities including fishing, clay shooting, archery, and an air rifle range. The fishing lakes (Flooded Brickworks) at Yorkshire Field Sports Ltd would be on the HS2 main line.

Bottom Boat, Methley Lanes, Scholey Hill and surrounds

6.3.11 This area covers the rural communities of Bottom Boat, Methley Lanes, Scholey Hill and surrounds. Together, these communities comprise approximately 400 residential properties.

6.3.12 In Bottom Boat, the nearest residential properties would be located approximately 750m west of the HS2 main line.

6.3.13 In the rural community of Methley Lanes, the nearest residential properties would be located approximately 25m east of the HS2 main line.

6.3.14 In the rural community of Scholey Hill, the nearest residential properties would be located approximately 600m east of the HS2 main line.

6.3.15 In the surrounding area, the Spire Methley Park Hospital is located on the A639 Methley Lane, approximately 1.8km to the north-east of Methley Lanes.

6.3.16 The Trans Pennine Trail is a promoted PRoW, which bisects Bottom Boat and Methley Lanes, running along Bottom Boat Road (Rothwell Footpath 41), the B6135 New Market Lane, and to the south of Moss Carr Wood (Rothwell Footpath 38), and would be crossed by the HS2 main line. Wakefield Way is a promoted PRoW, which runs to the west of Bottom Boat and along the Aire and Calder Navigation, and would be crossed by the HS2 main line. The Paulinus Pilgrimage and Heritage Way is a promoted PRoW, which runs to the south of Bottom Boat along Bottom Boat Road (Rothwell Footpath 41) and the B6135 New Market Lane, and would be crossed by the HS2 main line. Leeds Country Way is a promoted PRoW, which bisects Scholey Hill and runs to the south of Moss Carr Wood (Rothwell Footpath 38), and would by crossed by the HS2 main line.

6.3.17 National Route 67, part of the National Cycle Network bisects Bottom Boat and runs east to Scholey Hill, and would be crossed by the HS2 main line to the north of Bottom Boat Road.

Oulton, Woodlesford, Rothwell and surrounds

6.3.18 This area covers the towns and villages of Oulton, Woodlesford, Rothwell and surrounds.

6.3.19 Oulton and Woodlesford are two adjoining villages and the nearest residential properties would be located on the Leeds spur. Oulton and Woodlesford comprise of approximately 3,500 residential properties. Within the study area, community facilities include four public houses; Oulton Manor Care Home; Rothwell Leisure Centre; Oulton and Woodlesford Sports and Social Club; Oulton Hall Golf Club; St. John the Evangelist Church; Oulton Medical Centre; Woodlesford Bowling Club; Woodlesford Primary School; Oulton Primary School; Beechwood Dental Surgery; the Oulton Institute Village Hall; All Saint's Drive Skatepark; All Saint's Parish Hall; Woodlesford Methodist Church.

6.3.20 Water Haigh Woodland Park is a 97 hectare publically accessible park consisting of small, inter-connected broadleaved woodlands, pasture, hedgerows and wetland that has been created on the site of the former Water Haigh Colliery. The woodland contains a number of connected parts which are signposted and known locally as: Water Haigh Plantation, Fleet Bridge Wood, Swillington Bridge Wood, and Eshald Wood. The park is managed in partnership between Yorkshire Wildlife Trust and LCC. It borders St. Aiden's Nature Reserve, an RSPB Reserve, which would be located approximately 250m to the east of the route of HS2 main line. Oulton Brickworks allotment is located to the north of Water Haigh Woodland Park and accessed directly from Sydney Street.

6.3.21 Located along Fleet Lane to the east of Oulton and Woodlesford is Rothwell Juniors Football Club, West Riding County Football Association and Lemonroyd Marina. St. Bernard's Way is a promoted PRoW, which runs to the east of Oulton and Woodlesford along Fleet Lane and along the Aire and Calder Navigation (Rothwell Footpath 24), and which would be crossed by the HS2 main line and the Leeds spur. The Trans Pennine Trail is a promoted PRoW, which runs to the east of Oulton and Woodlesford along Fleet Lane and along the Aire and Calder Navigation (Rothwell Footpath 24), and would be crossed by the HS2 main line and the Leeds spur. National Route 67, part of the National Cycle Network, continues from the south and runs along the Aire and Calder Navigation (Rothwell Footpath 24), and would be crossed by the HS2 main line.

6.3.22 In Rothwell, the nearest residential properties would be located approximately 650m south-west of the Leeds spur. Rothwell comprises approximately 10,000 residential properties. Within the study area, community facilities include Rothwell Day Services; LCC Adult Social Care; Rothwell Labour Club; Rothwell Post Office; The Rose Lund Community Centre; John O'Gaunts Recreation Ground; Rothwell Town Juniors Football Club; Rothwell Haigh Road Infant School; and Haigh Ridge Avenue allotments.

6.3.23 In the surrounding area, there are two areas of open space, comprising Rothwell Country Park and Skelton Lake.

Swillington, Hollinthorpe and Swillington Common

6.3.24 This area covers the villages and hamlets of Swillington, Hollinthorpe and Swillington Common.

6.3.25 In Swillington, the nearest residential properties would be located approximately 220m west of the HS2 main line. Swillington comprises approximately 1,400 residential properties. Within the study area, community facilities include: Swillington Post Office; Swillington Health Practice; Swillington Primary School; Swillington Pre-School; Swillington Village Hall; Swillington Miners Welfare Club; Swillington Social Club; St. Mary's Church; The Pacey's Care Home; The Mistals Livery Stables; Primrose House Community Centre; and Astley Riding School.

6.3.26 Swillington Park Fishing Lakes are located south of Swillington and would be partially on the HS2 main line. Forming part of Swillington Organic Farm, this facility comprises a complex of fishing lakes originally created in the 18th century. There are five lakes stocking a variety of fish.

6.3.27 In the hamlet of Hollinthorpe, the nearest residential properties would be located 200m west of the HS2 main line. Hollinthorpe comprises eight residential properties.

6.3.28 In Swillington Common, the nearest residential properties would be located adjacent to the HS2 main line. Swillington Common comprises approximately 80 residential properties.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 As an outcome of design development, Fleet Lane retaining wall would be installed adjacent to the Woodlesford tunnel southern portal in order to reduce the land required which is within the control of West Riding County Football Association.

6.4.2 The draft Code of Construction Practice (CoCP)[64] 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 PRoW during construction where reasonably practicable (Section 14);
- monitoring and management of flood risk and other extreme weather events, where reasonable practicable, which may affect community resource 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).

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.3 As part of the construction of the Birkwood Road overbridge, it would be necessary to carry out works that fall within the boundaries of four residential properties located on Birkwood Road in Altofts. An area of garden space from one of the properties would be temporarily lost for a period of one year and three months. An area of garden space from three of the properties would be temporarily lost, in order to construct the overbridge for a period of two years. This would not impact on the ability of the residents to use their dwellings, and access would be maintained throughout construction. This is not considered to have a significant community effect.

[64] Supporting document: Draft Code of Construction Practice

6.4.4 As part of the construction of the Scholey Hill embankment, it would be necessary to carry out works which fall within the boundary of one residential property on Hungate Lane near Methley Lanes. An area of garden space would be temporarily lost. This would not impact on the ability of the residents to use their dwelling, and access would be maintained throughout construction. This is not considered to have a significant community effect.

6.4.5 As part of the construction of the Woodlesford tunnel southern cut and cover, it would be necessary to carry out works that fall within the boundary of one residential property located on Bernard Street, Woodlesford. An area of outside space consisting of a garden would be temporarily lost for a period of five years. This would not impact on the ability of the residents to use their dwelling, and access would be maintained throughout construction. This is not considered to have a significant community effect.

Community facilities

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

Recreational facilities

6.4.7 The construction of the River Aire viaduct would require land from Swillington Park Fishing Lakes located to the south of Swillington. The facility would not be accessible during the construction period however access will be reinstated following construction. The nearest alternative facility is Lowther Lake in Allerton Bywater, which is located approximately 2.6km to the south-east. The temporary closure of the Swillington Park Fishing Lakes would result in a major adverse effect, which would be significant.

Open space and PRoW

6.4.8 The construction of the Woodlesford cutting satellite compound and the River Aire viaduct satellite compound would require approximately 20% of the land at Water Haigh Woodland Park. The Woodlesford Cutting satellite compound would require the closure of the part of the woodland known locally as Water Haigh Plantation for a period of six years and one month. The River Aire viaduct satellite compound would require the closure of the part of the woodland known locally as Fleet Bridge Wood for a period of three years and three months. After this time these areas of the woodland park would be reinstated and returned back to use. In total, approximately 20% of the woodland would be temporarily lost; however, access to the remainder of the woodland would be maintained during construction. This would result in a moderate adverse effect, which would be significant.

6.4.9 The construction of the Woodlesford cutting satellite compound would require approximately 10% of land from Oulton Brickworks Allotments in Woodlesford. The south-eastern corner of the allotments would be required for construction works associated with the Woodlesford Cutting satellite compound for a period of six years and one month. Access to the remaining allotments would be maintained throughout construction however the plots in the south-eastern corner would be temporarily required during construction. The nearest alternative facility is located on Albert Road

approximately 480m to the west. The temporary loss of the south-eastern corner of the allotments would result in a moderate adverse effect, which would be significant.

6.4.10 The construction of the Rothwell Country Park cutting would require land from Rothwell Country Park on Bullough Lane. The northern edge of the park (approximately 10%) would be temporarily required during construction for approximately four years and one month. Access to the remainder of the park would be maintained throughout construction and the facility would remain open. Following construction this land would be returned back to use. This would result in a minor adverse effect, which would not be significant.

6.4.11 The construction of the Rothwell Country Park cutting satellite compound would require land from part of Skelton Lake located off Knowsthorpe Lane. A small area on the western edge of the parkland surrounding the lake (less than 5%) would be required in order to provide access to the compound for a period of four years and one month. The remainder of Skelton Lake would be unaffected and access to the parkland would be maintained during construction. This would result in a minor adverse effect which would not be significant.

6.4.12 The construction of the HS2 main line would result in severance of five promoted PRoW: Wakefield Way; the Trans Pennine Trail; Paulinus Pilgrimage and Heritage Way; St. Bernard's Way; and National Route 67. Wakefield Way would be severed at the Aire and Calder Navigation by the construction of the River Calder viaduct. Paulinus Pilgrimage and Heritage Way would be severed at three locations: at Bottom Boat Road (Rothwell Footpath 41) and the B6135 New Market Lane, both due to the construction of the River Calder viaduct; and at the Aire and Calder Navigation (Rothwell Footpath 24), due to the construction of the River Aire viaduct. St. Bernard's Way would be severed at the Aire and Calder Navigation (Rothwell Footpath 24), due to the construction of the River Aire viaduct. The Trans Pennine Trail would be severed at Bottom Boat Road (Rothwell Footpath 41) and the B6135 New Market Lane, due to the construction of the River Calder viaduct, and at the Aire and Calder Navigation (Rothwell Footpath 24) due to the construction of the River Aire viaduct. National Route 67 would be severed to the north of Bottom Boat Road due to the construction of the River Calder viaduct, and also at the Aire and Calder Navigation (Rothwell Footpath 24) due to the construction of the River Calder viaduct. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Permanent effects

Residential properties

6.4.13 The construction of the River Calder viaduct would require the demolition of one residential property on Newmarket Lane in the rural community of Methley Lanes. This residential property would be permanently lost.

6.4.14 The construction of the Woodlesford tunnel southern cut and cover would require the demolition of one residential property on Sydney Street in Woodlesford and one garage associated with a residential property on Bernard Street in Woodlesford. This residential property and garage would be permanently lost.

6.4.15 The construction of the Rothwell Country Park cutting satellite compound would require the demolition of one residential property on Pottery Lane in Woodlesford. This residential property would be permanently lost.

6.4.16 The construction of the Swillington embankment satellite compound would require the demolition of one residential property on Wakefield Road near to Swillington. This residential property would be permanently lost.

6.4.17 The construction of the River Aire viaduct would require the demolition of one residential property on Jinny Moor Lane near to Swillington. This residential property would be permanently lost.

6.4.18 As part of the construction of the West Garforth north embankment, it would be necessary to carry out works that fall within the boundary of one residential property located on the A63 Selby Road. An area of outside space currently used as an access road would be permanently lost due to the embankment. A new access road would be provided into the property. The loss of this area of outside space would not impact on the ability of the residents to use their dwelling. This is not considered to have a significant community effect.

Community facilities

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

Recreational facilities

6.4.20 The construction of the Normanton viaduct would require three of the Yorkshire Field Sports Ltd fishing lakes (Flooded Brickworks) to be drained. Yorkshire Field Sports Ltd is located in the grounds of Newland Hall and offers an air rifle range, clay shooting, archery and fishing. There are five fishing ponds, three of which would be drained. Annual memberships and day and night tickets are available as well as courses offered with The Angling Trust. The other activities offered by Yorkshire Field Sports Ltd would not be impacted. The two remaining fishing ponds which are located approximately 120m and 470m away would not be impacted however these are considerably smaller in size. The nearest alternative fishing facilities that would provide a comparative alternative, would be Birkwood Fisheries, located approximately 1.4km to the north on Birkwood Road. Birkwood Fisheries has five fishing lakes with more than 100 fishing stations, as well as associated car parking. The three Yorkshire Field Sports Ltd fishing lakes would be permanently lost, resulting in a major adverse effect, which would be significant.

6.4.21 The construction of the Leeds Spur would require approximately 14,500sqm of land that falls within the boundary of Oulton and Woodlesford Sports and Social Club. A grassed and wooded area to the east of the pitches would be required for landscape planting. The loss of this area of land would not impact on the ability of the club to use its facilities and access to the pitches would be maintained. This would result in a minor adverse effect, which would not be significant.

Open space and PRoW

6.4.22 The construction of the River Aire viaduct, the Woodlesford tunnel and the Fleet Lane retaining wall would require land from Water Haigh Woodland Park. Approximately 5% of the woodland park would be permanently lost. This would result in a minor adverse effect, which would not be significant.

6.4.23 The construction of the HS2 main line and the Leeds spur would result in severance of three promoted PRoW: Trans Pennine Trail, St. Bernard's Way, and Leeds Country Way. St. Bernard's Way would be severed at Fleet Lane due to the construction of the Fleet Lane overbridge however this would provide a permanent diversion. Leeds Country Way would be severed to the south of Moss Carr Wood (Rothwell Footpath 38) due to the construction of the Scholey Hill embankment; however, a permanent diversion would be provided 300m south of its current alignment, to pass under the River Calder viaduct adjacent to the M62. Trans Pennine Trail would be severed to the south of Moss Carr Wood (Rothwell Footpath 38) due to the construction of the Scholey Hill embankment, and at two points on Fleet Lane due to the construction of the Fleet Lane overbridge. A permanent diversion would be provided to the south of Moss Carr Wood 300m south of its current alignment, to pass under the River Calder viaduct adjacent to the M62 and also via Fleet Lane overbridge. This would result in a minor adverse effect, which would not be significant.

Other mitigation measures

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

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

Summary of likely residual significant effects

6.4.26 Land required for the Proposed Scheme is likely to result in temporary residual significant effects on the following community resources:

- Swillington Park Fishing Lake to the south of Swillington;
- Water Haigh Woodland Park in Woodlesford; and
- Oulton Brickworks Allotments in Woodlesford.

6.4.27 Land required for the Proposed Scheme is likely to result in the following permanent residual significant adverse effects: loss of Yorkshire Fields Sports Ltd Fishing Lakes (Flooded Brickworks) in the grounds of Newland Hall.

Cumulative effects

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

6.4.29 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 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.

Cumulative effects

6.5.5 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.

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

Monitoring

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

6.5.8 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 Warmfield to Swillington and Woodlesford 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, the Forestry Commission, Leeds City Council (LCC), Wakefield Metropolitan District Council (WMDC), Wakefield District Biodiversity Group and Yorkshire 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: LA15 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)[65].

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.

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

7.3.2 Land required for the construction of, and adjacent to, the route of the Proposed Scheme comprises mainly agricultural land, woodland and floodplain. The topography of the area is undulating and includes watercourses and wetland habitats in the River Aire and River Calder valleys. The area is relatively well wooded.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA15 Map Book.

Designated sites

7.3.4 This section describes the ecological baseline relevant to the assessment, including designated sites, habitats and species.

7.3.5 There is one statutory designated site of international importance that is relevant to the assessment in the Warmfield to Swillington and Woodlesford area. The Humber Estuary Ramsar, Special Area of Conservation (SAC) and Special Protection Area (SPA) is a multi-designated site located 36km east of the Proposed Scheme.

7.3.6 The Humber Estuary Ramsar, SAC, and SPA covers an area of respectively 37,988ha, 36,657ha, 37,630ha. It is the largest macro-tidal estuary on the British North Sea coast and is designated for its component intertidal and coastal habitats and species. The estuary is internationally important for a number of wetland birds and other species. The land required for the Proposed Scheme in the Warmfield to Swillington and Woodlesford area is within the catchment of this site, connected by the River Aire, a tributary of the River Humber.

7.3.7 There is one nationally important Site of Special Scientific Interest (SSSI) that is relevant to the assessment in the Warmfield to Swillington and Woodlesford area. Humber Estuary SSSI, covering an area of 37,000ha is designated for its component intertidal and coastal habitats and species. The estuary is nationally important for a number of wetland birds. This SSSI is located 36km east of the land required for the Proposed Scheme within the Warmfield to Swillington and Woodlesford area. The land required for the Proposed Scheme in this area is within the Impact Risk Zone for this SSSI relevant to railway infrastructure as identified by Natural England[66].

7.3.8 There are three Local Wildlife Sites (LWS) of potential relevance to the assessment in the Warmfield to Swillington and Woodlesford 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 used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Hell Lane Railway Cutting LWS, covering an area of 18. 1ha. According to the designation citation the site, a former railway cutting, is designated for features of interest including: grassland, wetland, amphibians and ferns. The LWS contains

[66] 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.

standing water and broadleaved woodland habitats. It is partially within the land required for the Proposed Scheme;

- the former Newmarket Colliery LWS, covering an area of 33ha. The former colliery site contains a mosaic of immature restored habitat (grassland and scrub) with a mature broadleaved tree belt lining the River Calder. According to the designation citation the LWS is designated for species features of interest including: water vole, skylark, teal and warbler species. The site contains areas of standing water, scrub and broadleaved woodland habitats. This LWS is located partially within the land required for the Proposed Scheme; and
- Altofts Ings LWS, covering an area of 90ha. This LWS is located within the floodplain of the River Calder. The designation citation was not available at the time of writing. Based on aerial imagery the site appears to contain semi-mature broadleaved woodland and wetland mosaic habitats. Altofts Ings LWS is located partially within the land required for the Proposed Scheme.

7.3.9 There is one Site of Ecological or Geological Importance (SEGI) of potential relevance to the assessment in this area: Swillington Park Lakes, Cockpit Round, Garforth/ Rothwell SEGI, which is of district/borough value. According to the designation citation the SEGI is designated for its range of open water, wetland and grassland habitats. The citation also notes the presence of water vole at this site. The area known as Cockpit Round appears to contain areas of wetland, woodland and lowland fen habitats which are categorised as habitats of principal importance (HoPI)[67] . This site covers an area of 20.3ha, and is located within the land required for the Proposed Scheme.

7.3.10 There are five Leeds Nature Areas (LNA) of potential relevance to the assessment in the Warmfield to Swillington and Woodlesford area, each of which is of district/borough value. These are:

- Moss Carr Wood LNA, covers an area of 18.4ha. The designation citation was not available at the time of writing. Based on aerial imagery the site appears to contain broadleaved woodland and mixed plantation woodland habitats. Water bodies occur in the west of the Moss Carr Wood site. The boundary of the LNA incorporates Moss Carr Ancient Woodland Inventory Site (AWIS – See below for details). Moss Carr Wood LNA is located partly within the land required for the Proposed Scheme;
- Rothwell Colliery LNA (Rothwell Country Park), covering an area of 46.8ha. The designation citation was not available at the time of writing, but from publicly available sources the site appears to contain mosaic habitat of grassland, woodland, pond and scrub. The LNA is located south of the existing Hallam Line, partially within the land required for the Proposed Scheme;

[67] Section 41 (41) of the Natural Environment and Rural Communities Act 2007

- St Aidan's North-west Lake LNA, covering an area of 24ha. The designation citation was not available at the time of writing, but from available sources the site appears to contain wetland and open water and grassland habitat. The LNA is encapsulated by the boundary of St Aiden's Nature Reserve, an RSPB reserve - See Paragraph 7.3.10 for details. This site is located adjacent to (east of) the River Aire, 100m from land required for the Proposed Scheme;
- Canalside Ponds LNA, covering an area of 2.3ha. The designation citation was not available at the time of writing, but from available sources the site appears to contain woodland and pond habitat. The LNA is located adjacent (south) to the Aire and Calder Navigation, partially within the land required for the Proposed Scheme; and
- Leventhorpe Lagoon and Ings LNA, covering an area of 55.8ha, the designation citation was not available at the time of writing, but from available sources the site appears to contain wetland habitat that likely supports assemblages of wintering, passage and breeding birds. The LNA is located on the north bank of the River Aire, and is located within the land required for the Proposed Scheme.

7.3.11 There are two nature reserves of potential relevance to the assessment in the area, each of which is of district/ borough value. They are:

- Water Haigh Woodland Park, a Yorkshire Wildlife Trust reserve, covering an area of 97ha. This site is part of a corridor of green spaces in the Lower Aire Valley in Leeds which is currently managed in partnership between Yorkshire Wildlife Trust and LCC. The site comprises a matrix of interconnected pockets of semi-natural and plantation broadleaved woodland, grassland, hedgerow and wetland. Water Haigh Woodland Park is partially located within the land required for the Proposed Scheme; and
- St. Aiden's Nature Reserve, an RSPB reserve, covering an area of 257.9ha. The nature reserve is noted for its wetland habitat that supports significant assemblages of wintering, passage and breeding birds including bittern. The boundary of this nature reserve encapsulates St Aiden's North-west Lake LNA. St. Aiden's Nature Reserve is located 100m to the east of the land required for the Proposed Scheme.

7.3.12 There is one Ancient Woodland Inventory Site (AWIS) of potential relevance to the assessment in the Warmfield to Swillington and Woodlesford area. Moss Carr Wood AWIS, covering an area of 6.2ha. Information currently available for Moss Carr Wood AWIS indicates that it is a Planted Ancient Woodland Site (PAWS). The AWIS is located 240m west of the land required for the Proposed Scheme. Due to the habitats and species present, this site is considered to be of up to county/metropolitan value.

7.3.13 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

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

Woodland

7.3.15 In addition to the aforementioned designated woodland sites there are six areas of lowland deciduous woodland, likely to qualify as habitats of principal importance and local Biodiversity Action Plan (BAP)[68,69] habitats, which would be within, or partly within, the land required for the Proposed Scheme. These are:

- woodland north-east of Kirkthorpe;
- restored woodland areas around Welbeck landfill south of Newland Hall;
- Newland Hall/Newland Park woodland;
- Moss Carr Wood area (including Clumpcliffe Covert and Winter Wood);
- woodland associated with the River Aire/Aire and Calder Navigation corridor, and;
- New Covert east of the M1 near Swillington.

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

Parkland

7.3.17 Parkland habitat outside of designated sites occurs within the land required for the Proposed Scheme. Two notable areas of parkland are located at Newland Hall and in the vicinity of Moss Carr Wood LNA, respectively. These habitats are likely to qualify as habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, parkland areas are considered to be of up to district/borough value.

Grassland

7.3.18 Grasslands that are not designated that occur within the land required for the Proposed Scheme comprise two potentially diverse areas of grassland, at the former Welbeck landfill site and at Newland Hall, respectively. On a precautionary basis, these areas of grassland would qualify as a habitat of principal importance and local BAP habitat. Unless the field surveys identify these areas as being unimproved grasslands, these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.19 Many of the hedgerows in the Warmfield to Swillington and Woodlesford area are likely to qualify as a habitat of principal importance and a local BAP habitat. Some

[68] Leeds City Council, *Biodiversity Action Plan* for Leeds Available online at: https://www.leeds.gov.uk/docs/Leeds%20BAP%20combined.pdf
[69] Wakefield Metropolitan District Council (2014) *Wakefield Biodiversity Action Plan.* Available online at: http://www.wakefield.gov.uk/Documents/sports-leisure/parks-countryside/biodiversity-action-plan.pdf

may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[70]. In addition, they could also provide commuting corridors for wildlife, bird nesting opportunities and feeding habitat. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.20 The route of the Proposed Scheme would cross the River Aire and the River Calder, the Aire and Calder Navigation, Oulton Beck and several smaller unnamed watercourses. The River Aire, the River Calder and Oulton Beck may qualify as habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, these watercourses are considered to be of up to county/metropolitan value. The smaller unnamed watercourses are considered to be of up to district/borough value.

Water bodies

7.3.21 There are 26 ponds that would be located within, or partly within, the land required for the Proposed Scheme. Some ponds may qualify as habitats of principal importance[71], or local BAP[72] habitats (e.g. if they support fauna species of high conservation value such as great crested newts). On a precautionary basis, pending the findings of field surveys, these ponds have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

7.3.22 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present within land required for the Proposed Scheme. On a precautionary basis, pending the findings of field surveys, these ancient and veteran trees are considered to be of up to county/metropolitan level.

Protected and notable species

7.3.23 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 17.

[70] Her Majesty's Stationery Office (1997). Hedgerows Regulations 1997. Statutory Instrument No. 1160.
[71] Section 41 (41) of the National Environment and Rural Communities Act 2007

Table 17: Species potentially relevant to the assessment within the Warmfield to Swillington and Woodlesford area

Resource/ feature	Value	Rationale
Bats	Up to regional	A review of the Wakefield BAP and Leeds BAP indicates that nine species of bat are likely to be present in the Warmfield to Swillington and Woodlesford area: Daubenton's bat; Brandt's bat; whiskered bat; Natterer's bat; common pipistrelle; soprano pipistrelle; noctule; Leisler's bat; and brown long-eared bat. Desk study records from West Yorkshire Ecology and West Yorkshire Bat Group for the Leeds area indicate bat roost records for common pipistrelle, soprano pipistrelle and brown long-eared bat in Swillington, Oulton and Woodlesford, including maternity roosts within 100m of land required for the Proposed Scheme. There is suitable habitat for both roosting and foraging bats along the route of the Proposed Scheme. Key roosting, commuting and foraging features in the area include: River Calder; River Aire; the Aire and Calder Navigation; and Oulton Beck. In addition, mature parkland likely to provide roosting and foraging opportunities occurs at Moss Carr Wood LNA and Newland Hall. It is likely that these habitat features support significant bat populations, which could include less common/scarce species such as noctule or Leisler's bat.
Otter	Up to county/metropolitan	Otter are known to be present on the River Aire and River Calder from incidental records. The Yorkshire Wildlife Trust is implementing restoration projects on both rivers with the specific objective of improvements for otter, including artificial holt creation and wetland habitat creation. Habitat suitable for otter is present within land required for the Proposed Scheme. Key features include: River Calder, River Aire, Aire and Calder Navigation and Oulton Beck. Additional suitable wetland habitat occurs at St. Aiden's Nature Reserve, Altofts Ings and Newland Hall. No desk study records are currently available.
Water vole	Up to county/metropolitan	Habitat suitable for water vole is present within land required for the Proposed Scheme. Key features include: River Calder, River Aire, Aire and Calder Navigation and Oulton Beck. Additional suitable wetland habitat occurs at St. Aiden's Nature Reserve, Altofts Ings and Newland Hall. No desk study records are currently available.
Great crested newt	Up to county/metropolitan	Suitable aquatic and terrestrial habitats for great crested newt are present within land required for the Proposed Scheme. Positive field survey results for great crested newt have been confirmed in two ponds at Newland Hall, one of which is located within the land required for the Proposed Scheme, and the other is 80m east of it.
Birds	Up to county/metropolitan	Barn owl boxes are located adjacent to land required for the construction of Proposed Scheme and it is assumed that the surrounding farmland and floodplains provide suitable foraging habitat for this species. There are a number of wetland sites within the wider area which provide suitable habitat for a range of breeding/overwintering wading birds. There is an incidental observation of kingfisher at Hell Lane Railway Cutting LWS, within land required for the Proposed Scheme, and there are records of bittern at St. Aiden's Nature Reserve, 60m east of the land required for the Proposed Scheme. Habitat suitable for breeding/overwintering birds is present within land required for the Proposed Scheme. The route would mainly pass through farmland and woodland. These habitats commonly support populations of lapwing, barn owl, skylark, tree sparrow, yellow wagtail, linnet and yellowhammer, which breed in low numbers in farmland, and a range of typical common woodland breeding and wintering birds.
White-clawed crayfish	Up to county/metropolitan level	Habitat suitable for white-clawed crayfish is present within land required for the Proposed Scheme, including River Calder and River Aire, Oulton Beck, and other smaller watercourses. No desk study records are currently available.

Resource/ feature	Value	Rationale
Aquatic Invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates is likely to be present within land required for the Proposed Scheme, including: River Calder and River Aire; Oulton Beck; smaller watercourses; and in water bodies.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates is present within land required for the Proposed Scheme. Areas suitable for terrestrial invertebrates include: woodland and parkland habitats, sites near Moss Carr Wood/ Newland Hall, brownfield sites, habitats associated with restored former colliery land (e.g. Former Newmarket Colliery LWS), and Hell Lane Railway Cutting LWS.
Fish	Up to district/borough	The River Calder and Aire, and the Aire and Calder Navigation, along with smaller watercourses and water bodies, have suitable habitat for notable fish species including: European bullhead (listed on Annex II of the EC Habitats Directive), and brown trout. In addition, a review of the Wakefield BAP and Leeds BAP indicate that Atlantic Salmon and European eel are potentially present in the River Calder catchment.
Reptiles	Up to district/borough	There are suitable habitats for reptiles within land required for the Proposed Scheme. Areas of habitat suitable for reptiles include grassland around Newland Hall and the disused railway cutting adjacent to Warmfield Lane. Reptile surveys at Newland Hall have recorded grass snakes within the land required for the Proposed Scheme. Grass snake have also been recorded in habitats adjacent to the Hell Lane Railway Cutting LWS within the land required for the Proposed Scheme.

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: LA15 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:

- new woodland planting would contribute towards replacing for the losses of woodland and parkland (e.g. Moss Carr Wood LNA, Hell Lane Railway Cutting LWS and Newland Hall) and enhance connectivity between remaining woodlands;
- construction of the Proposed Scheme on viaducts over the River Calder, River Aire, the Aire and Calder Navigation and Oulton Beck would reduce direct effects to these watercourses and allow free passage for wildlife beneath them, including along the rivers and their banks. Similarly, the construction of the Proposed Scheme on viaducts would also reduce direct impacts on locally designated sites, such as the Former Newmarket Colliery LWS and Altofts Ings LWS located within the meander loops of the River Calder, and the Swillington Park Lakes, Cockpit Round, Garforth, and Rothwell Country Park SEGI located adjacent to the River Aire. Additionally, the construction of a viaduct at Newland Hall would avoid direct effects on wetland features such as the flooded former brickworks in this location);

- provision of new ecological ponds (ponds lost would be replaced on a minimum 1:1 basis);
- provision of some new species-rich hedgerows, using appropriate native species, to mitigate the loss of hedgerows and reconnecting the ecological network in the surrounding areas. Hedgerows would be provided along the margins of the route and in specific areas such as Newland Hall and land north-east of Altofts up to the Aire and Calder Navigation; and
- grassland habitat creation, including some species-rich grasslands, to mitigate specific grassland losses from land required for the Proposed Scheme.

7.4.2 Any such additional measures will be designed in consultation with the Environment Agency.

7.4.3 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[73], which includes translocation of protected species where appropriate.

7.4.4 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;
- implementation of 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 protected and invasive species and designated sites.

[73] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

7.4.5 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

7.4.6 The land required for the Proposed Scheme is connected to the Humber Estuary Ramsar, SAC and SPA by the River Aire, a tributary of the River Humber. This site is geographically distant, being located 36km to the east of the land required for construction of the Proposed Scheme. It is expected that this distance and the implementation of measures in the draft CoCP will ensure there are no effects to the Humber Estuary Ramsar, SAC and SPA. Having consideration to the nature of the Proposed Scheme and the distance between the construction area and the receptors, these sites have been scoped out of the Habitats Regulations Assessment process.

7.4.7 The land required for the Proposed Scheme is located within the Natural England Impact Risk Zone for Humber Estuary SSSI. However, due to the distance between the Proposed Scheme and the SSSI, and having regard to the measures in the draft CoCP to control impacts on the River Aire, there would be no significant effects.

7.4.8 Construction of the Proposed Scheme west of Kirkthorpe, between the A655 Wakefield Road and Warmfield Lane, would result in the permanent loss of 3.2ha of the Hell Lane Railway Cutting LWS (18%). In addition, the current design would lead to the draining down of existing impounded standing water present within the LWS leading to further degradation of the sites integrity. Design solutions are under consideration to mitigate for these effects. Habitat loss and indirect effects on priority habitats within the LWS would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

7.4.9 Construction of the River Calder viaduct would result in the permanent loss of 2.6ha of the Former Newmarket Colliery LWS (78% of the site) and 8ha of the Altofts Ings LWS (90% of the site). Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

7.4.10 Construction of the River Aire viaduct would result in the permanent loss of 1.4ha of the Swillington Park Lakes, Cockpit Round, Garforth, Rothwell Country Park SEGI (7% of the site). This site comprises broadleaved woodland and lowland fen habitat. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the district/borough level.

7.4.11 Construction of the Moss Carr viaduct would result in the permanent loss of 2.5ha of the Moss Carr LNA (14% of the site). Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the district/ borough level.

7.4.12 Construction of the Rothwell Country Park retaining wall and a temporary access/haul route would result in the permanent loss of 3.2ha (6.8%) of Rothwell Colliery LNA in the Warmfield to Swillington and Woodlesford area and alteration of hydrological conditions that could lead to the permanent changes in potential groundwater

dependent habitat within Rothwell Colliery LNA. In addition, this would result in the loss of 3.5ha (7.5 %) of Rothwell Colliery LNA in the Stourton to Hunslet area (reported in the Volume 2: Community area report LA17 Stourton to Hunslet). In combination this would result in a total permanent loss of 6.7ha (14.3%) of Rothwell Colliery LNA and would be a permanent adverse effect on site integrity that would be significant at the district/borough level.

7.4.13 Construction of the River Aire viaduct would result in indirect adverse effects on the breeding/ wintering bird assemblage at St. Aiden's North-west Lake LNA and notable species supported by this reserve (including bittern). On a precautionary basis, there would be a temporary adverse effect, which would be significant at the district/borough value level.

7.4.14 The construction of Woodlesford tunnel on the Leeds spur would result in the permanent loss of 1.6ha (68%) of Canalside Ponds LNA and an alteration of hydrological conditions that could lead to the permanent changes in potential groundwater dependent habitat within Canalside Ponds LNA. Habitat loss would result in a permanent adverse effect on site integrity that would be significant up to the district/borough level.

7.4.15 Construction of the Proposed Scheme would result in the permanent loss of 1.8ha (3.3%) of Leventhorpe Lagoon and Ings LNA and temporary alteration of hydrological conditions that could lead to the deterioration in potential groundwater dependant habitats within Leventhorpe Lagoon and Ings LNA. Habitat loss would result in a permanent adverse effect on site integrity that would be significant up to the district/borough level.

7.4.16 Construction of the Leeds spur near Woodlesford would result in the permanent loss of 70.4ha (73%) of habitats within Water Haigh Woodland Park. This site comprises a matrix of interconnected pockets of broadleaved woodland, pasture, hedgerow and wetland. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the district/borough level.

7.4.17 Construction of the River Aire viaduct would result in indirect adverse effects on the breeding/ wintering bird assemblage at St. Aiden's Nature Reserve and notable species supported by this reserve (including bittern). On a precautionary basis, there would be a temporary adverse effect, which would be significant at the district/borough value level.

Habitats

Woodland

7.4.18 Construction would result in the loss of 5.4ha of broadleaved woodland from this section of the route. Incorporated woodland creation is not expected to reduce the loss to a level that is not significant given the extent of this loss and the potential for the ongoing review to identify additional ancient woodlands, the permanent loss of these woodlands would result in an effect that would be significant at up to county/metropolitan level.

Parkland

7.4.19 Outside of the designated sites discussed above, land required for the Proposed Scheme would result in the loss of this habitat type in two notable areas located at Newland Hall and in the vicinity of Moss Carr Wood LNA. The extent of the permanent loss of parkland habitat would result in an effect significant at up to the district/borough level.

Grassland

7.4.20 Outside of the designated sites discussed above, land required for the Proposed Scheme would result in the loss of grassland from this section of the route. In the absence of further survey information, it has been assumed that none of the grassland lost would be classified as unimproved, and hence the loss would be significant at up to the district/borough level.

Hedgerows

7.4.21 The Proposed Scheme would result in the permanent loss of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The effects of these losses will be fully assessed in the formal ES. The Proposed Scheme includes new hedgerow planting which would help offset losses. Further hedgerow planting 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 the district/borough level.

Watercourses

7.4.22 The route of Proposed Scheme would cross the River Calder at three locations, the River Aire and the Aire and Calder Navigation, and Oulton Beck, on viaducts. 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, land required for the Proposed Scheme would result in the loss of sections of other smaller watercourses and severance of river corridors due to diversion through culverts, which would result in a permanent effect that would be significant at up to the district/borough level.

Water bodies

7.4.23 Twenty six ponds would be lost as a result of the Proposed Scheme. The loss of these ponds could result in an impact that would be significant at up to county/metropolitan level, if it is confirmed through field surveys that they support great crested newts or other priority species. The provision of replacement ponds would reduce this loss to a level that is not significant.

Ancient and veteran trees

7.4.24 It is assumed that veteran trees within the land required for the Proposed Scheme in the Warmfield to Swillington and Woodlesford 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 county/metropolitan level in each case.

Species

Bats

7.4.25 The permanent removal of vegetation as a result of the land required for the Proposed Scheme may have impacts on bats. Habitat loss would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. This could particularly affect breeding populations of bat species within the Warmfield to Swillington and Woodlesford area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through application of the measures in the draft CoCP. 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

7.4.26 Suitable habitat for otter occurs at a number of locations within the land required for the Proposed Scheme including: the River Aire; River Calder; the Aire and Calder Navigation; Newland Hall; and Oulton Beck. The construction of viaducts in these locations would reduce loss of habitat along the river corridor. Indirect effects from construction activities, such as increased light and noise, may result in disturbance to these species during the construction period, and prevent them from moving along the watercourses. However, it is anticipated that these indirect effects would be controlled through application of the measures in the draft CoCP. On a precautionary basis, in the absence of further survey information, impacts upon otter would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Water vole

7.4.27 Suitable habitat for water vole occurs at a number of locations within the land required for the Proposed Scheme including: the River Aire, River Calder, the Aire and Calder Navigation, Newland Hall and Oulton Beck. The use of viaducts in these locations would reduce loss of habitat along the river corridor. Indirect effects from construction activities such as increased light and noise may result in disturbance to these species during the construction period, and prevent them from moving along the watercourses. However, it is anticipated that these indirect effects would be controlled through application of the measures in the draft CoCP. On a precautionary basis, in the absence of further survey information, impacts upon water vole would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Great crested newt

7.4.28 On a precautionary basis, it has been assumed that all 26 ponds and surrounding terrestrial habitat within the land required for the Proposed Scheme may support great crested newts and would be lost during construction. The loss of ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newts across this area. Where great crested newt is shown to be present by survey, two new ecological mitigation ponds would be created for every pond lost to the land permanently

required for the Proposed Scheme. The implementation of this mitigation would reduce the effect of loss of breeding habitat to not significant. Suitable terrestrial habitat would be required around new ponds with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat). In the absence of full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/metropolitan level.

Birds

7.4.29 Land required for the Proposed Scheme would result in the permanent loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland, woodland, and wetland species. These are likely to include Schedule 1 species such as barn owl and kingfisher. On a precautionary basis, in the absence of further survey information, it has been assumed that land required for the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

7.4.30 In addition, there would be temporary adverse effects via disturbance that would be significant up to the county/metropolitan level. Notable habitats likely to be affected by disturbance include those known to support significant numbers wetland birds within the River Aire corridor. This includes habitats that support overwintering and/or breeding populations of Schedule 1 species such as bittern at St. Aiden's Nature Reserve and adjacent wetland habitats.

White-clawed crayfish

7.4.31 The land required for the Proposed Scheme would result in loss of habitat suitable for white-clawed crayfish (principally the River Calder, River Aire, Oulton Beck and Aire and Calder Navigation). On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effects that would be significant at up to the county/metropolitan level.

Aquatic invertebrates

7.4.32 Land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates (including species of principal importance). On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

Terrestrial invertebrates

7.4.33 Land required for the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates (including species of principal importance). On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

Fish

7.4.34 Suitable habitat for fish, including European bullhead (listed on Annex II of the EC Habitats Directive), and brown trout, exists in watercourses (principally the River Aire and River Calder). In addition, a review of the Wakefield BAP and Leeds BAP indicate that Atlantic Salmon and European eel are potentially present in the River Calder catchment. The route of the Proposed Scheme would pass over these watercourses on viaducts and indirect impacts to the watercourses would be controlled through application of the measures set out in the draft CoCP. Other smaller watercourses would still be affected and may require assessment under the Water Framework Directive (WFD)[74]. On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effects on fish species that would be significant at up to the district/borough level.

Reptiles

7.4.35 The land required for the Proposed Scheme would result in the loss of suitable habitat for reptiles. Grass snake have been recorded in habitats around Newland Hall and Hell Lane Railway Cutting LWS. In addition, common lizard and slow worm may be present in grassland and scrub habitats. On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

7.4.36 Effects on other habitats and species that would be significant at the local/parish level during construction will be reported in the formal ES.

7.4.37 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered for sites within 200m of construction routes where habitats are considered to be sensitive to air quality changes. These effects will be reported in the formal ES.

Other mitigation measures

7.4.38 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:

- options to mitigate the partial loss of non-statutory LWS and SEGI at the following sites: Hell Lane Railway Cutting LWS, Former Newmarket Colliery LWS, Altofts Ings LWS, Moss Carr Wood LNA, Cockpit Round SEGI and Water Haigh Woodland Park. The options would include enhancements of retained habitats within these locally designated sites and/or additional habitat creation in areas along the route yet to be agreed with stakeholders in terms of location and extent;

[74] EU Water Framework Directive http://ec.europa.eu/environemt/water/water-framework/index_en.html

- a survey of the potential groundwater dependent habitat at Rothwell Colliery LNA, Canalside Ponds LNA and Leventhorpe Lagoon and Ings LNA will be undertaken to determine whether it is dependent on groundwater. If it is confirmed to be groundwater dependent, additional mitigation measures for the management of groundwater during cutting excavation and in the permanent case may be required. Mitigation measures would be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:
  - installation of a groundwater cut-off;
  - recirculation of treated water back to the site at an appropriate rate and location; and permanent drainage measures to ensure baseflows are maintained;
  - provision of additional broadleaved woodland (non-ancient) to replace those lost, and/ or enhancement of remaining woodlands;
  - areas of woodland habitat creation and Landscape mitigation planting (non-ancient) to replace those lost, and/or enhancement of remaining woodlands by increasing size, improving condition and/or improving and enhancing connections to other woodlands, thus increasing the overall resource;
  - creation of additional hedgerow habitat, which would mitigate the losses and maintain the connectivity of the network;
  - create new species-rich grassland habitat (including translocation where appropriate) to mitigate grassland losses, including grassland habitat at Newland Hall and parkland habitat near Moss Carr Wood LNA;
  - provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
  - considering the need for inclusion of structures to reduce severance effects on bats;
  - 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/nesting habitat (nest boxes etc.) for barn owl;
  - 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 the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

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

7.4.40 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

7.4.41 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 18.

Table 18: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Hell Lane Railway Cutting LWS	Permanent adverse effect on site integrity due to loss of 3.2ha (18%) of broadleaved woodland, scrub and grassland habitat.	County/metropolitan
Former Newmarket Colliery LWS	Permanent adverse effect on site integrity due to loss of 2.6ha (78%) of fen, scrub and grassland habitat.	County/metropolitan
Altofts Ings LWS	Permanent adverse effect on site integrity due to loss of 8ha (90%) of fen, scrub and grassland habitat.	County/metropolitan
Swillington Park Lakes, Cockpit Round, Garforth, and Rothwell Country Park SEGI	Permanent adverse effect on site integrity due to loss of 1.4ha (7%) of lowland meadows (unimproved grassland) and lowland fen habitat.	District/borough
Moss Carr Wood LNA	Permanent adverse effect on site integrity due to loss of 2.5ha (14%). Comprising mostly of broadleaved woodland.	District/borough
Rothwell Country Park LNA	Permanent adverse effects on site integrity due to loss of 3.2ha (6.8%). Comprising mostly of grassland and scrub habitat.	District/borough
Canalside Ponds LNA	Permanent adverse effects on site integrity due to loss of 1.6ha (68%). Comprising mostly of woodland and pond habitat.	District/borough
Leventhorpe Lagoon and Ings LNA	Permanent adverse effects on site integrity due to loss of 1.8ha (3.3%). Comprising mostly of woodland and pond habitat.	District/borough

Resource/feature	Residual effect	Level at which the effect would be significant
Water Haigh Woodland Park	Permanent adverse effect on site integrity due to loss of 70.5ha (73%) of grassland, scrub and woodland habitat.	District/borough
Woodland	Construction would result in the loss of 5.4ha of broadleaved woodland from this section of the route. A review is being undertaken to identify any additional woodlands that are not currently listed on the Ancient Woodland Inventory but that may nevertheless be ancient. These will be identified and assessed in the formal ES.	Up to county/metropolitan
Grassland	Permanent loss of grassland within and near to the former Welbeck landfill site and at Newland Hall.	Up to district/borough
Hedgerows	Permanent loss of hedgerows.	Up to district/borough
Watercourses	Loss of small sections of watercourses crossed by viaducts, and severance of river corridors due to diversions through culverts.	Up to district/borough
Ancient and veteran trees	Permanent loss of individual trees.	Up to county/metropolitan
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 severance effects on foraging habitat and loss of breeding sites and resting places.	Up to county/metropolitan
Water vole	Potential permanent adverse effect on conservation status due to loss of breeding sites and foraging habitat and habitat severance due to indirect disturbance.	Up to county/metropolitan
Great crested newts	Loss of 71 water bodies and surrounding terrestrial habitat, which may support great crested newts. Current known population at Newland Hall (additional GCN populations may be present within land required for the Proposed Scheme).	Up to county/metropolitan
Birds	Potential permanent effect on mainly farmland, woodland and wetland assemblages including schedule 1 birds for example barn owls and kingfisher. Temporary disturbance effects including bittern at St. Aiden's Nature Reserve.	Up to county/metropolitan

Resource/feature	Residual effect	Level at which the effect would be significant
White-clawed Crayfish	Potential permanent adverse effect on the habitat of white-clawed crayfish.	Up to county/metropolitan level
Aquatic Invertebrates	Potential permanent adverse effect upon the habitat of notable aquatic invertebrates.	Up to district/borough
Terrestrial Invertebrates	Potential permanent adverse effect upon the habitat of notable terrestrial invertebrates.	Up to district/borough
Fish	Potential permanent adverse effect upon the habitat of notable fish species.	Up to district/borough
Reptiles	Potential permanent adverse effect upon the habitat of reptile species.	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 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.

7.5.4 Barn owls are at risk of colliding with trains at several locations along the route where there is suitable grassland foraging and connecting 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. Effects on all other habitats and species would likely be significant at the local/ parish level during operation. These effects will be assessed and reported in the formal ES.

Other mitigation measures

7.5.5 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 measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- updating the HS2 barn owl mitigation plan[75] 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 local landowners; and
- structures to reduce mortality to bats.

Summary of likely residual significant effects

7.5.6 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 19.

Table 19: 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

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

7.5.8 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Warmfield to Swillington and Woodlesford area.

[75] *Currently in development for Phase 1 of HS2.*

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Warmfield to Swillington and Woodlesford 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 Public Health England, relevant directors of Public Health and Health and Wellbeing Boards, and relevant Clinical Commissioning Groups. The purpose of the engagement has been to understand health issues in the Warmfield to Swillington and Woodlesford area 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 Warmfield to Swillington and Woodlesford 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: LA15 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)[76].

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 well-being 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.

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

8.2.4 The health determinants of relevance within the Warmfield to Swillington and Woodlesford area are:

- for impacts during construction (temporary and permanent):
  - neighbourhood quality;
  - access to services, health and social care;
  - access to green space, recreation and physical activity; and
  - social capital.
- for impacts during operation (permanent):
  - neighbourhood quality; and
  - access to green space, recreation and physical activity.

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[77] 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.

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

8.3 Environmental baseline

Existing baseline

Description of communities in the Warmfield to Swillington and Woodlesford area

8.3.1 The Warmfield to Swillington and Woodlesford area is characterised by towns, villages and hamlets set within a rural area. As reported in Section 14, Traffic and transport, there are a number of public rights of way (PRoW) within the vicinity of the Proposed Scheme, which provide access to the countryside and are considered important to health and wellbeing.

8.3.2 For the purposes of the health assessment, the study area is divided into the communities described below. A description of community facilities is provided in Section 6, Community.

Kirkthorpe, Warmfield and Goosehill

8.3.3 This area covers the villages of Kirkthorpe, Warmfield and Goosehill. Together these villages comprise approximately 250 residential properties. Kirkthorpe is a village located to the west of the route of the Proposed Scheme while Warmfield and Goosehill are villages located to the east of the route of the Proposed Scheme.

8.3.4 The nearest residential properties within Kirkthorpe would be approximately 240m from the route of the Proposed Scheme. The nearest residential properties within Warmfield and Goosehill would be approximately 250m and 320m from the route of the Proposed Scheme, respectively. Community facilities within these settlements include a church, a post office and a public house.

Normanton, Altofts and surrounds

8.3.5 Normanton and Altofts are a town and village respectively, located to the east of the route of the Proposed Scheme and connected to one another by Altofts Road. Normanton comprises approximately 9,000 residential properties, the nearest of which would be approximately 1.2km from the route of the Proposed Scheme. Altofts comprises approximately 2,500 residential properties, the nearest of which would be approximately 170m from the route of the Proposed Scheme.

8.3.6 Community facilities within these settlements include allotments, primary schools, a community hub, a public house, a post office, care homes and churches. In addition, Newland Hall, Yorkshire Field Sports Ltd., Pylon Angling Club and Birkwood Fisheries all provide recreational opportunities for the general public.

Bottom Boat, Methley Lanes, Scholey Hill and surrounds

8.3.7 This area covers the rural communities of Bottom Boat, Methley Lanes, Scholey Hill and surrounds. Together, these communities comprise approximately 400 residential properties.

8.3.8 Bottom Boat is a hamlet located to the west of the route of the Proposed Scheme on the northern banks of the River Calder and the Aire and Calder Navigation.

The nearest residential properties would be approximately 750m from the route of the Proposed Scheme.

8.3.9 Methley Lanes is a rural community located to the east of the route of the Proposed Scheme. The nearest residential properties within Methley Lanes would be approximately 25m from the route of the Proposed Scheme.

8.3.10 Scholey Hill is a rural community located to the east of the route of the Proposed Scheme. The nearest residential properties within Scholey Hill would be approximately 600m from the route of the Proposed Scheme.

8.3.11 Community facilities within these settlements include a hospital while Moss Carr Wood provides recreational opportunities for the general public.

Oulton, Woodlesford, Rothwell and surrounds

8.3.12 Oulton and Woodlesford are two adjoining villages to the west of the route of the Proposed Scheme comprising approximately 3,500 residential properties. The nearest residential properties would be approximately 150m from the route. Rothwell is located south-west of the route of the Proposed Scheme and comprises approximately 10,000 residential properties. The nearest residential properties would be located approximately 650m from the route.

8.3.13 Community facilities within these settlements include allotments (in particular Oulton Brickworks Allotments), public houses, a care home, a medical centre, churches, a bowling club, primary schools and a village hall. In addition, a leisure centre, Woodlesford Sports and Social Club, Oulton Hall Golf Club, Rothwell Country Park, All Saint's Drive Skatepark, Water Haigh Woodland Park and St. Aiden's Nature Reserve (an RSPB Reserve) provide recreational facilities for the general public.

Swillington, Hollinthorpe and Swillington Common

8.3.14 Swillington is a village located predominantly east of the route of the Proposed Scheme, comprising approximately 1,400 residential properties. The nearest residential properties within Swillington would be approximately 220m from the route of the Proposed Scheme. Hollinthorpe is a hamlet located to the east of the route comprising eight residential properties. The nearest residential properties within Hollinthorpe would be approximately 200m from the route. Swillington Common is located to the east of the route, comprising approximately 80 residential properties. The nearest residential properties within Swillington Common would be adjacent to the route of the Proposed Scheme.

8.3.15 The community facilities within these settlements are located in Swillington and include a nursery, a primary school, a post office, a village hall, a community centre, a social club, a church, a GP surgery and a care home. In addition, Swillington Park Fishing Lakes, and the Mistals Livery Stables and Astley Riding School provide recreational opportunities for the general public.

Demographic and health profile of the Warmfield to Swillington and Woodlesford area

8.3.16 The local communities potentially affected by the Proposed Scheme, in the Warmfield to Swillington and Woodlesford area, have a relatively low population, commensurate with the rural nature of the area.

8.3.17 Data provided by the Office for National Statistics[78] for the local authority areas of Wakefield Metropolitan District Council (WMDC) and Leeds City Council (LCC), shows that this population has a broadly similar health status compared with the national (England) averages.

8.3.18 The population has similar levels of deprivation to the national average, with regard to the combined indices of multiple deprivation[79], and the health domain (a sub-set of the indices of multiple deprivation).

8.3.19 The available data provide detail down to local authority level, and enables a demographic and health profile to be made of the population within the Ravenfield to Clayton area. The description of the whole population, and the populations within a local authority area, 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 a number of PRoW and roads to maintain access (see Section 14, Traffic and transport for further detail).

8.4.2 In addition, the locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts insofar as reasonably practicable.

[78] The Office for 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.
[79] 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

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)[80, 81], 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.

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 would affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGV). These will be assessed in the relevant sections

[80] All construction will be undertaken in accordance with the Code of Construction Practice. The CoCP will also contain generic control measures and standards to be implemented throughout the full duration of the construction phase.
[81] Supporting document: Draft Code of Construction Practice

of the formal ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the formal 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 Warmfield to Swillington and Woodlesford area, taking account of mitigation measures contained in the draft 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 would have temporary and permanent[82] impacts on neighbourhood quality in areas close to construction sites. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.

8.4.13 Construction activities 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 reported in Section 13, Sound, noise and vibration. It is currently expected that the construction of the Proposed Scheme may be visible from nearby neighbourhoods, as reported in Section 11, Landscape and visual. This has the potential to contribute to impacts on neighbourhood quality and will be assessed in the formal ES.

8.4.14 This has the potential to contribute to adverse impacts on neighbourhood quality.

[82] 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.

8.4.15 Traffic and transport impacts in the Warmfield to Swillington and Woodlesford area would 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.

8.4.16 Construction traffic, including heavy goods vehicles (HGV), would be present on a number of roads in this area, as described in Section 14, Traffic and transport.

8.4.17 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 over man-made environments, and that exposure to views of natural environments is associated with increased 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 Warmfield to Swillington and Woodlesford area is predominantly rural in character. Typically, there is a reliance on shops and services in nearby settlements within the area. To access alternative services and facilities it is necessary to travel longer distances. There is the 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 on PRoW, including temporary closures, diversions and loss of amenity, which may deter the use of these routes by walkers, cyclists and equestrians;
- 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 There would be direct impacts on access to green space, recreation and physical activity at a number of locations in the Warmfield to Swillington and Woodlesford area, where publicly accessible open space is either temporarily or permanently lost, community facilities are permanently lost, or where the usability of land is compromised. This includes the following:

- temporary loss of access to and use of Swillington Park Fishing Lakes due to the construction of the River Aire viaduct. Access would be reinstated following construction;
- temporary loss of approximately 50% of land at Water Haigh Woodland Park. The Woodlesford Cutting satellite compound would require the closure of the part of the woodland known locally as Water Haigh Plantation for a period of four years. The River Aire viaduct satellite compound would require the closure of the part of the woodland known locally as Fleet Bridge Wood for a period of three years and three months. Access to the remainder of the woodland would be maintained during construction and after this time, the lost areas of the woodland park would be reinstated and returned back to use;
- temporary loss of 10% of land at Oulton Brickworks Allotments in Woodlesford for four years due to the construction of the Woodlesford Cutting satellite compound. While access to the allotments would be maintained throughout construction, the functionality of the resource would be partly impaired;
- draining and permanent loss of three out of five Yorkshire Field Sports Ltd fishing lakes (Flooded Brickworks) due to the construction of the Normanton viaduct; and
- permanent loss of approximately 10% of Water Haigh Woodland Park due to construction of the River Aire viaduct and the Woodlesford tunnel.

8.4.24 As reported in Section 14, Traffic and transport, the route of the Proposed Scheme would intersect a number of PRoW in the Warmfield to Swillington and Woodlesford area. The impacts on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be assessed in the formal ES.

8.4.25 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 local roads. This could obstruct or deter pedestrians, cyclists and equestrians from

using these routes. Health effects associated with these impacts, including consideration of levels of use and available alternative routes for active travel and recreation, will be assessed in the formal ES.

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:

"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."[83]

8.4.27 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.

8.4.28 The settlements along the route support small, well-established communities. The size of the temporary construction workforce would 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 main compounds and satellite compounds in the vicinity of the settlements of Warmfield, Kirkthorpe, Normanton, Altofts, Methley Lanes, Oulton, Woodlesford, Swillington, Hollinthorpe and Swillington Common. The maximum duration of the works at each site would be approximately five years and three months. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds and workers using commercial facilities, such as shops, restaurants, and public houses within settlements.

8.4.29 The introduction of a temporary construction workforce into communities could have 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.

8.4.30 The draft CoCP includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations

[83] 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

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.

8.4.31 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.

8.4.32 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.

8.4.33 In the Warmfield to Swillington and Woodlesford area, no health effects are anticipated on the remaining community, where five residential properties would be demolished as a result of the Proposed Scheme. Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.34 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 communities.

Other mitigation measures

8.4.35 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.

8.4.36 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.

8.4.37 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 Warmfield to Swillington and Woodlesford 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 and at neighbourhoods in proximity to the route of the Proposed Scheme, as reported in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme may be visible from neighbourhoods as reported in Section 11, Landscape and visual. This has the potential to contribute to impacts on neighbourhood quality and will be assessed in the formal ES.

Access to green space, recreation and physical activity

8.5.3 The potential impact on neighbourhood quality during operation, described above, could have the potential to change behaviours, such as reducing the use of outdoor spaces. The effects arising from the operation of the Proposed Scheme will be assessed in the formal ES.

Other mitigation measures

8.5.4 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

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

8.5.6 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 Warmfield to Swillington and Woodlesford 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, Wakefield Metropolitan District Council (WMDC), Leeds City Council (LCC) and West Yorkshire Archaeological Service. 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: LA15 Map Book. Only designated heritage assets within the Warmfield to Swillington and Woodlesford area are shown on maps CT-10-106b to CT-10-111a. 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. 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)[84] , including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

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

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 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 500m. This is referred to in the remainder of this assessment as the 500m study area.

9.2.4 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out in the vicinity of bored or mined tunnels is defined as 100m either side of the extent of tunnelling. This is referred to in the remainder of this assessment as the 100m study area.

9.2.5 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.

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

9.2.7 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.

9.2.8 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.

9.2.9 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, in the main, been undertaken on that basis. However, exceptions to this are two scheduled monuments, Newland Preceptory (NHLE 1012153) and Henge on Birkwood Common (NHLE 1005774), which although within the land required for the construction of the Proposed Scheme, would not be physically impacted. Also, in relation to the following assets, although the asset is within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant:

- Woodlesford Conservation Area; and
- Eshald Lane, railway tracks.

9.2.10 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.

9.2.11 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.

9.2.12 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 results of field surveys will be reported within 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 within the formal ES.

9.3 Environmental baseline

Existing baseline

9.3.1 Baseline data was collated from a variety of sources, including:

- the NHLE (Historic England register of designated heritage assets);
- West Yorkshire HER (WYHER);
- conservation area appraisals; and
- historic maps and aerial photography.

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

Designated assets

9.3.3 The following designated heritage assets are located partially or wholly within the land required for the Proposed Scheme:

- Newland Preceptory (NHLE 1012153), a scheduled monument of high value;
- Henge on Birkwood Common (NHLE 1005774), a scheduled monument of high value; and
- Woodlesford Conservation Area of moderate value.

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 of high value: Stanley Ferry Aqueduct (NHLE 1005773, also a Grade I listed building), Rothwell Castle (NHLE 1005792), Length of Grim's Ditch immediately north of Gamblethorpe (NHLE 1018791), Length of Grim's Ditch partly under Bullerthorpe Lane 620m north of Gamblethorpe (NHLE 1018792), and Length of Grim's Ditch immediately east of Barrowby Road (NHLE 1018795);

- eight Grade I listed buildings of high value: The Brewhouse and East Pavilion at Heath Hall (NHLE 1313191), Flanking screen walls and gate piers attached to west front of Heath Hall linking east and west pavilions (NHLE 1200345), Heath Hall (NHLE 1200238), The West Pavilion (NHLE 1200273), The Stable House, Heath Hall (NHLE 1135583), Frieston's Hospital (NHLE 1313217), Stanley Ferry Aqueduct (NHLE 1261690; also a scheduled monument) and Church of St Oswald (NHLE 1135664);

- 14 Grade II* listed buildings of high value: Dame Mary Bolle's water tower including water wheel housing and overflow channel (NHLE 1200499), The Dower House (NHLE 1135585), Heath House (NHLE 1200517), Stable Building/Barn at Heath Hall (NHLE 1135584), Deershed in park at Heath Hall (NHLE 1135559), Boat House on south bank of the Half Moon Lake (NHLE 1300638), Church of St Peter (in Kirkthorpe, NHLE 1313216), Church of All Saints (in Normanton, NHLE 1253747), Gazebo approximately 100 metres north of Clumpcliffe Farmhouse (NHLE 1135669), Church of St John the Evangelist (in Oulton, NHLE 1135676), 32-36 Commercial Street (NHLE 1135680); The Nookin (NHLE 1135675) Leventhorpe Hall (NHLE 1247691) and Church of St Mary (in Swillington, NHLE 1247710);

- 130 Grade II listed buildings of moderate value, predominantly residential and including houses and cottages within the settlements of Heath, Kirkthorpe, Normanton, Stanley, Rothwell and Colton; farmhouses and traditional agricultural buildings such as the Farm Buildings to Former Newland Hall (NHLE 1253636) and the Dovecote and stables/outbuilding approximately 20 metres north of Gamblethorpe Farmhouse (NHLE 1247690); country houses such as Oulton Hall (NHLE 1184583); buildings and structures associated with country houses, including the Stables to Former Swillington House (NHLE 1247697), the Lodge to Leventhorpe Hall (NHLE 1247692), Kennels on east side of forecourt to south of gazebo at Clumpcliffe Farm (NHLE 1184432), Kennels on west side of forecourt to south of gazebo at Clumpcliffe House (NHLE 1135670), and various ornamental gate piers, commemorative monuments, churches, and buildings and structures associated with transport, including canal locks, a railway viaduct and mileposts;

- four conservation areas of moderate value: Kirkthorpe Conservation Area, Oulton Conservation Area, Rothwell Conservation Area and Methley Church Side Conservation Area; and

- one Grade II registered park and garden: Oulton Hall (NHLE 1000413), of moderate value.

Non-designated assets

9.3.5 The following non-designated assets of moderate value lie wholly or partially within the land requested for the Proposed Scheme:

- Iron Age/Roman enclosure complex (cropmarks), Gled Hill (WYHER 559);

- Savile Park Farm, enclosure (cropmark) (WYHER 4513);

- Iron Age/Roman enclosure (cropmark), Warmfield (WYHER 569);

- Iron Age/Roman trackway & field boundaries (cropmark), Scholes Hill (WYHER 4519);
- Ditched enclosure, associated field boundaries (cropmarks) (WYHER 4521);
- Gamblethorpe Cottage, ditch (cropmark) (WYHER 4695; on the projected line of Grim's Ditch, its value is derived from the potential it has to contribute to our understanding of that monument);
- Bullerthorpe Medieval Settlement (WYHER 616);
- Swillington Common, circular ditched feature and two parallel linear features (cropmark);
- Birkwood Plantation, enclosure (cropmark); and
- Newland Park, late prehistoric/Romano-British enclosure and field system.

9.3.6 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme;

- Ridge and furrow, Gled Hill (WYHER 6201);
- Medieval Hollow Way and Trackway (cropmark) (WYHER 4205);
- Deanfield, Iron Age/Romano-British/post-medieval field boundaries;
- Bank of uncertain date or function (cropmark) (WYHER 4523);
- Medieval/Post-Medieval hollow way (earthwork) (WYHER 15388);
- Ridge and furrow, Cockpit Round (WYHER 5236);
- The Smithy, Swillington (WYHER 15979);
- Fragmentary Linear Cropmarks (WYHER 4572);
- Templethorpe Farm, ditch;
- Blacksmith Cottage, Swillington;
- Savile Park Farm, Methley Lanes[85];
- Top Farm, Altofts;
- Top Farm, linear cropmarks;
- Eshald Lane, railway tracks; and
- Methley Deer Park (site of) (WYHER 4004).

[85] Referred to as Saville Park Farm in Section 2 of this report.

9.3.7 Non-designated heritage assets located partially or wholly within the 100m or 500m study areas include:

- 41 assets of moderate value, including evidence of Iron Age and Romano-British activity in the form of ditched enclosures, field systems and ring ditches identified from aerial photography; historic buildings including locally listed domestic buildings such as 'Greystones' in Wakefield (WYHER 9881) and houses with surviving 17th and 18th century fabric, such as 18-24 Farrer Lane, Oulton (WYHER 11586), 19th century school buildings, such as Lee Briggs School (WYHER 9882), commercial buildings, for example Stanley Ferry Repairs Shop (WYHER 9928), 19th century road and rail bridges, including King's Road Bridge over the Aire and Calder Navigation (WYHER 9885), and Upper Altofts Methodist Chapel (WYHER 199); and
- 54 assets of low value, including buried archaeological remains identified from aerial photographs such as post-medieval field systems or features whose date and function cannot be determined and may be geological in origin; other archaeological sites including the earthwork remains of Lee and Watson's Canal (WYHER 6273) and the site of Swillington House (WYHER 5234); historic buildings including post-medieval and 19th century domestic buildings, farmstead complexes such as Top Hill Farm, buildings and structures associated with canals including Lake Lock Boat Yard (WYHER 4948) and Kirkthorpe Locks (WYHER 4146), and the walled gardens and associated domestic buildings at Methley and Swillington Park (WYHER 15974 and WYHER 15978).

Historic environment overview

9.3.8 The geology of the Warmfield to Swillington and Woodlesford area, comprising alluvium deposits on a bedrock geology of the Pennine Middle Coal Measures Formation, are known to contain Quaternary River Terrace Deposits, formed of sands and gravels and areas of peat. Both the River Aire and River Calder flow through the Warmfield to Swillington and Woodlesford area.

9.3.9 Although evidence for Palaeolithic activity in West Yorkshire is scarce, possibly because much of the county at this time was at the edge of, or under, glacial ice, river valleys are places where evidence for early human activity may often be encountered, particularly for the Palaeolithic period.

9.3.10 Mesolithic evidence within the Warmfield to Swillington and Woodlesford area is usually characterised by discoveries of stone or flint tools. Examples have been found on river terraces like those at Willow Grove, Methley (NRHE 1216152)[86] and Knowesthorpe (NRHE 53012). Neolithic activity is similarly characterised by the tools in use at the time, such as the flint scraper (WYHER 7778) and flint fragment (WYHER 8493) from Swillington, or the stone axes which have a marked distribution along the

[86] National Record of the Historic Environment (NRHE) reference number

Aire and Calder rivers[87]. These include a polished axe from near Altofts (NRHE 52722) and another from Allerton Bywater (NRHE 54322).

9.3.11 Bronze Age activity is characterised by monuments and structures resulting from settled habitation[88]. Recognisable from cropmarks[89], a number of possible ploughed out round barrows[90] of Bronze Age date have also been identified, including examples at Swillington (WYHER 1346). Bronze Age finds from areas near to the Warmfield to Swillington and Woodlesford area include a spearhead from the River Aire at Thwaite Gate (WYHER 3434). Additionally, while its actual date and function remains in debate, a large oval earthwork on Birkwood Common has been identified as a possible henge (NHLE 1005774), a ritual monument of late Neolithic or early Bronze Age date.

9.3.12 Settlement and landscape management continued into the Iron Age. Aerial photographs have highlighted the remains of ditched enclosures and field systems throughout the Warmfield to Swillington and Woodlesford area. Where similar features have been excavated, such as at Swillington Common, ditched field boundaries and a series of structures, including a round house, have been identified[91], whilst excavations at Normanton have recorded a number of round houses within an enclosure[92].

9.3.13 The remains of Romano-British field systems, including a number of enclosures and ditches near Warmfield (NRHE 1391197), and the discovery of Roman artefacts such as coins (WYHER 1926), suggest an established Roman presence within the Warmfield to Swillington and Woodlesford area. Direct evidence of Romano-British occupation is provided by a square, ditched enclosure discovered at Rothwell Haigh Colliery in the 1970s. This featured a well containing wooden objects, animal parts and a human skull, a collection hinting at a ritual function.

9.3.14 A well-defined section of Grim's Ditch, an earthwork comprising a ditch and earthen bank, survives north-west of Gamblethorpe (NHLE 1018791). While this monument's exact date and function are uncertain, results from archaeological excavations have suggested sections of the ditch were open during the Roman period. It may be that the earthwork originated as an Iron Age territorial boundary or defensive structure[93]. Elsewhere, evidence suggests the feature was still in use in the 7th century AD[94].

9.3.15 The Warmfield to Swillington and Woodlesford area in the medieval period is characterised by the development of established settlements and their surrounding

[87] Vyner, B, 2011, *Research Agenda: The Neolithic, Bronze Age and Iron Age in West Yorkshire*
[88] Such as those found during archaeological excavations at St John's open-cast site, Wakefield Road, Normanton, Anon, 2003, *Johns 2 Opencast, Off Boundary Lane, Wakefield Road, Normanton, West Yorkshire: Archaeological Excavation.* MAP Archaeological Consultancy Ltd, Malton
[89] The presence of buried walls and/or infilled ditches/pits can cause crops to grow and ripen at different rates. When viewed from above in the right conditions, this effect can reveal the presence of buried archaeological sites.
[90] A round barrow is a mound of earth constructed over one or more burials. A ring ditch is a trench of circular or penannular (incomplete circle) plan. When excavated, ring ditches are usually found to be the ploughed-out remains of a round barrow where the barrow mound has completely disappeared, leaving only the infilled former quarry ditch.
[91] Chadwick, A M, 2009, *Research Agenda: The Iron Age and Romano-British Periods in West Yorkshire*
[92] Timms, S., 2005, *Normanton Golf Course, Normanton, West Yorkshire: Excavation and Evaluation.* Field Archaeology Specialists Ltd, York
[93] Weldrake, D, 2011, *Grim's Ditch: A tourist's guide to interesting archaeological sites in West Yorkshire*
[94] Historic England, 2017a, *Length of Grim's Ditch immediately north of Gamblethorpe.* Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1018797

landscapes. Villages such as Methley may have been founded prior to, or during the Anglo-Saxon period. The remains of an earlier church, possibly of this date, were identified on the site of the Church of St Oswald in Methley (NHLE 1135664) during 19th century restoration works[95]. A moated site at Methley provides evidence for an original manor house, while historic maps depict the type of surrounding agricultural fields characteristic of land management practices of the time. The park at Methley may also have been established at this time (WYHER 4004).

9.3.16 This period also saw the establishment of a preceptory, a monastery of the military order of the Knights Hospitallers, at Newland (NHLE 1012153). Whilst contemporary documentary evidence for Newland Preceptory is scarce, it is known to have comprised a chapel with additional buildings for communal living. Although they may survive as buried archaeological remains, the medieval buildings are known to have been replaced by the later country house and buildings, including the farm buildings (NHLE 1253636) and stables (NHLE 1253635)[96].

9.3.17 The landscape of the Warmfield to Swillington and Woodlesford area in the post-medieval period was characterised by large farms, parliamentary enclosure[97] and country house estates. Large mansions surrounded by designed landscapes, ornate estate buildings and 'eyecatchers'[98] such as the gazebo and kennels at Clumpcliffe (NHLE 1135669, NHLE 1135670 and NHLE 1184432), were built as statements of economic prosperity by landed families and entrepreneurs. Other examples include Heath Hall (NHLE 1200238) and Oulton Hall (NHLE 1184583). Their decline in the 20th century in some cases led to dereliction and subsequent demolition. This was the case for three country houses within the Warmfield to Swillington and Woodlesford area, including Swillington House and Methley Hall (WYHER 5234 and WYHER 2285). In these cases, like in other examples elsewhere, a country house's ancillary buildings and elements of its designed landscapes outlived the main residence.

9.3.18 The canalisation of the rivers Aire and Calder in order to improve navigation began in the 18th century. As demand for goods increased and the waterborne vessels which carried them became more substantial, the canal system expanded. Evidence of these improvements within the Warmfield to Swillington and Woodlesford area includes Stanley Ferry Aqueduct (NHLE 1261690) and two canal locks (NHLE 1253637 and NHLE 1261691), as well as sections of canal and canalised rivers. Constructed between 1836 and 1839, the aqueduct is thought to be the first iron suspension aqueduct in the world[99].

9.3.19 Medieval coal and ironstone workings at Sharlston Common (NHLE 1018399) provide evidence for the early exploitation of resources. Quarrying and allied manufacturing activities continued to develop and expand throughout the post-medieval period, but

[95] Leeds City Council, 2008, *Methley Church Side: Conservation Area Appraisal and Management Plan*
[96] Historic England, 2017b, Newland Preceptory. Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1012153
[97] The Inclosure Acts were a series of Acts of Parliament that empowered enclosure of open fields and common land in England and Wales, creating legal property rights to land that was previously held in common.
[98] An eyecatcher is a building or structure that has been placed in the landscape as a focal point to "catch the eye" or gain a viewer's attention.
[99] Historic England, 2017c, *Stanley Ferry Aqueduct.* Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1005773

it was the 20th century which saw the most dramatic change. Widespread opencast extraction and industrial-scale manufacturing brought substantial change to the landscape[100]. Examples include clay extraction pits and brickworks near Newland, potteries and stone quarries at Woodlesford, and underground coal workings and opencast mines south of Normanton. The industrial boom also saw the expansion of many rural villages, which developed into larger settlements and towns as the focus of their economy changed from agriculture to industrial production.

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)[101] 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 The Farm Buildings to Former Newland Hall (NHLE 1253636) and Old Stables at Site of Former Newland Hall (NHLE 1253635) are Grade II listed buildings of moderate value

[100] Newman, P, 2016, *The Archaeology of Mining and Quarrying in England: A Research Framework for the Archaeology of the Extractive Industries in England – Resource Assessment and Research Agenda.* National Association of Mining History Organisations
[101] Supporting document: Draft Code of Construction Practice

located approximately 20m and 50m to the west of the land required for the Proposed Scheme. They comprise 17th century farm buildings with 18th and 19th century alterations, and an ornate 18th century stable block, formerly associated with Newland Hall. The farm buildings are located within an intimate setting which includes deciduous trees that filter wider views to the west and north, and a modern farm building to the north-east. The stables are located in an area of scrub/woodland. The wider setting of both assets includes the remaining features of the former Newland Park designed landscape. The key elements which contribute to their value are their historical association with the Newland Hall estate, their relationship with contemporary estate buildings, and their location within the wider estate. The setting of both assets would be affected by construction activities to the east, including the operation and movement of construction vehicles and equipment, and activities within Normanton embankment main compound. These activities would spatially and visually block the relationship between the assets and the remaining elements of Newland Park, thereby affecting the ability to understand their historical relationship with Newland Hall estate. This would result in a medium magnitude of impact and a moderate adverse effect.

9.4.6 Henge on Birkwood Common (NHLE 1005774) is a scheduled monument of high value lying partly within the land required for the Proposed Scheme. Although its date and function is debated and the most recent interpretation is that the monument's earthworks were formed as the result of an experimental mining gas explosion, the asset is designated as a possible henge of late Neolithic or early Bronze Age date. As such, it would derive most of its value from its evidential interest and its potential to contribute to an understanding of ritual monuments of this period. Further research and discussion with Historic England are ongoing to establish the date and function of this asset.

9.4.7 The henge's semi-rural setting comprises farmland, with Birkwood Road to the south and 19th century to present-day farm buildings to the south-east. The asset is located on a slight north-facing plateau with extensive views over the Calder valley to the north. As a henge, its prominent position and its views to the north may have contributed to the choice of its location, and as such would make a positive contribution to the asset's value. If the earthworks formed as a result of early 20th century mining activities, its setting within views across the Calder valley would not contribute to the value of asset.

9.4.8 The setting of Henge on Birkwood Common would be altered by the operation and movement of construction plant and vehicles on an adjacent site access road to the east, the construction of Birkwood Road overbridge and activities within Normanton cutting satellite compound and River Calder embankment satellite compound. These activities would detract from the asset's prominent location in the landscape and affect views over the Calder valley. If interpreted as a henge the ability to fully appreciate the value of the asset would be reduced. This would result in a low magnitude of impact and a moderate adverse effect.

9.4.9 The Gazebo approximately 100 metres north of Clumpcliffe Farmhouse (NHLE 1135669) is a Grade II* listed building of high value located approximately 65m from the land required for the Proposed Scheme. The gazebo (also known as an

observatory) was built in 1708 for the Savile family as part of a complex of hunting buildings which include two surviving kennel buildings (NHLE 1135670 and NHLE 1184432). The asset lies 1km from the site of Methley Hall on the edge of the designed landscape of Methley. The building derives its value from its surviving historic fabric, architectural interest, prominent topographic position and historical relationship with Methley[102].

9.4.10 The extensive views between the gazebo and the Aire valley, which extend as far as Temple Newsam House (NHLE 1255943), suggest the asset was designed as an 'eyecatcher'. It may also have been seen from within parts of the designed landscape at Methley. Its setting also includes the courtyard formed by the kennels and the collection of buildings at Clumpcliffe to the south. The asset's prominence in views and intervisibility with other historic features, as well as the agricultural character of the surrounding landscape, make a positive contribution to the asset's value. The gazebo's setting would be altered by the operation and movement of construction plant and vehicles on a temporary site access road, the forming of material stockpiles and activities within a large number of transfer nodes and satellite compounds. These activities would adversely affect views from and to the asset and therefore diminish the ability to fully appreciate its value. They would also disrupt the historical relationship between the asset, the site of Methley Hall and the surviving elements of the designed landscape at Methley. This would result in a medium magnitude of impact and a major adverse effect.

9.4.11 Leventhorpe Hall (NHLE 1247691) is a Grade II* listed building of high value located approximately 50m from land required for the Proposed Scheme. It was built in 1774 and derives its value from its architectural interest as a well-preserved example of a late 18th century country house. Its setting comprises formal gardens and grounds, associated auxiliary buildings to the east, the remaining elements of a designed landscape, and its position on a prominent escarpment overlooking the River Aire towards Woodlesford. This setting contributes to the value of the asset. Views from the principal elevation towards Woodlesford are important and contribute to the value of the building. The setting of Leventhorpe Hall would be affected by the operation of construction vehicles, the formation of a replacement floodplain storage area and Woodlesford cut and cover tunnel satellite compound. These works would introduce visual and noise disturbance into the setting and would disrupt or obscure views between the asset and Woodlesford. This would result in a low magnitude of impact and a moderate adverse effect.

Permanent effects

9.4.12 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.

[102] The extent of the designed landscape at Methley has been identified from historic mapping and site inspection.

9.4.13 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.

9.4.14 The following non-designated heritage assets have been identified as cropmarks on aerial photographs. They are characteristic of Iron Age or Romano-British rural settlement in West Yorkshire. The moderate value of these assets is derived from their potential to contribute to an understanding of land use during the Iron Age and Romano-British and transition between the two periods. Their removal during construction of the Proposed Scheme would constitute a high magnitude of impact and a major adverse effect:

- Iron Age/Roman enclosure complex (cropmarks), Gled Hill (WYHER 559);
- Savile Park Farm, enclosure (cropmark) (WYHER 4513);
- Ditched enclosure, associated field boundaries (cropmarks) (WYHER 4521);
- Swillington Common, circular ditched feature and two parallel linear features (cropmark);
- Birkwood Plantation, enclosure (cropmark);
- Deanfield, Iron Age/Romano-British/post-medieval field boundaries;
- Iron Age/Roman enclosure (cropmark), Warmfield (WYHER 569); and
- Iron Age/Roman trackway & field boundaries (cropmarks), Scholes Hill (WYHER 4519).

9.4.15 Newland Park, late prehistoric/Romano-British enclosure and field system was identified during archaeological evaluation and is of moderate value. The removal during construction of the Proposed Scheme, of archaeological remains associated with this enclosure and field system, would constitute a high magnitude of impact and a major adverse effect.

9.4.16 Bullerthorpe Medieval Settlement (WYHER 616) is represented by earthworks. The value of this asset is derived from its potential to contribute to our understanding of medieval settlement, contraction and desertion. It is of moderate value. The asset is located within land required for the Proposed Scheme and would be removed. This would constitute a high magnitude of impact and a major adverse effect.

9.4.17 Although the date and function of a ditch at Gamblethorpe Cottage (WYHER 4695) identified on aerial photography is not known, it is on the projected line of Grim's Ditch and is of moderate value. Its value is derived from the potential it has to contribute to our understanding of Grim's Ditch. The removal of the asset during construction of the Proposed Scheme would constitute a high magnitude of impact and a major adverse effect.

9.4.18 The Smithy, Swillington (WYHER 15979); Blacksmith Cottage, Swillington; Savile Park Farm, Methley Lanes and Top Farm, Altofts are historic buildings of late 18th or 19th century date. As examples of common building types they are of low value. Their

removal during construction of the Proposed Scheme would constitute a high magnitude of impact and a moderate adverse effect.

9.4.19 Two areas of surviving ridge and furrow earthworks of low value have been identified within the land required for the Proposed Scheme at Gled Hill (WYHER 6201) and Cockpit Round (WYHER 5236). Surviving ridge and furrow earthworks are uncommon in West Yorkshire. The removal of these areas during construction of the Proposed Scheme would constitute a high magnitude of impact and a moderate adverse effect.

9.4.20 Two fragments of sunken road of low value (Medieval Hollow Way and Trackway (cropmark), WYHER 4205 and Medieval/Post-Medieval hollow way (earthwork), WYHER 15388) have the potential to contribute to an understanding of medieval road systems. Their removal during construction of the Proposed Scheme would constitute a high magnitude of impact and a moderate adverse effect.

9.4.21 The following non-designated heritage assets of low value have been identified as cropmarks on aerial photographs or from LiDAR as surviving earthworks. They are either characteristic of features associated with post-medieval field systems or are of unknown function or date. Their removal during construction of the Proposed Scheme would constitute a high magnitude of impact and a moderate adverse effect:

- Bank of uncertain date or function (cropmark) (WYHER 4523);
- Fragmentary Linear Cropmarks (WYHER 4572);
- Templethorpe Farm, ditch; and
- Top Farm, linear cropmarks.

9.4.22 Methley Deer Park (site of) (WYHER 4004) is a well-documented late medieval deer park. While it has been largely incorporated into a later designed landscape, elements of the deer park, such as the park pale may survive, and the boundary of the deer park as documented on early mapping is traceable in the current landscape. The Proposed Scheme would bisect the known extent of the deer park and remove any surviving archaeological remains of the asset within the land required for construction of the Proposed Scheme. This would constitute a high magnitude of impact and a moderate adverse effect.

9.4.23 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 the Farm Buildings to Former Newland Hall (NHLE 1253636) and Old Stables at Site of Former Newland Hall (NHLE 1253635), Grade II listed buildings of moderate value located approximately 20m and 50m to the west of the land required for the Proposed Scheme (for setting description see Section 9.4.6), would be affected by the formation of Normanton embankment and cutting. The embankment would remove surviving elements of the former designed landscape, detracting from the ability to understand the historical context of these assets in relation to Newland Park, and reducing the ability to fully appreciate them. This would be harmful to the value of these assets, and would constitute a medium magnitude of impact and a moderate adverse effect;

- The setting of Henge on Birkwood Common (NHLE 1005774), a scheduled monument of high value lying partly within land required for the Proposed Scheme (for setting description see Section 9.4.8), would be affected by components of the Proposed Scheme including Birkwood Road overbridge and the River Calder viaduct. These components would detract from the asset's prominent location in the landscape and adversely affect views between it and the Calder valley. If interpreted as a henge it would reduce the ability to fully appreciate the asset's value. This would constitute a low magnitude of impact and a moderate adverse effect; and

- The setting of the Gazebo approximately 100 metres north of Clumpcliffe Farmhouse (NHLE 1135669), a Grade II* listed building of high value located approximately 65m from the land required for the Proposed Scheme (for setting description see Sections 9.4.11-12) would be affected by the presence within views from the asset of landscape mitigation planting, Clumpcliffe Covert embankment, Oulton Beck viaduct and Fleet Lane overbridge. This would affect views to and from the heritage asset and diminish the ability to fully appreciate its value as an 'eyecatcher'. The presence of the Proposed Scheme would disrupt the historical relationship between the structure, the site of Methley Hall and the surviving elements of the designed landscape at Methley Park. In consequence, it would reduce the ability to fully appreciate the asset's value. This would constitute a medium magnitude of impact and a major adverse effect.

Other mitigation measures

9.4.24 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

9.4.25 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.

9.4.26 As no specific mitigation measures have yet been identified in relation to the heritage assets described above, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

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 CT-06 Map Series within the Volume 2: LA15 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 the following heritage assets, 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:

- Farm Buildings to Former Newland Hall (NHLE 1253636);
- Old Stables at Site of Former Newland Hall (NHLE 1253635);
- Henge on Birkwood Common (NHLE 1005774); and
- Gazebo approximately 100 metres north of Clumpcliffe Farmhouse (NHLE 1135669).

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 specific mitigation measures have yet been identified in relation to the heritage assets described above, 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 Warmfield to Swillington and Woodlesford 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 mining activity in the context of land quality 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), Leeds City Council (LCC), Wakefield Metropolitan District Council (WMDC), The Coal Authority, the Environment Agency, Fera Science Ltd (FSL)[103] and the Animal and Plant Health Agency (APHA). 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: LA15 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)[104].

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.

[103] Formerly known as the Food and Environment Research Agency
[104] 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[105] identified on published mineral 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 Minerals Plan).

10.2.8 The geo-conservation assessment is based upon publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data has been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, Public Health England, the Environment Agency, Natural England, LCC, WMDC, FSL and APHA records, as well as web sources such as local geological trusts.

[105] Defined in the SMR as "mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)".

Geology

10.3.2 This section describes the underlying ground conditions within the Warmfield to Swillington and Woodlesford area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate.

10.3.3 Table 20 provides a summary of the geology (made ground, superficial and bedrock units) underlying the Proposed Scheme in the study area.

Table 20: Summary of the geology underlying the Warmfield to Swillington and Woodlesford area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Deposits along the route, particularly within the immediate area of Normanton, Altofts and Methley Lanes	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not applicable
Superficial			
Peat	Isolated areas to the north and south of the River Calder	Accumulation of partially decomposed vegetation	Unproductive strata
Alluvium	Vicinity of the River Aire, Oulton Beck and River Calder	Clay, silt, sand and gravel	Secondary A
Head	Isolated area to the south-west of Swillington	Clay, silt, sand and gravel	Secondary (undifferentiated)
River terrace deposits	North of the River Aire, south-east of Woodlesford, south of Oulton Beck, area around Hungate Lane and south and east of the River Calder	Sand and gravel	Secondary A
Glaciofluvial sand and gravel	Area around Clumpcliffe, and also northern Rothwell and western Woodlesford	Sand and gravel	Secondary A
Glacial Till – Harrogate Till Formation	Isolated areas south-west of Clumpcliffe. Also area to the south of A639 Leeds Road in the north-west of Rothwell	Clay, sand and gravel	Secondary (undifferentiated)
Bedrock			
Pennine Middle Coal Measures Formation	Majority of the study area	Interbedded mudstone, siltstone and sandstone, with coal seams	Secondary A
Pennine Lower Coal Measures Formation	Smaller areas west of Swillington and to the north of Swillington Common	Interbedded mudstone, siltstone and 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, or quarries have been backfilled.

10.3.5 More extensive deposits of made ground are likely to be associated with historical industrial land-use within the study area, including open cast and underground coal mining, colliery spoil heaps, landfills, former brick works and quarries and sewage works along the potential route. Made ground is also anticipated to be associated with existing operational and former railway land within the study area, both in track bed and raised earthworks and embankments.

10.3.6 No known farm burial or pyre sites associated with the 2001 outbreak of foot and mouth disease are known to be present within the Warmfield to Swillington and Woodlesford study area. However, the APHA Foot and Mouth Disease (FMD) County Status maps[106] show West Yorkshire was a high risk county, and therefore FMD burial sites cannot be discounted. Older unrecorded sites may also be present from the 1967 outbreak. Similarly, anthrax-infected cattle burials may be present, generally relating to burials 50 to 100 years ago. However, no records have been found of any such burials. In all cases, the records do not provide an exact location for the burial or pyre sites and other, unrecorded sites are likely to be present.

Superficial geology

10.3.7 Small isolated areas of peat are located to the north and south of the River Calder, comprising partially decayed organic matter and vegetation.

10.3.8 Alluvium comprising variable proportions of clay, silt, sand and gravel occur along the courses of the rivers Aire and Calder, and Oulton Beck.

10.3.9 An isolated linear deposit of head, comprising unsorted sediment from clay up to boulder size, is located to the south-west of Swillington and aligned with an unnamed drain.

10.3.10 River terrace deposits comprising sand and gravel are present to the north of the River Aire, to the south-east of Woodlesford, to the south of Oulton Beck, in the area around Hungate Lane and to the south and east of the River Calder.

10.3.11 An area of glaciofluvial sand and gravel deposits occurs in the area around Clumpcliffe, northern Rothwell and western Woodlesford.

10.3.12 Isolated areas of Glacial Till comprising unsorted glacially derived material are located to the south-west of Clumpcliffe, and to the south of the A639 Leeds Road in the north-west of Rothwell.

[106] Animal and Plant Health Agency, (2001), Foot and Mouth Disease 2001 – County Status Map 29.10.2001. Available online at: https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001

Bedrock geology

10.3.13 The bedrock geology in this area comprises the Pennine Middle and Pennine Lower Coal Measures Formations.

10.3.14 The Pennine Middle Coal Measures Formation underlies the majority of the Proposed Scheme in this study area, and comprises cyclical[107] layers of interbedded mudstone, siltstone and sandstone with coal seams. The Pennine Middle Coal Measures Formation is characterised by well-developed cyclothems[108], good quality economically important coal seams and thick sandstone beds.

10.3.15 Many of the coal seams in the study area outcrop at the surface and have been worked economically in the past. Key seams include:

- Sharlston Top, Muck, Low, Thin and Yard Coal;
- Swinton Pottery Coal;
- Warren House Coal;
- Methley Park Rider, Upper and Lower Coal;
- Stanley Main Coal;
- Beck Bottom Stone Coal;
- Swallow Wood Coal; and
- Haigh Moor Coal.

10.3.16 There are a number of named sandstone strata within the Pennine Middle Coal Measures Formation, notably (from south to north) the Oaks Rock, Ackton Rock, Glass Houghton Rock, Horbury Rock, High Moor Rock and Thornhill Rock. There are also numerous unnamed sandstone strata outcropping along the route. Many of these sandstone strata have been historically worked for building stone and grinding stones.

10.3.17 The Pennine Lower Coal Measures Formation outcrops to the west of Swillington and to the north of Swillington Common, and also comprise mudstone, siltstone and sandstone with coal seams. The notable sandstone unit within the study area is the Emley Rock.

10.3.18 Coal seams outcropping within the Pennine Lower Coal Measures Formation in the study area include the Joan Coal, the Flockton Thin Coal and the Flockton Thick Coal.

10.3.19 The study area is punctuated by a number of north-east to south-west trending normal faults, with downthrow generally to the south-east. There are also faults orientated in a north-west to south-east direction. The faulting in the study area and

[107] Repetitive patterns of different rock layers, caused by repeated changes in the depositional environment
[108] Coarsening-upward sequences of mudstone, siltstone and sandstone, often topped with seatearths and coal seams

resulting offset of strata means that there is repetition of the units over the length of the route of the Proposed Scheme in the study area.

Radon

10.3.20 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[109].

10.3.21 The following areas of the Warmfield to Swillington and Woodlesford area lie within radon affected areas:

- from Hell Lane to Newland Park, the Proposed Scheme lies in a radon area where 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/m3) for residential properties;
- between Newland Park and the Aire and Calder Navigation, and from Robin Hood north along the A61 Wakefield Road the Proposed Scheme lies in a radon area where between 3% and 5% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m3) for residential properties; and
- the majority of the remainder of the Proposed Scheme lies in a radon area where between 1% and 3% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m3) for residential properties, with the exception of a small area in the northeast between the M1, Pontefract Lane and Bullough Lane which lies in a radon area where less than 1% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m3) for residential properties.

10.3.22 The formal ES will include an assessment of areas where there are 5% of homes estimated to have radon levels at or above 200Bq/m^3.

Groundwater

10.3.23 Four categories of aquifer have been identified within the study area, as defined by the Environment Agency.

10.3.24 Pennine Middle and Lower Coal Measures Formations, alluvium, river terrace deposits and the glaciofluvial sand and gravel are designated as Secondary A aquifers;

- glacial till and head are designated as Secondary (undifferentiated) aquifers; and
- Peat is designated as an unproductive aquifer.

[109] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html This dataset underpins Public Health England's Indicative Atlas of 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: 978-0-85951-608-2. 29 pp) available at www.ukradon.org/information/ukmaps.

10.3.25 There are no groundwater source protection zones (SPZ)[110] identified within the study area within the Warmfield to Swillington and Woodlesford area.

10.3.26 There are no Drinking Water Safeguarding Zones within the study area.

10.3.27 The Environment Agency reports that there are two licensed groundwater abstractions within the study area, used for agricultural purposes and dust suppression.

10.3.28 There are no discharge consents to groundwater within the study area.

10.3.29 There are no recorded private water supplies within the study area.

10.3.30 Details of 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 by default provided with SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

Surface water

10.3.31 The Proposed Scheme would intersect the following watercourses, from south to north. The Water Framework Directive (WFD) designation of each watercourse is shown in brackets.

- Tributary of Red Beck 3 (Ordinary Watercourse);
- Tributary of River Calder 1, 2, 3, 4, 5 and 6 (Ordinary Watercourse);
- Aire and Calder Navigation canal immediately north of Altofts Canal);
- River Calder just north of Altofts (Main River);
- Tributary of Navigation Beck 1, 2, 3 and 4 (Ordinary Watercourse);
- Almhouses Wood Drain (Ordinary Watercourse);
- Methley Lane Drain 1, 2 and 3 (Ordinary Watercourse);
- Tributary of Oulton Beck 1 and 2 (Ordinary Watercourse);
- Oulton Beck(Main River);
- Tributary of River Aire 1, 2, 3, 4, 5, 6, 7, 8 and 9 (Ordinary Watercourse);
- Aire and Calder Navigation canal west of Woodlesford to the M1 (Canal);
- River Aire near Woodlesford (Main River); and
- The Beck (Ordinary Watercourse).

[110] 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.

10.3.32 The Proposed Scheme would also intersect or run adjacent to a number of surface water features, detailed below:

- unnamed pond on dismantled railway east of Kirkthorpe;
- unnamed pond at disused brickworks south-east of Newland Hall;
- unnamed ponds on Altofts Ings;
- Cockpit Round fishing lake to the immediate north of the River Aire;
- two springs; and
- numerous field drains.

10.3.33 There are two licensed surface water abstraction located within the study area, used for agricultural spray irrigation and dust suppression.

10.3.34 There are no recorded private water supplies from surface water within the study area.

10.3.35 There are 32 discharge consents to surface water within the study area, primarily for trade or sewage discharges.

10.3.36 Further information on surface water within the Warmfield to Swillington and Woodlesford area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.37 Current potentially contaminative land uses within the study area include sewage works, landfills, electrical sub-stations, in-filled ponds, railway lines and an oil depot, together with several farms.

10.3.38 Historical land uses identified within the study area with the potential to have caused contamination include a number of farms, landfills, coal mining, extensive open cast, a brewery, potential fuel storage tanks, engineering workshops/manufacturing, garages and disused railway lines. Current and historical landfill sites located in the study area are shown in Table 21.

10.3.39 Table 22 shows current and historical mining and colliery spoil sites located in the study area. Current and historical industrial sites located in the study area are shown in Table 23.

Table 21: Current and historical landfill sites located in the study area

Name and Area Reference	Location	Description
Rudd Quarry Licensed Landfill Site LA15-73	West of Normanton ~ 570m south west of Normanton Station.	Active landfill receiving inert waste.
Skelton Grange and Oxbow Landfill LA15-102	~100m south of Newsam Green Farm, Woodlesford	Active landfill receiving industrial waste.
Welbeck Landfill Site LA15 – 267, LA15 – 265, LA15 - 264 LA15-263	Area between Goosehill and Newland Hall. Intersected by the Proposed Scheme	Active and historical landfill site. Active area opened in 2009 receiving hazardous, inert, household, commercial and industrial waste, and is lined. Historical area thought to have opened in 1998,

Name and Area Reference	Location	Description
		waste type unknown.
Swillington Park Spoil Heap and Recorded Landfill LA15 - 68	~400m north east of Fleet Bridge	Recorded landfill identified by LCC. Active dates and waste type unknown, no record of licence or licence surrender
Foxholes Bight Landfill LA15-234 and LA15-235	~330m south of Newmarket Lane-Bottom Boat Road Junction. Intersected by the Proposed Scheme	Recorded landfill identified by LCC receiving domestic and trade waste. Active dates and full extent unknown, no record of licence or licence surrender.
Undetermined Landfill LA15-123	~170m north east of Park Avenue, Warmfield. Intersected by Proposed Scheme	Undetermined Landfill identified by WMDC. Waste type and active dates unknown, no evidence of licence or licence surrender.
Undetermined Landfill LA15-237	~160m south of Parkin Farm, Scholey Hill	Undetermined Landfill identified by LCC. Waste type and active dates unknown.
Armitages Quarry Recorded Landfill LA15-141	Water Haigh Woodland Park, Aberford Road, Oulton, Leeds. Intersected by Proposed Scheme	Historical landfill site operative from 1946 to 1977. Waste thought to include colliery spoil, brickwork waste, tyres, debris, paint, asbestos and timber. Unlined.
Crossley Street Landfill LA15-125	~30m north west of Long Row-Crossley Street Junction, New Sharlston, Wakefield	Historical landfill receiving inert and commercial waste between 1988 and 1991.
Foxholes Landfill LA15-70	~370m south east of Newmarket Lane-M62 bridge	Historical landfill accepting inert, commercial and household waste between 1962 and 1977.
Gamblethorpe Landfill LA17-94	~15m south east of Newsam Green Farm, Newsam Green Road	Waste disposal site used mainly for household, commercial and industrial waste. Active 1996-present.
Land at Rear of 215 Bottomboat Road LA15-276 and LA15-107	~30m north of Bottom Boat Road, Bottom Boat	Historical landfill accepting inert and commercial waste between 1982 and 1984, and also between 1990 and 1994.
Historical Landfill LA15-120	~40m east of Wakefield Road-Boundary Road roundabout, Woodhouse	Historical landfilling active dates and waste type unknown, no record of licence or licence surrender.
To the West of Quarry Hill LA17-192	Holmfield Farm, Quarry Hill, Woodlesford	Historical landfill site receiving inert and commercial waste, operational dates and lining unknown.
Lemonroyd LA15 – 01, LA15-07	Lemonroyd Sewage Works and Lemonroyd Marina, Fleet Lane, Rothwell	Historical landfill site and sewage works used mainly for commercial waste. First input 1973.
Pottery Lane LA17-191	Pottery Lane, Woodlesford	Historical landfill accepting inert waste. The Environment Agency states this landfill as first receiving waste on 1st December 1969, with no dates provided for the last accepted waste.
Rose Cottage Farm LA17-101	10m west of Rose Cottage Farm, Rothwell Haigh	Historical landfill accepting inert, commercial and household waste. First received waste on 1st November 1982 and last waste received 27th November 1990. The Environment Agency states that this landfill shows evidence of having leachate control measures.

Table 22: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and Area Reference	Location	Description
Burcroft and Gap Lane Opencast LA15-156, LA15-134-137	Immediately south of Hell Lane-Red Lane junction New Sharlston, and ~60m south of Pineapple Cottages, A655, Warmfield. Intersected by Proposed Scheme.	Historical opencast and mine entries. Seven historical shafts and adits are shown to be present on site.
Foxholes Colliery, Metalworks and Gasworks LA15 – 53-57, LA15 – 103-104	~140m south of Newmarket Lane-Bottom Boat Road Junction, Methley Lanes. Intersected by Proposed Scheme.	Historical colliery with on-site metal works and gasworks. Six historical shafts are shown to be present on site.
St John's Colliery and Historical Landfill LA15 – 60-62, LA15 - 73, LA15 – 171-172, LA15 - 197, LA15 – 262-267	Area between Goosehill and Newland Hall. Intersected by Proposed Scheme	Historical colliery, open cast coal site and historical landfill. Five historical shafts and one potential historical adit are shown to be present on site.
Hilltop Farm LA15-199	~50m south west of Top Farm, Birkwood Road, Altofts. Intersected by Proposed Scheme.	Historical opencast. No historical shafts or adits shown to be present.
Cringlesworth tips and Altofts Ings LA15-039, LA15-038, LA15-003	Adjacent to north and south banks of River Calder, south and east of Bottom Boat. Intersected by Proposed Scheme.	Historical spoil heaps adjacent to River Calder. Likely to comprise spoil from Foxholes and Newmarket collieries.
Newmarket Colliery LA15-261	~300m east of West Hall Farm, Newmarket Lane.	Historical colliery with railway lines and spoil heaps. Four historical shafts are shown to be present on site.
Methley Park Opencast LA15 126-127, LA15-130-132, LA15-158	Immediately south of Clumpcliffe Wood, Methley Lane, and immediately west of Water Haigh Farm, Fleet Lane. Intersected by Proposed Scheme.	Historical opencast. No historical shafts or adits shown to be present.
Water Haigh Colliery LA15-048, LA15-259-260	Area between River Aire and Fleed Lane to east of Woodlesford. Intersected by Proposed Scheme.	Historical colliery, railway lines and spoil heaps. Four historical shafts are shown to be present on site.
Rothwell Haigh colliery LA15 – 48, LA15 – 88-91, LA15 – 259-260	Rothwell Country Park, Bullough Lane. Intersected by Proposed Scheme.	Deep mining. Mine shafts. Spoil heaps. Above ground infrastructure no longer remains, site now Rothwell Country Park. Four historical shafts are shown to be present on site.
Open cast coal extraction, realignment of River Aire, backfilling of former channels and open cast works with various including spoil, sludge, landfill. LA15 – 102, LA17 – 58-59, LA11 – 116, LA15 – 118, LA15 - 131	Skelton Country Park, Immediately north of River Aire and east of M1.	Opencast coal mining with unknown infill material. Further details in Table 2 (Skelton Grange and Oxbow Landfill).
Localised shallow mineral extraction	Historical areas of localised shallow mineral extraction at various locations across the study area	The historical areas of localised shallow mineral extraction were identified from historical Ordnance Survey maps and information obtained from the Coal Authority. Several sites are located within the land required for the Proposed

Name and Area Reference	Location	Description
		Scheme.

Table 23: Current and historical industrial sites located in the study area

Name and Area Reference	Location	Description
Petrol Station LA15 - 76	10m south west of Aberford Lane-Fleet Lane junction, Oulton	Current petrol station.
Foxholes Colliery, Metalworks and Gasworks LA15 – 53-57, LA15 – 103-104	~140m south of Newmarket Lane-Bottom Boat Road Junction, Methley Lanes. Intersected by Proposed Scheme.	Historical colliery and gasworks.
Garage/filling station LA15 - 118	East View, Altofts.	Historical garage.
Lemonroyd Sludge Treatment Facility LA15 - 01, LA15 - 07	Lemonroyd Sewage Works, Fleet Lane, Rothwell	Historical sewage works and landfill site used mainly for commercial waste. First input 1973.
Petroleum depot LA15 - 45	End of Fleet Lane, Rothwell. Adjacent to Proposed Scheme.	Historical fuel storage depot.
Tank LA15 - 49	End of Goosehill Lane, Goosehill.	Historical tank.
Tank at Top Farm LA15 - 50	Top Farm, Birkwood Road, Altofts. Intersected by Proposed Scheme.	Historical tank, farm buildings and probable shallow coal workings.
Tank LA15 - 14	Immediately south of Marshall Hill, Warmfield Lane, Warmfield. Intersected by Proposed Scheme.	Historical tank.
Glenoit Mills and Minerva Works LA17 – 182-183	Immediately south of Aberford Road-Aire and Calder Navigation Bridge and south west of Aire and Calder Navigation, Woodlesford.	Synthetic fibre mill and adjacent tanks.
Chemical Works LA17 - 03	200m west of Woodlesford Lock, Woodlesford.	Historical chemical works and paper mill.

10.3.40 Contaminants commonly associated with sites in Table 21 could include metals, semi-metals, asbestos, organic and inorganic compounds. Infilled pits and landfills could give rise to landfill gases such as methane or carbon dioxide and mobile contamination within leachate.

10.3.41 Contaminants associated with sites in Table 22 could include metals, semi-metals, asbestos, organic and inorganic compounds, acid mine drainage and mine gases.

10.3.42 Contaminants commonly associated with industrial sites in Table 23 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

10.3.43 There are no Control of Major Accident Hazards (COMAH) sites within the Warmfield to Swillington and Woodlesford area.

10.3.44 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).

10.3.45 There were two major and eight significant incidents reported within the study area over a 10-year period between 2000 and 2010.

10.3.46 The first major incident occurred in 2002 involving an unidentified pollutant in the Cockpit Round area, and the second occurring in 2008 involving oils and fuels in the River Calder around Newland Hall.

10.3.47 There have been eight significant pollution incidents, seven to land and one to water. Pollutants to land included tyres, construction and demolition waste, animal matter, clinical waste, tarry wastes and other wastes. The pollutants to water were alcohols / aldehydes.

10.3.48 There are two environmental permits and one integrated pollution prevention and control permit within the study area. The integrated pollution prevention and control and one environmental permit are for Yorkshire Water Services Ltd at the Lemonroyd Sludge Treatment Facility, Fleet Lane for Disposal of non-hazardous waste by physico-chemical treatment. The other environmental permit is for Shanks Waste Management at the Welbeck Household Waste Site for the disposal of household waste.

10.3.49 There are no nationally significant ecological designations as defined in the land quality section of the SMR[111] located within the study area.

Mining/mineral resources

10.3.50 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 can include sand, gravel, clay, sandstone, and coal, which can be protected via local or county level mineral 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).

Mineral plans

10.3.51 WMDC and LCC are responsible for the overall mineral and waste local plans for the study area. The Site Specific Policies Local Plan for WMDC[112] was adopted in

[111] Sensitive ecological receptors are defined as national designations such as SSSIs.
[112] Wakefield Metropolitan District Local Development Framework - Adopted 12 September 2012, Site Specific Policies Local Plan. Available online at: http://consult.wakefield.gov.uk/portal/spatial_policy/ssplp/ssplp?pointId=2345043#document-2345043

September 2012 and covers Minerals Safeguarding Areas and Mineral Reserves. The Natural Resources and Waste Local Plan[113] was adopted by LCC in January 2013 and sets out how resources will be managed over the next 15 years.

Sand, gravel and clay deposits

10.3.52 The WMDC interactive map[114] shows four minerals safeguarding areas (MSAs) within the study area. Two MSAs are located at St. south of Altofts, both for safeguarding clay reserves. Two MSAs are located to the north and south of the River Calder, near Bottom Boat, both for sand and gravel.

10.3.53 The LCC Natural Resources and Waste Local Plan[115] shows one MSA for sand and gravel within the study area, located in the area adjacent to the River Aire between Swillington and Woodlesford.

Coal mining

10.3.54 The study area has been subject to extensive open cast and deep coal mining. It is also likely that unrecorded shallow workings are present. Key coal seams outcropping in the study area are listed in Paragraph 10.3.15, and it is likely that all these seams have been worked economically in the past.

Open cast coal mining

10.3.55 LCC and WMDC identify the entire study area to be underlain by MSAs for shallow coal, which has the potential to be exploited by opencast methods. The WMDC Core Strategy[116] states that "shallow coal extraction by opencast methods is most likely to occur before some other form of development takes place on a site."

Deep coal mining

10.3.56 Geological mapping from the BGS shows that coal seams are present at depth beneath the entire study area and have the potential to be exploited in the future, for both coal and coal bed methane. However, the WMDC Core Strategy states that deep mining for coal is unlikely to be a significant development in the future.

Petroleum Exploration Development Licences/Hydrocarbons

10.3.57 The area to the south and west of Moss Carr Wood is part of the Bowland Prospective Area.

[113] Leeds City Council Adopted Natural Resources and Waste Local Plan, Adopted January 2013 (Minerals Transport - September 2015). Available online at: https://www.leeds.gov.uk/your-council/planning/natural-resources-and-waste-local-plan
[114] Wakefield Metropolitan District Local Development Framework LDF District Map. Available online at: http://map.wakefield.gov.uk/connect/analyst/mobile/#/main?mapcfg=LDFadopted&zoom=7&x=437645&y=422810&overlays=WMDC_Boundary,Natural%20Environment%20and%20Open%20Land
[115] Leeds City Council Natural Resources and Waste Map Book, January 2013. Available online at: https://www.leeds.gov.uk/docs/02%20Overview%20Maps%20Minerals%202,3.pdf
[116] Wakefield Metropolitan District Local Development Framework, Core Strategy - Adopted 15 April 2009. Available online at: http://www.wakefield.gov.uk/Documents/planning/planning-policy/local-plan/core-strategy/core-strategy.pdf

10.3.58 A 1km² Onshore Licenced Block (PEDL037) is present in the study area, to the north of Newmarket Lane and south east of Junction 30 of the M62. This is related to exploitation of coal bed methane via a well.

Geo-conservation resources

10.3.59 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geo-conservation resources has been undertaken.

Receptors

10.3.60 The sensitive receptors that have been identified within the study area are summarised in Table 24. A definition of receptor sensitivity is given in the SMR.

Table 24: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties, schools, play areas, parks, public open space	High
		Users of allotments, commercial areas, retail parks, hotels	Moderate
		Users of industrial areas	Low
	Groundwater	Secondary A aquifers Pennine Lower and Middle Coal Measures Formations Alluvium, river terrace deposits and glacio-fluvial sand and gravel	Moderate
		Secondary (undifferentiated) aquifers Head, Harrogate Till Formation	Low
	Surface waters	Aire and Calder Navigation (WFD: Good) River Calder (WFD: Moderate) Oulton Beck (WFD: Moderate) River Aire (WFD: Moderate) Ordinary Watercourses (WFD: Moderate)	Moderate Moderate Moderate Moderate Moderate
	Built Environment	Underground structures and buried services	Low
	Natural environment	Humber Estuary SSSI Impact Risk Zone (IRZ)[117]	High
		Warmfield Common, Hell Lane Railway Cutting, Goosehill Common, Former Newmarket Colliery, Altofts Ings, Foxholes, Swillington Park Lakes / Cockpit Round, Avenue Wood	Moderate

[117] 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.

Issue	Receptor type	Receptor description	Receptor sensitivity
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	MSAs – shallow coal, clay, sand and gravel	Medium
		Petroleum Exploration and Development Licence (PEDL) blocks, onshore methane vents.	High

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)[118]. 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.

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 (Section 5);
- the management of human exposure for both construction workers and people living and working nearby (Section 13);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7 and 15);
- management of any unexpected contamination found during construction (Section 11);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5 and 16);
- traffic management to ensure that there is a network of designated haul routes 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).

[118] Supporting document: Draft Code of Construction Practice

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[119] and British Standards BS10175[120] and BS8576[121].

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 with the framework set out by the Sustainable Remediation Forum UK[122]. 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 and 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: LA15 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, mining and commercial sites.

[119] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[120] British Standard, (2011), *BS10175+A1:2013 Investigation of Potentially Contaminated Sites*.
[121] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*
[122] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

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.

10.4.10 A simple summary of the baseline CSM is provided in Table 25. 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 25: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[123]	**Area name**	**Human health risk**	**Ground water risk**	**Surface water risk**	**Ecosystem risk**	**Buildings risk**
On site[124]						
LA15 - 14, LA15 – 63-64, LA15 - 122, LA15 - 124, LA15 – 134-137, LA15 – 144-145, LA15 - 156, LA15 – 173-190,LA15 – 195-196, LA15 - 214, LA15 - 218, LA15 - 244, LA15 – 256-258, LA15 – 268-270	Opencast, probable shallow workings and mine entries near Warmfield	Moderate/ low	Moderate/ low	Low	Low	Low
LA15 - 19, LA15 - 46, LA15 - 49, LA15 - 215, LA15 - 216	Historic / current railway near Warmfield	Low	Moderate/ low	Moderate/ low	Moderate/ low	Very low
LA15 - 123	Landfill near Kirkthorpe	Moderate/ low	Moderate/ low	Low	Moderate/ low	Moderate
LA15 – 60-62, LA15 - 73, LA15 – 171-172, LA15 - 197,	St John's colliery and	High	Moderate	Moderate/ low	Low	Moderate/ low

[123] Each potentially contaminated site is allocated a unique reference number.
[124] 'On site' is within the area of land required the Proposed Scheme.

Area reference[123]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA15 – 262-267	landfill site					
LA15 - 02, LA15 - 16, LA15 - 31, LA15 - 50, LA15 – 65-66, LA15 - 114, LA15 - 117, LA15 – 198-203, LA15 – 220-221, LA15 - 254	Opencast, probable shallow workings and mine entries near Altofts	Moderate/ low	Moderate/ low	Low	N/A	Moderate/ low
LA15 - 03, LA15 – 38-39, LA15 - 55, LA15 – 58-59, LA15 - 83, LA15 – 99-100, LA15 – 109-110, LA15 - 157, LA15 - 261, LA15 - 275	Newmarket & Fox colliery, spoil heaps	Moderate/ low	Moderate/ low	High	Moderate	Low
LA15 - 70, LA15 - 107, LA15 – 234-237, LA15 - 276	Landfills north of River Calder	Moderate	Moderate/ low	Moderate	Low	Moderate
LA15 – 52-54, LA15 – 56-57, LA15 – 103-106, LA15 - 111, LA15 - 245	Foxholes colliery, metal works and gasworks, mine entries	Moderate/ low	Moderate/ low	Low	Low	Very low
LA15 – 11- 12, LA15 - 35, LA15 - 241	Farms	Low	Low	Low	Low	Very low
LA15 - 51, LA15 - 163, LA15 - 223, LA15 - 225	Probable shallow workings near M62	Moderate/ low	Moderate/ low	Low	Low	Low
LA15 - 34, LA15 - 133, LA15 - 158, LA15 – 164-165, LA15 - 170, LA15 - 204, LA15 – 207-208, LA15 - 226	Methley opencast and probable shallow workings - North	Moderate/ low	Moderate/ low	Low	N/A	Low
LA15 - 30, LA15 - 92, LA15 – 130-132, LA15 – 161-162, LA15 – 166-169, LA15 - 206, LA15 - 228, LA15 – 252-253, (10887)	Methley opencast and probable shallow workings - South	Moderate/ low	Moderate/ low	Low	N/A	Moderate/ low
LA15 - 09, LA15 - 44, LA15 - 48, LA15 - 68, LA15 – 88-91, LA15 – 126-127, LA15 – 159-160, LA15 - 209, LA15 – 211-212, LA15 – 229-230, LA15 - 233, LA15 – 250-251, LA15 – 259-260	Methley Park opencast and Water Haigh colliery	Moderate	Moderate/ low	Moderate/ low	Low	Low
LA15 - 10, LA15 - 22, LA15 – 40-41, LA15 - 80, LA17 - 94,	Farms, gravel pits and vehicle	Moderate/ low	Moderate/ low	Low	N/A	Low

Area reference[123]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA15 – 282-283	storage area					
LA15 - 67, LA15 - 101	Opencast workings and mine entry near Swillington	Moderate/ low	Moderate/ low	Low	Moderate/ low	Moderate
LA15 - 231	Probable shallow workings, Swillington Common	Low	Moderate/ low	Moderate/ low	N/A	Very low
LA15 - 86, LA15 - 139, LA15 - 141	Armitage's landfill	High	Moderate/ low	Moderate/ low	N/A	Moderate
LA15 - 76, LA17 - 03, LA17 - 183, LA17 - 185, LA17 – 190-193	Works and light industries, Woodlesford	Moderate	Moderate/ low	Moderate/ low	N/A	Moderate/ low
LA15 - 102, LA15 - 232, LA17 - 57, LA17 - 59, LA17 - 90, LA17 - 101, LA17 - 116, LA17 - 118, LA17 – 131-132, LA17 - 152, LA17 - 153, (10882), (10883), (10884), (10885)	Spoil heaps, sludge beds, landfills, mine entries	Moderate	Moderate/ low	Moderate	N/A	Moderate
LA15 - 118, LA15 - 121, LA15 - 153	Garages / scrap yards, across study area	Moderate	Moderate/ low	Moderate/ low	N/A	Low
Off site[125]						
LA15 - 01, LA15 - 07	Sewage works	Moderate	Moderate/ low	Moderate/ low	N/A	Low
LA15 - 45	Petroleum depot	High	Moderate	High	N/A	Low
LA15 - 94, LA15 - 247	Gamblethorpe landfill and probable shallow workings	Moderate/ low	Moderate/ low	Moderate/ low	N/A	Low
LA15 - 120, LA15 - 125	Landfills, Woodhouse / New Sharlston	Moderate/ low	Moderate/ low	Low	Low	Moderate

[125] 'Off site' is beyond the land required for the Proposed Scheme but within 250m of it.

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. Once updated, this would also include mining related contamination.

10.4.14 All of the sites set out in Table 25 have been assessed for the change in impact associated with the construction stage of the work. Table 26 presents the summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 25 were found to have non-significant effects.

Table 26: Summary of construction CSM effects

Name and area ref[126]	Receptor	Main baseline risk	Main construction risk	Temporary effect
Opencast, probable shallow workings and mine entries near Warmfield LA15 - 14, LA15 – 63-64, LA15 - 122, LA15 - 124, LA15 – 134-137, LA15 – 144-145, LA15 - 156, LA15 – 173-190, LA15 – 195-196, LA15 - 214, LA15 - 218, LA15 - 244, LA15 – 256-258, LA15 – 268-270	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) on site	Moderate/low	High	Moderate adverse
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) off site	Moderate/low	High	Moderate adverse
Opencast, probable shallow workings and mine entries near Altofts LA15 - 02, LA15 - 16, LA15 - 31, LA15 - 50, LA15 – 65-66, LA15 - 114, LA15 - 117, LA15 – 198-203, LA15 – 220-	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) on site	Moderate/low	High	Moderate adverse
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of	Moderate/low	High	Moderate adverse

[126] Each potentially contaminated site is allocated a unique reference number.

Name and area ref[126]	Receptor	Main baseline risk	Main construction risk	Temporary effect
221, LA15 - 254	ground gases) off site			
Foxholes colliery, metalworks and gasworks, mine entries LA15 – 52-54, LA15 – 56-57, LA15 – 103-106, LA15 - 111, LA15 - 245	Controlled waters - groundwater (leaching, vertical and lateral migration from contaminated soils and waters)	Moderate/low	High	Moderate adverse
Methley opencast and probable shallow workings – North LA15 - 34, LA15 - 133, LA15 - 158, LA15 – 164-165, LA15 - 170, LA15 - 204, LA15 – 207-208, LA15 - 226	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) on site	Moderate/low	High	Moderate adverse
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) off site	Moderate/low	High	Moderate adverse
	Controlled waters - groundwater (leaching, vertical and lateral migration from contaminated soils and waters)	Low	Moderate	Moderate adverse
Methley opencast and probable shallow workings – South LA15 - 30, LA15 - 92, LA15 – 130-132, LA15 – 161-162, LA15 – 166-169, LA15 - 206, LA15 - 228, LA15 – 252-253, (10887)	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) on site	Moderate/low	High	Moderate adverse
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils and waters, inhalation of ground gases) off site	Moderate/low	High	Moderate adverse
	Controlled waters - groundwater (leaching, vertical and lateral migration from contaminated soils and waters)	Low	Moderate	Moderate adverse

10.4.15 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.

10.4.16 For mining sites, a potential for significant adverse effects has been identified associated with the uncertainty around mine gas and mine water in historical workings. For the WDES, the CoCP does not address this in detail, but is being further developed in consultation with authoritative consultees to develop mechanisms for mitigating any significant adverse effects.

Permanent effects

10.4.17 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.

10.4.18 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, when 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 negative effect and an improvement would result in positive effects.

10.4.19 The assessment demonstrates that there would be no significant permanent effects in the Warmfield to Swillington and Woodlesford area.

10.4.20 In relation to the potential significant effects associated with mining sites at construction stage, there will be a greater level of knowledge and understanding of the mine workings ground model and the best means to mitigate the potential effects on a permanent basis.

10.4.21 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

10.4.22 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[127] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.23 The area required for construction of the Proposed Scheme intersects an MSA for sand and gravel adjacent to the River Calder.

[127] 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.

Temporary effects

Sand, gravel and clay deposits

10.4.24 Although the area required for construction of the Proposed Scheme intersects an MSA for sand and gravel, no construction compounds are located in this area. Therefore, the effects of the Proposed Scheme on sand, gravel and clay deposits would be negligible.

Coal mining

10.4.25 As there are no currently worked opencast sites or deep mines within the study area, there are no effects on coal mining. There are currently no known plans for future opencast sites.

Petroleum Exploration Development Licences

10.4.26 The route of the Proposed Scheme would cross an area underlain by a PEDL and a mine gas extraction well. The effect of construction of the Proposed Scheme on these would be negligible. The construction of the Proposed Scheme would be unlikely to place a constraint on future exploitation of potential sources of shale gas. The resource is potentially present, deep underground and would remain accessible across the licensed area.

Permanent effects

Sand, gravel and clay deposits

10.4.27 As the MSAs located within the study area do not underlie the footprint of the Proposed Scheme, there would be no permanent effects.

Coal mining

10.4.28 The effects of the Proposed Scheme on the shallow coal MSAs would be permanent where overlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority and the Coal Authority.

Petroleum Exploration Development Licences

10.4.29 The effects of the Proposed Scheme on the identified PEDLs would be negligible due to the deep nature of the identified hydrocarbons. Operation of the Proposed Scheme is unlikely to place a constraint on future exploitation of potential sources of shale gas.

10.4.30 There would be no significant permanent effects from construction of the Proposed Scheme on mining and minerals resources.

10.4.31 Table 27: Summary of effects for mining and mineral resourcesTable 27 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 27: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance (Y/N)
Clay, sand and	MSA	MSAs for clay, sand and gravel,	Medium	Negligible	Negligible (N)

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance (Y/N)
gravel		defined by LCC and WMDC			
Shallow Coal	MSA	MSAs for shallow coal	Medium	Minor	Negligible (N)
PEDL037	PEDLs, Bowland Prospective Area	Extent of hydrocarbons with potential for exploitation for gas	High	Negligible	Negligible (N)

Geo-conservation sites

10.4.32 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

10.4.33 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.

10.4.34 Mitigation of the effects on mineral resources within the proposed MSAs could include extraction of the resource in landscaping areas within the Proposed Scheme 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 SCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MSA.

Summary of likely residual significant effects

10.4.35 Based on the information currently available and with the application of the mitigation measures detailed above, no likely significant residual effects are anticipated with respect to land quality.

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 an auto-transformer station, auto-transformer feeder station and grid supply point. 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 Warmfield to Swillington and Woodlesford 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 Wakefield Metropolitan District Council (WMDC) and Leeds City Council (LCC) 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: LA15 Map Book shows the locations 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. 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)[128].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from August to September 2017 and in June 2018, and winter surveys from November 2017 to March 2018 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES.

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

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

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 (ZTVs). The ZTVs 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 ZTVs. 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. This will 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. Long distance views of up to 2km have also been considered at settlement edges, such as at Heath, Normanton, Wakefield, Stanley, Bottom Boat, Methley, Oulton, Rothwell and Woodlesford.

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 effects for year 30 will be reported in the formal ES.

11.2.8 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.

11.2.9 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 extends from Sharlston Common in the south to Swillington Common, Woodlesford and Rothwell in the north, with the large settlements of Wakefield and Leeds to the west and Normanton to the east. The underlying Pennine Coal Measures geology has defined the undulating form of the landscape, which ranges in height between 81m above Ordnance Datum[129] (AOD) near Warmfield in the south, and below 20m AOD within the gently sloping Calder and Aire river valleys. The geology has also influenced land use with many areas having undergone coal extraction. This has led to a change in landscape pattern due to the removal of older field boundaries and vegetation blocks. As a result, the arable farmland in the north and south of the study area is relatively open in character. Sand and gravel extraction has also influenced the landscape by introducing open water areas or raised landform where sites have been used for landfill. The landfill areas and spoil heaps in former colliery areas are particularly noticeable in the Calder and Aire river valleys where the landform is less undulating. Regenerating tree and shrub vegetation is also a common feature within these areas and strongly defines landscape character in areas such as Water Haigh Woodland Park.

11.3.2 The Calder and Aire river valleys cross the central part of the study area, with the Calder crossing from south-west to north-east and the Aire crossing from north-west to south-east. The Aire and Calder Navigation (main line and Wakefield branch) is a historic landscape feature running parallel to each river. The river valleys are particularly important ecologically and recreationally and include features such as the Trans Pennine Trail, Leeds Country Way, the Aire and Calder Navigation towpaths, Swillington Park fishing lakes, St. Aidan's Nature Reserve (an RSPB reserve), Water Haigh Woodland Park, Rothwell Country Park, Skelton Lake and several local wildlife sites. Both rivers are lined by trees and shrubs to a degree; however, the River Aire corridor is more densely vegetated.

11.3.3 The landscape surrounding Wakefield and Leeds contains several former or intact parkland areas including: at the derelict Newland Hall; within the Methley estate; at Leventhorpe Park; at Swillington Park; and at the registered park and gardens of Oulton Hall (Grade II former Repton landscape) and Temple Newsam (Grade II estate with Grade I Jacobean mansion). The areas contain features such as large woodland blocks, some of which are classed as ancient woodland, mature individual trees within pasture and tree avenues. Other historic features in the landscape include scheduled monuments such as Newland Preceptory and listed buildings within the Methley estate, which contribute to a sense of place.

[129] In the British Isles, an Ordnance Datum or OD is a vertical datum used by an ordnance survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD for "above Ordnance Datum". Usually mean sea level is used for the datum

11.3.4 The settlement pattern consists of rural villages such as Warmfield, Heath and Kirkthorpe, and towns and villages established around former colliery sites such as New Sharlston, Altofts, Bottom Boat, Normanton, Rothwell, Woodlesford and Swillington, which are located within the landscape to the east of Wakefield and Leeds. Urban fringe areas are often present around the settlements and evidence of this is found in the form of horse paddocks, light industry and restored opencast coal mining areas. Several linear infrastructure features are present in the landscape including the Aire and Calder Navigation, the M62, the M1, Pontefract to Wakefield Line, existing Hallam Line and several dismantled railways.

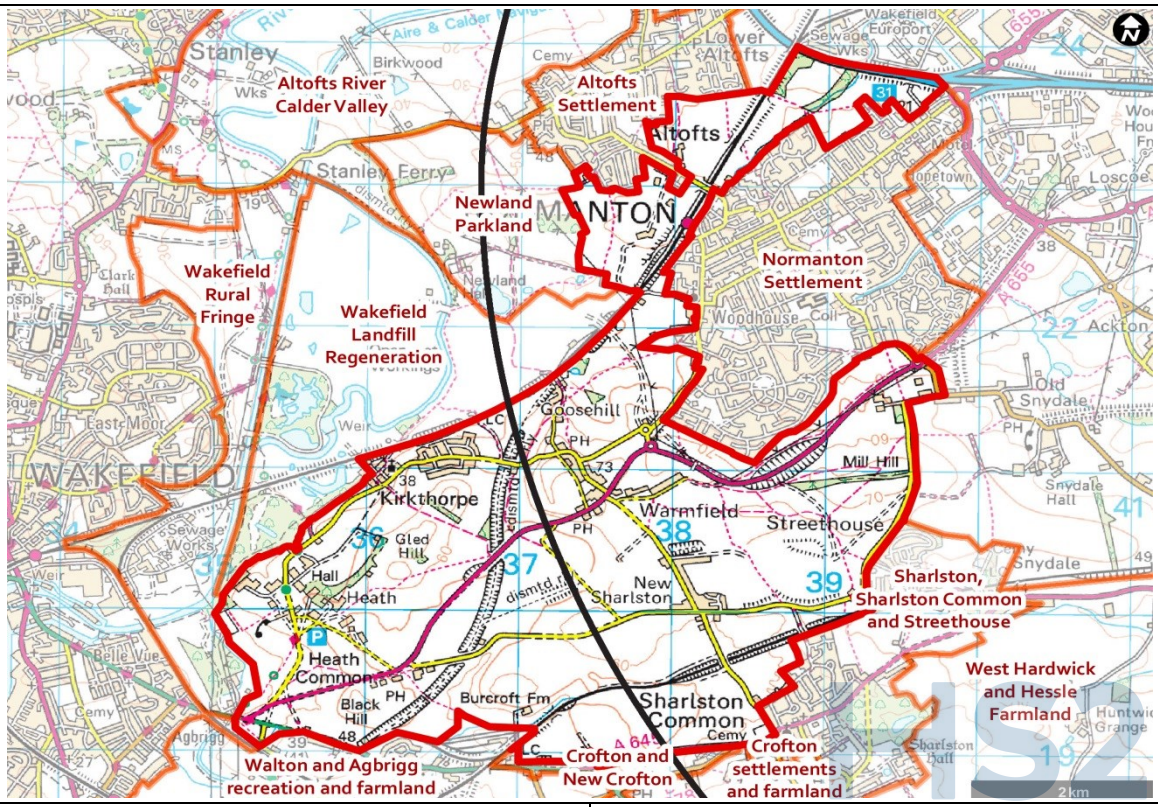
11.3.5 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic 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[130] , the Landscape Character Assessment of Wakefield District[131] and the Leeds Landscape Assessment[132] and Landscape Character Review[133]. The 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.

11.3.6 For the purposes of this assessment, the study area for Warmfield to Swillington and Woodlesford has been subdivided into 19 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. Eleven of the 19 LCAs would not be significantly affected by the Proposed Scheme as there would be no physical changes to landscape characteristics and/or the LCAs would be at a distance from the Proposed Scheme. A summary of the eight LCAs that would be significantly affected within the Warmfield to Swillington and Woodlesford area is provided in Table 28.

[130] 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
[131] Wakefield Council (2004), *Landscape Character Assessment of Wakefield District*. Available online at: http://www.wakefield.gov.uk/Documents/planning/planning-policy/information-monitoring/ldf-landscape-assessment.pdf
[132] Leeds City Council (1994), *Leeds Landscape Assessment*. Available online at: http://www.leeds.gov.uk/docs/CD11-15%20LA%20Composite%20version.pdf
[133] Leeds City Council (2011), *Landscape Character Review*. Available online at: http://www.leeds.gov.uk/docs/CD11-14%20Leeds%20Landscape%20Review%20Maps%202011.pdf

Table 28: Summary of significantly affected LCAs

Sharlston Coalfield Farmland



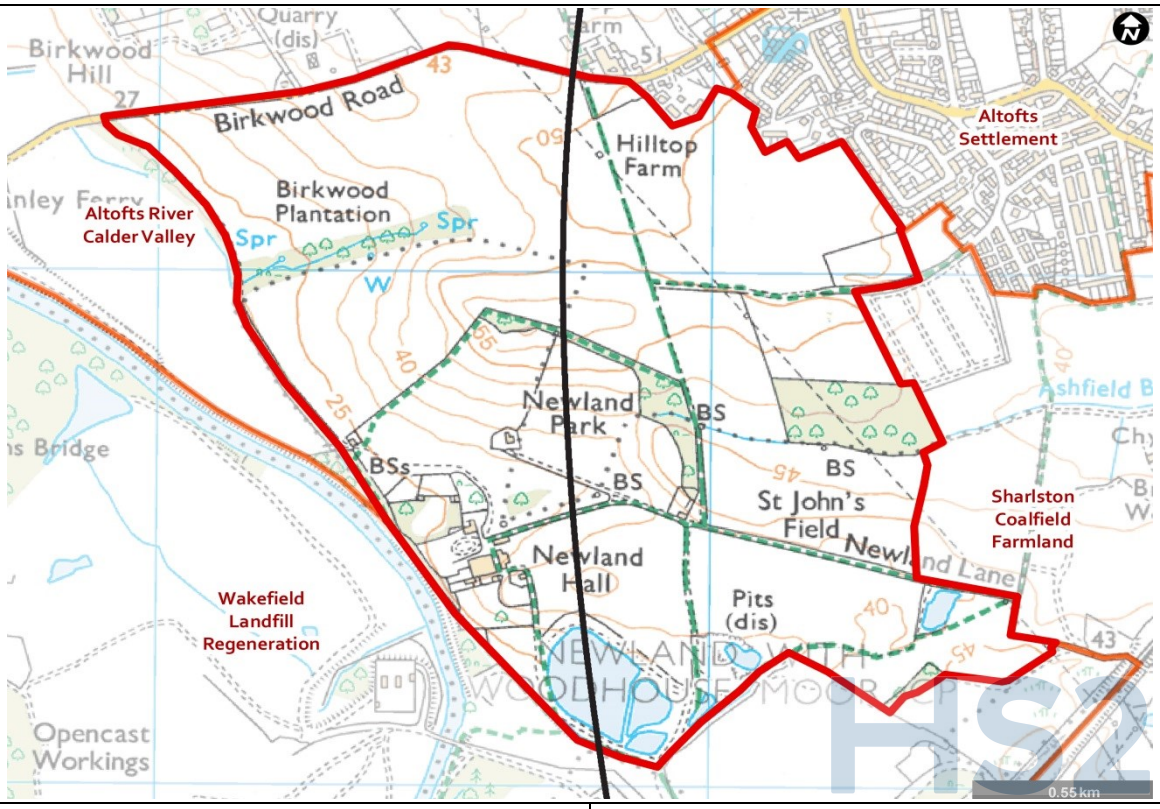
Arable farmland near Hell Lane

Dismantled railway near Warmfield

The Sharlston Coalfield Farmland LCA comprises undulating, arable farmland between the settlements of Heath, Normanton, Altofts and Sharlston Common. The landform rises to 81m AOD at Plump Hill, and 75m AOD at Peas Hill to the west of Warmfield. Fields are medium to large-scale, semi-regular in shape and bounded by degraded hedgerows and fence lines. Coal extraction, spoil heaps and intensive arable farming have resulted in field amalgamation and loss of field boundary vegetation, and have limited historic continuity and aesthetic qualities in the landscape. Tree cover is present along settlement edges and infrastructure routes, with occasional woodland blocks such as Peashill Plantation and Goosehill Common. Locally designated woodland habitat at the dismantled railway near Warmfield forms a notable landmark and contributes to landscape value. Restored opencast workings, brick works and chimneys impart an urban fringe character around the former coal mining towns of Normanton and Sharlston Common. Due to the proximity of the A655 Wakefield Road, the Pontefract to Wakefield Line and existing Hallam Line, the level of tranquillity is low. Common land at Heath and Warmfield is used recreationally, and together with a network of public rights of way (PRoW), contributes to landscape value. Generally, the open, undulating landscape allows panoramic views across the expansive, rural landscape.

The value of this LCA is medium as the landscape is largely modified by coal extraction and arable farming; however, there is an expansive, rural character and valued features such as the woodland at the dismantled railway near Warmfield.

Newland Parkland



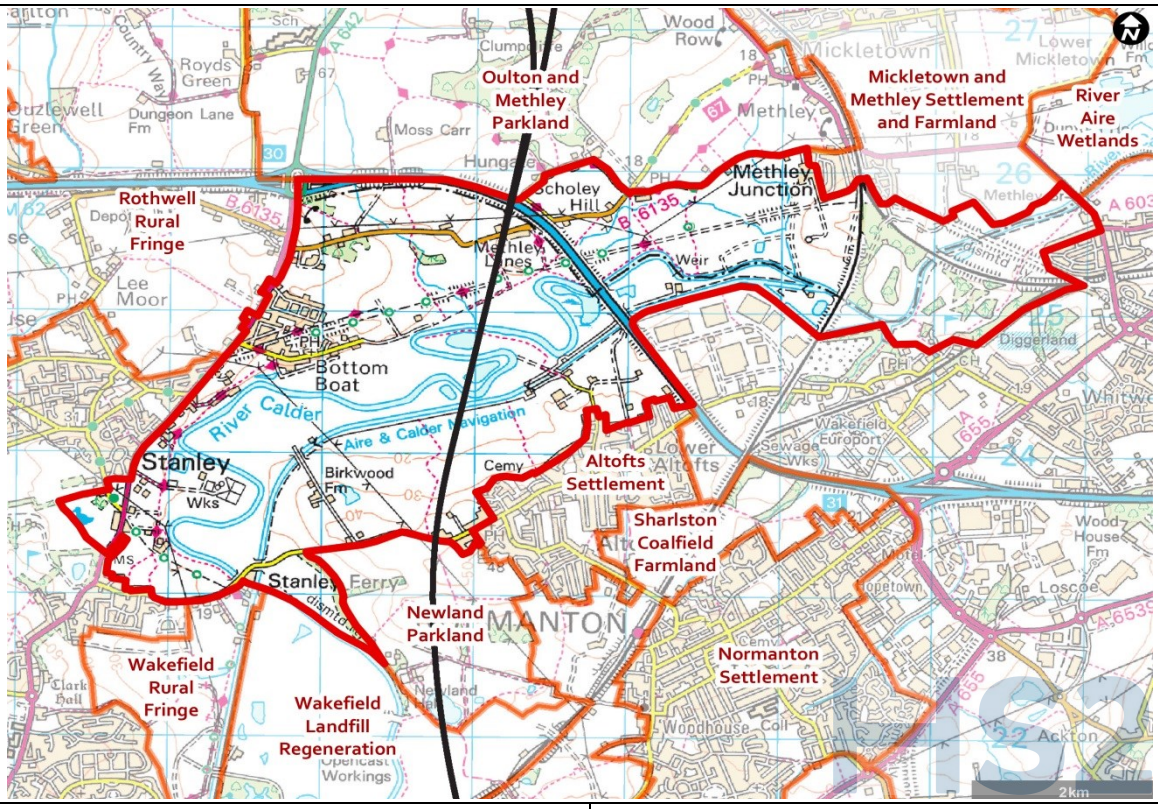
Arable farmland with wooded ridgeline beyond

Pasture fields and parkland trees near the fishing lake

The Newland Parkland LCA is a former parkland area at the derelict 18th century Newland Hall west of Normanton. The landform is 'bowl-like' and at the north of the LCA rises to a wooded ridgeline at approximately 50m AOD, before descending to meet Birkwood Road. The landform is reinforced by woodland belts to the north, south and west, including Ruddings Wood and Birkwood Plantation. Small-scale pasture fields with mature parkland trees are present near the Newland Hall complex, with small to medium-scale arable fields elsewhere. The pasture fields and parkland trees contribute to a sense of place, along with a dry stone boundary wall and gate posts, the remnants of a former summer house, the Yorkstone woolpack route, listed buildings at the Newland Hall complex and the Newland Preceptory Scheduled Monument. The presence of several PRoW and a fishing lake contribute to landscape value. The enclosure by woodland and landform creates a distinctive small-scale, intimate, rural landscape, and the wooded ridgeline to the north is visible in the wider landscape and forms a backdrop to views within the LCA. However, the parkland landscape is not intact, there is a strong visual connection with the detracting Welbeck landfill site in the adjacent LCA and noise from moving machinery reduces the level of tranquillity.

The value of this LCA is medium due to the intimate, rural character and the presence of distinctive features in the parkland landscape such as the prominent wooded ridgeline; however, the parkland landscape is not intact due to previous industrial activity.

Altofts River Calder Valley



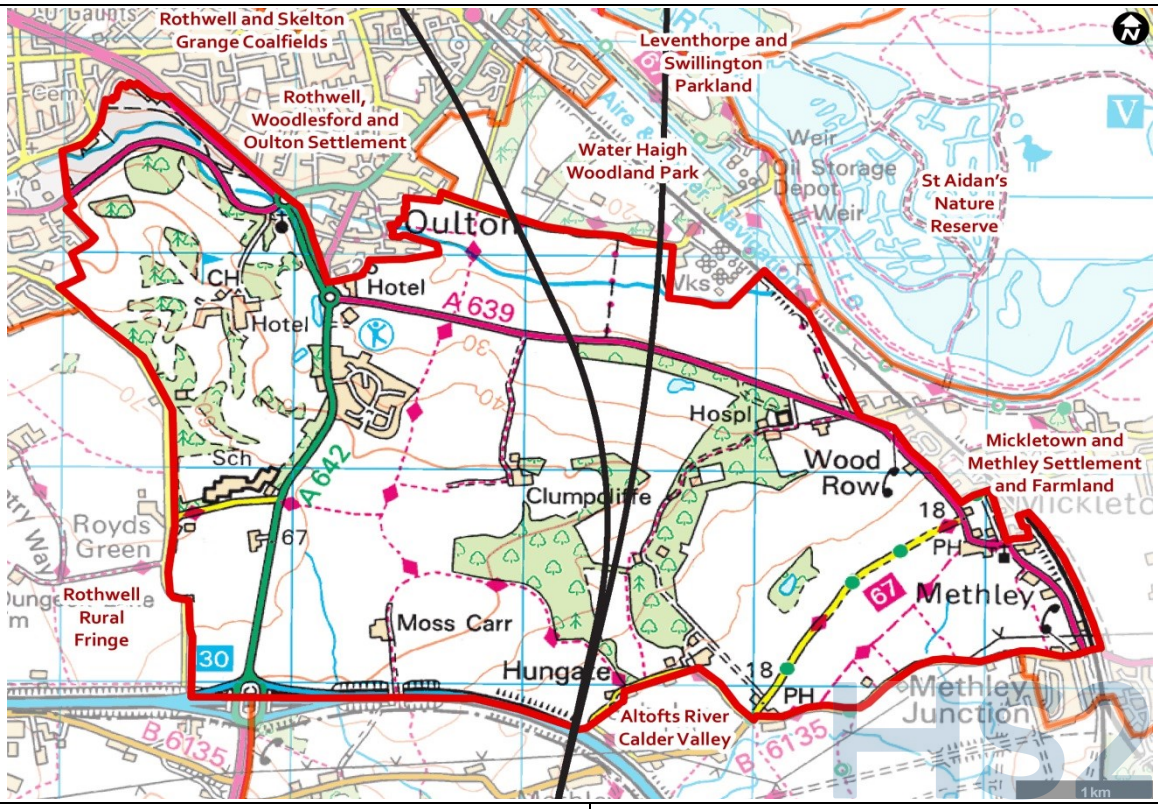
Gently sloping arable fields near Altofts

Aire and Calder Navigation (Wakefield branch) towpath

The Altofts River Calder Valley LCA encompasses the wide, flat to gently sloping valley of the River Calder and the Aire and Calder Navigation (Wakefield branch) between Stanley, Methley Junction and Altofts. Coal mining and landfill activities have introduced raised landform into the flat valley and have limited historic continuity and aesthetic qualities. Locally designated woodland, wetland and standing water habitats follow the river corridor such as at Altofts Ings and the former Newmarket Colliery. The river, canal and associated habitats contribute to a strong sense of place. Small to medium-scale pasture and arable fields bordered by fences or hedgerows are present on the valley sides. Several historic hedgerow boundaries are evident, albeit degraded, with some removed to create larger, more open fields as a result of the intensification of farming. Mature trees, shrubs and woodland blocks are found intermittently, including a distinctive linear belt along the dismantled railway now used by the Trans Pennine Trail. Several other PRoW cross the LCA including a well-used route along the canal towpath. A fishing lake at Birkwood Farm also contributes to recreational value. Development consists of scattered residential properties, pylon lines and the NewCold Advanced Cold Logistics warehouse. This 40m high white clad building is a prominent landmark due to its uncharacteristic scale, which contrasts with the rural nature of views within the predominantly remote valley. Motorway traffic noise in the north detracts from an otherwise tranquil area.

The value of this LCA is medium due to the ecological habitats, recreational routes and the rural, remote character; however, tranquillity is reduced by motorway noise and the NewCold warehouse is a prominent detracting feature.

Oulton and Methley Parkland



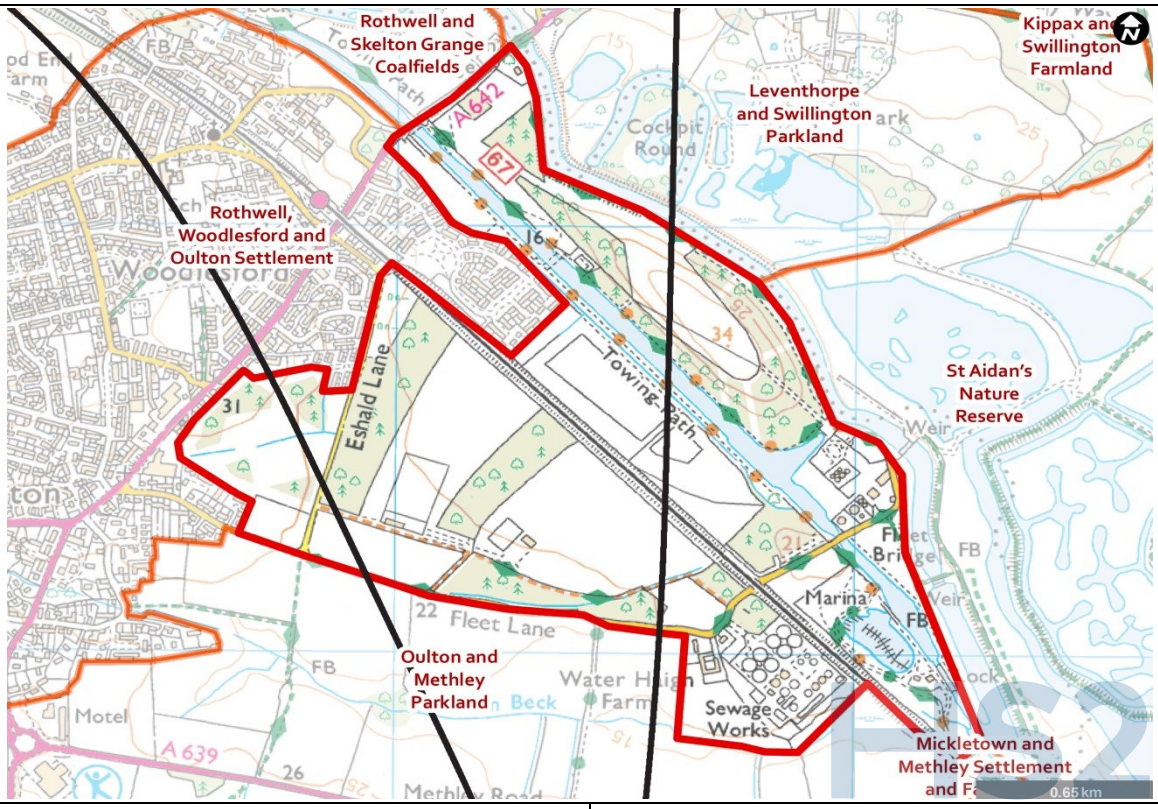
Gently sloping arable field with woodland blocks beyond

Pasture field and parkland trees within Methley estate

The Oulton and Methley Parkland LCA encompasses a rural, parkland landscape between the settlements of Methley and Oulton. The landform gently slopes from a ridgeline at Clumpcliffe at approximately 50m AOD towards the valleys of the Calder, Aire and Oulton Beck at around 20m AOD. There are several large woodland blocks including Almshouses Wood, Winter Wood and Clumpcliffe Wood, with ancient woodland at Moss Carr Wood. Land cover also consists of a formal tree avenue north of Park Lane, small-scale pasture fields, mature parkland trees and small to medium-scale, irregular arable fields bordered by fences and hedgerows. Tree cover creates enclosure and intimacy in the landscape, contributes to a strong sense of place and contains views. Mature woodland blocks often form a backdrop to views. Listed buildings at Home Farmhouse, Clumpcliffe, Methley and Oulton Hall, and elements from the Humphrey Repton landscape park and pleasure grounds at Oulton Hall Registered Park and Garden, also contribute to a sense of place. The high scenic quality is recognised by the local designation of Oulton Beck Special Landscape Area. However, much of the parkland at the Methley estate is not intact and there is a relatively low level of tranquillity due to the proximity of the M62. Several PRoW including the Trans Pennine Trail and a recreational area at Rothwell Leisure Centre contribute to landscape value.

The value of this LCA is medium to high due to the presence of parkland trees and woodland blocks, the intimate, rural, character and high scenic quality; however, motorway noise reduces tranquillity and previous mining activity has reduced the intactness of the parkland.

Water Haigh Woodland Park



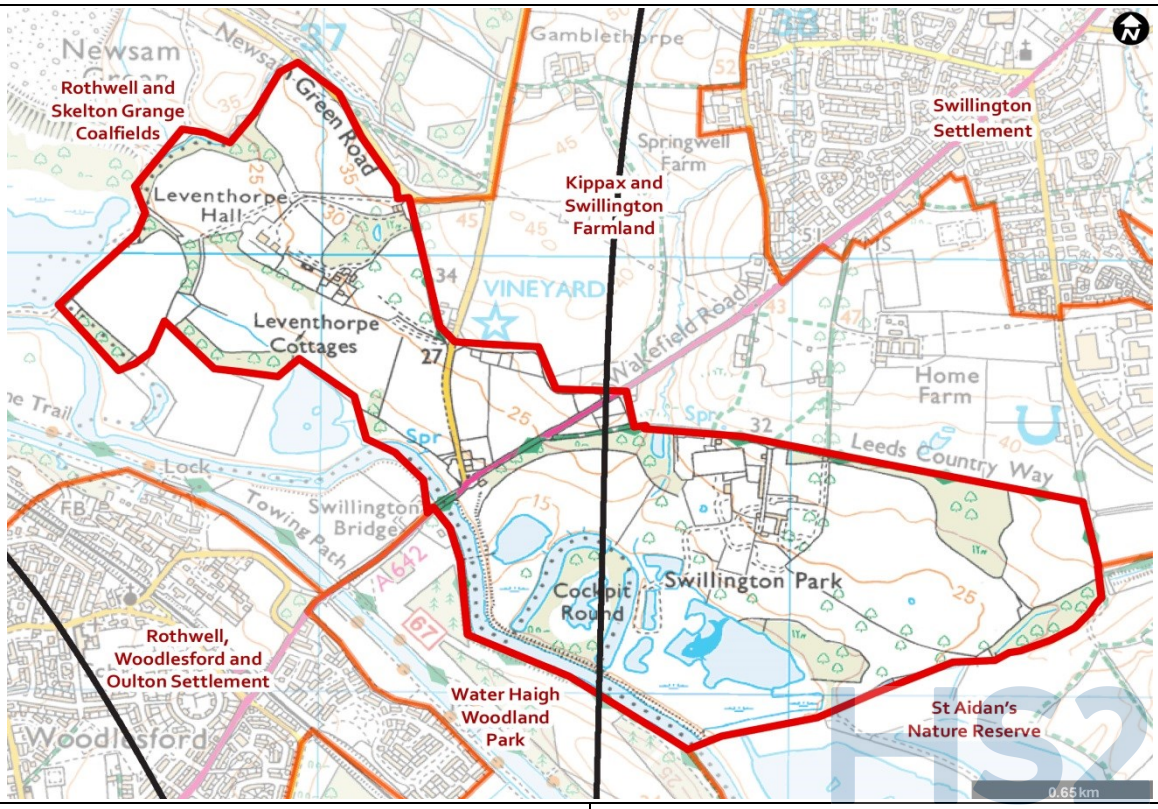
Informal grass recreation area east of football fields

Informal grass recreation area and restoration woodland

The Water Haigh Woodland Park LCA is a Yorkshire Wildlife Trust nature reserve located in an area of former industrial land restored to enhance biodiversity and green infrastructure. It is a relatively flat area dissected into four separate land parcels by Eshald Lane, the Aire and Calder Navigation (main line) and the existing Hallam Line, with the River Aire bordering the LCA to the north. A restored spoil heap from the former Water Haigh Colliery is prominent in the flat landscape. Land cover comprises large blocks of restoration woodland interspersed with swathes of rough grassland, mature trees and shrubs along the river and canal, small pasture fields, wetland, football fields and informal recreation areas. Development is limited to the West Riding County Football Association grounds, Lemonroyd Marina and a wastewater treatment works. The Trans Pennine Trail, Leeds Country Way and PRoW connecting to St. Aidan's Nature Reserve contribute to landscape value. Woodland provides a sense of enclosure, forms a backdrop to views within the LCA and creates a series of small-scale, intimate landscape spaces which are relatively tranquil. However, this is a relatively new landscape with limited historic continuity or aesthetic qualities and the various rural fringe landscape spaces are disjointed and lack character.

The value of this LCA is medium due to the presence of woodland blocks, areas used for recreation, ecological habitats and the intimate, tranquil character; however, the landscape is disjointed and strongly influenced by the urban edge.

Leventhorpe and Swillington Parkland



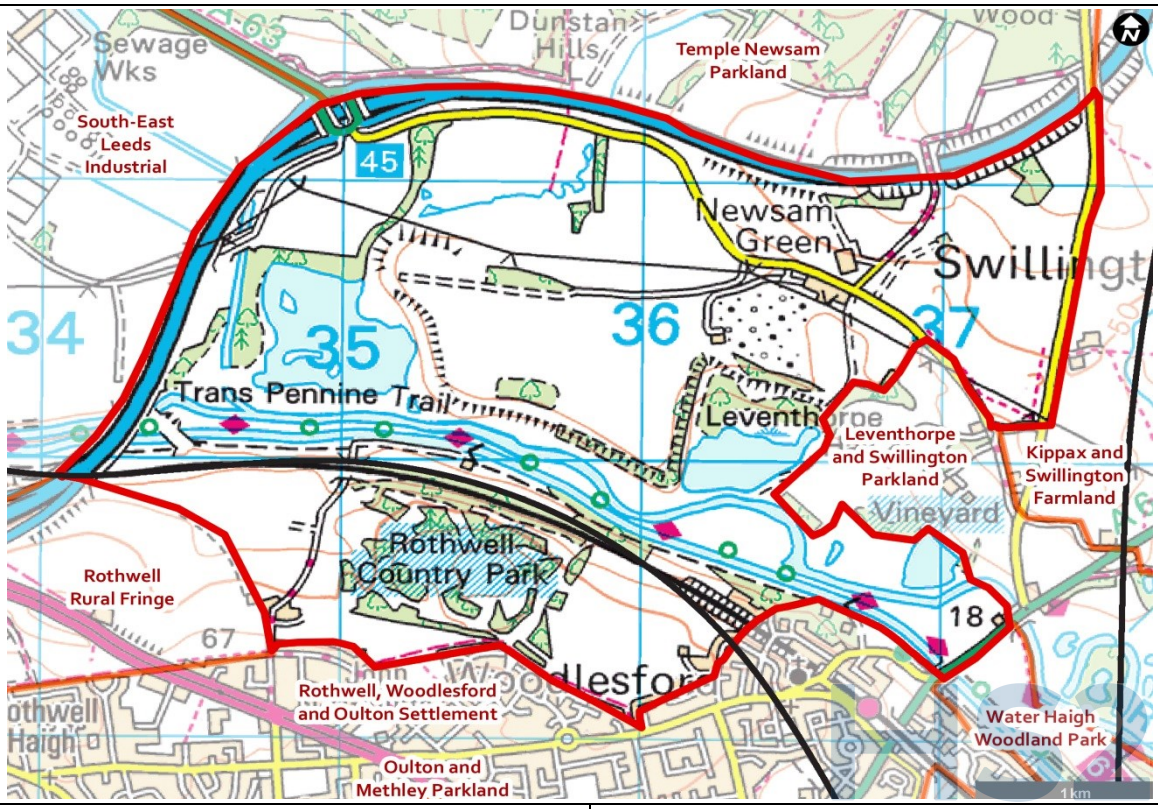
Fishing lake at Swillington Park

Lake at Leventhorpe Park

The Leventhorpe and Swillington Parkland LCA is a former parkland landscape associated with the listed Leventhorpe Hall and the now demolished Swillington House. The landform gently slopes from around 40m AOD towards the River Aire, which meanders through the southern part of the LCA. Several locally designated water features and wetland habitats are present to the north of the river. Amongst the water features are small to medium-scale pasture fields bordered by hedgerows and fences, and isolated arable fields. Large woodland blocks, tree avenues and scattered parkland trees create enclosure and intimacy, contribute to a strong sense of place and form a backdrop to views. The high scenic quality of the LCA is recognised by the local designation of Swillington/Leventhorpe Special Landscape Area. Other historic features contributing to a sense of place include listed gate piers, lodges and other ancillary buildings associated with the estate houses. Development is limited to scattered residential properties, Leventhorpe Vineyard and Swillington Organic Farm. The Leeds Country Way and a series of fishing lakes are present within Swillington Park, which contribute to landscape value. The LCA is relatively tranquil except for background noise from the M1 and the A642 Wakefield Road. Views within the LCA are generally contained by vegetation and are rural in character.

The value of this LCA is medium to high due to the presence of parkland trees, tree avenues and woodland blocks, the intimate, rural character and high scenic quality; however, background motorway noise reduces tranquillity.

Rothwell and Skelton Grange Coalfields



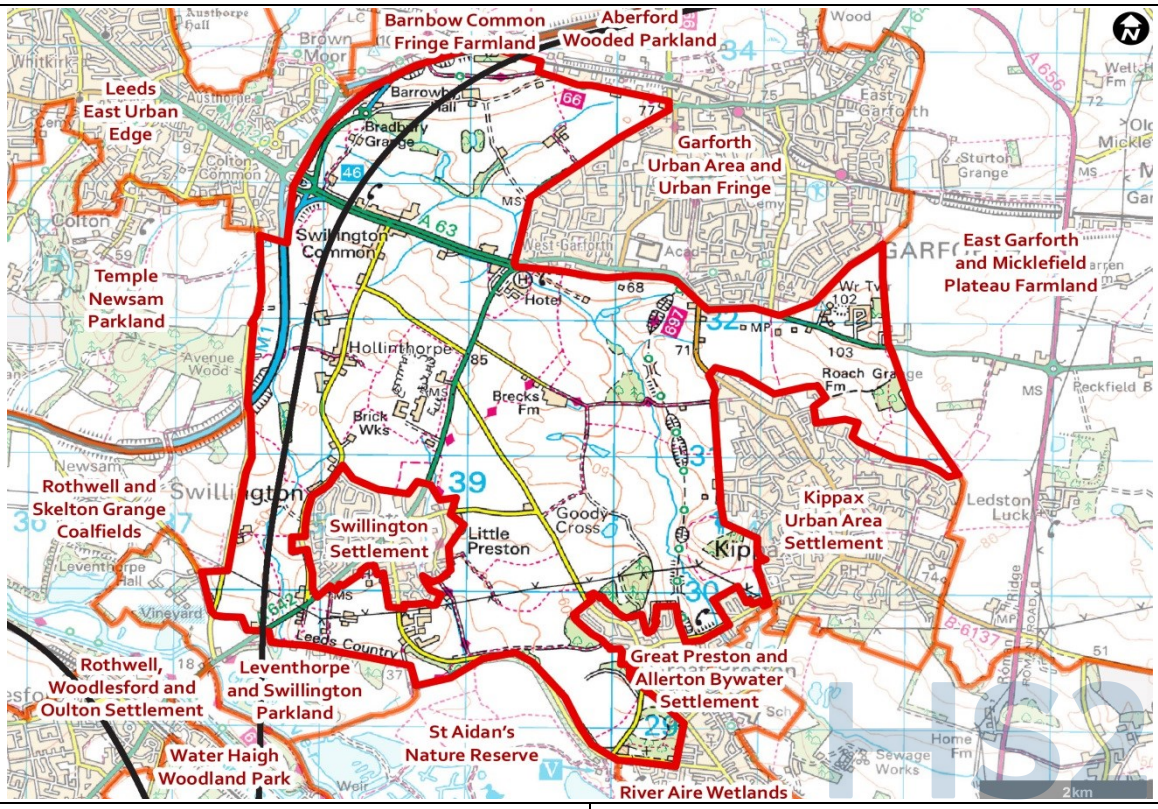
Restoration planting and footpath north of Skelton Lake

Informal footpath south of Skelton Lake

The Rothwell and Skelton Grange Coalfields LCA encompasses the River Aire valley between Rothwell and the M1. The southern side of the valley is steep and slopes between 65m and 25m AOD, whilst the northern side gently slopes between 35m and 20m AOD. Land cover consists of water features created by extraction activities and small to medium-scale pasture and arable fields bordered by fences and hedgerows. Locally designated woodland, grassland and wetland habitats are also present within the valley, such as at the restored spoil heap at Rothwell Country Park. The River Aire, Aire and Calder Navigation (main line) and existing Hallam Line are within a narrow corridor along the valley bottom. Large blocks of restoration woodland and mature trees and shrubs along the river, canal and railway provide intermittent enclosure, contrasting with the open farmland and water features. Development is limited to occasional residential properties. Extraction activities and the Skelton Grange landfill site near Newsam Green have resulted in a highly modified landscape with limited historic continuity. The Trans Pennine Trail along the canal and informal paths within Rothwell Country Park and at Skelton Lake contribute to landscape value. The level of tranquillity is relatively high within parts of Rothwell Country Park and along the Trans Pennine Trail and there is an intimate, rural character. Elsewhere, the level of tranquillity is low due to the proximity of the M1 and Skelton Grange landfill site. Woodland within Rothwell Country Park and Temple Newsam form a backdrop to views south and north respectively.

The value of this LCA is medium as it is a highly modified landscape with a detracting landfill site; however, there is an intimate, rural character and mature tree and shrub belts within the river valley.

Kippax and Swillington Farmland



Undulating pasture field near Swillington Lane

Undulating arable field near Bullerthorpe Lane

The Kippax and Swillington Farmland LCA consists of undulating, arable farmland rising northwards from the River Aire valley towards a high point of 90m AOD near Swillington Common. Generally intact, small to medium-scale fields bordered by fences and hedgerows are present around Swillington, with medium to large-scale fields further north and east. Quarrying, mining and intensification of agriculture have resulted in field amalgamation and loss of field boundary vegetation, and have limited historic continuity and aesthetic qualities in the landscape. Mature tree and shrub belts such as Parkinson's Wood and Carr Wood are present along streams, settlement edges and roads; however, the landscape is generally open in character. Light industry and horse paddocks impart an urban fringe character around the former mining towns of Swillington and Kippax. Elsewhere, development is limited and consists of scattered residential properties and farmsteads. Former parkland at Barrowby Hall (within the boundary of LA16 Garforth and Church Fenton) includes a listed hall, designed ponds, mixed plantation woodland and a mature beech tree avenue along the Leeds Country Way. Dense woodland at Temple Newsam provides a backdrop to views west. These historic and aesthetic features contribute to a sense of place. Due to the proximity of the M1 and the A63 Selby Road, the level of tranquillity is low. A network of PRoW including the Leeds Country Way contributes to landscape value. Generally, the open, undulating landscape allows panoramic views across the expansive rural landscape, particularly across the Aire valley to the south.

The value of this LCA is medium as the landscape is largely modified by coal extraction and arable farming; however, there is an expansive, rural character and valued features such as woodland at Parkinson's Wood and a mature beech tree avenue.

Visual baseline

11.3.7 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: LA15 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[134], 4: Transport, 5: Hotels/healthcare/education (none within this area) and 6: Employment (none within this area).

11.3.8 Residential views are available from a number of settlement types comprising: the towns of Normanton and Rothwell; the villages of Heath, Warmfield, Kirkthorpe, Altofts, Stanley, Methley, Oulton, Woodlesford, Swillington, Hollinthorpe and Swillington Common; and numerous farmsteads and isolated residential properties.

11.3.9 Views from residences are open or filtered[135] depending on the location. Views from the northern edge of Altofts and the western edge of Swillington are relatively open due to limited vegetation cover in adjacent fields. Conversely, views from the eastern edges of Kirkthorpe and Woodlesford are filtered by intervening vegetation, although residential properties near Chestnut Grove in Woodlesford have more open views. On the whole, views are generally filtered by vegetation along settlement edges, within surrounding farmland or along the Aire and Calder river corridors.

11.3.10 The Trans Pennine Trail is located at the River Calder, Methley estate and near Woodlesford; and the Leeds Country Way is to the north of the River Aire. Several other PRoW are located within farmland areas, particularly in the area between Normanton and the River Calder. Views from PRoW tend to be open or filtered by field boundary vegetation, although within the Methley estate, Water Haigh Woodland Park and Rothwell Country Park views are restricted by large woodland blocks.

11.3.11 Views from the Aire and Calder Navigation (Wakefield branch) and towpath are generally open; conversely, views from the Aire and Calder Navigation (main line) and towpath are filtered by canalside vegetation. Views from PRoW within St Aidan's Nature Reserve and Skelton Lake vary from being open in character to being enclosed by woodland.

11.3.12 Views from rural roads such as Hell Lane near Normanton and Birkwood Road near Altofts are open or intermittently filtered depending on the presence of roadside hedgerows and tree and shrub belts.

[134] Reference to specific footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath.
[135] Filtered views are less open due to vegetation.

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 2025 and 2029. 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)[136] 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[137];
- 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.

[136] Supporting document: Draft Code of Construction Practice
[137] *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*. London, BSI Standards Limited

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; boring of Woodlesford tunnel and construction of associated tunnel infrastructure; the construction of the Woodlesford cut and cover tunnels; the removal of existing trees and hedgerows; and the closure, realignment or diversion of existing public highways and PRoW. Other key changes include: the construction of overbridges and underbridges, an auto-transformer feeder station, grid supply point and overhead power lines; utility diversions; the presence of transfer nodes and pre-cast yards and demolitions of buildings and structures.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 29 would be significantly affected during construction of the Proposed Scheme.

Table 29: Summary description and assessment of effects on LCAs

Sharlston Coalfield Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, isolated woodland blocks and otherwise open, expansive, rural character have a medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for New Sharlston cutting and embankment, Kirkthorpe cutting and embankment and PRoW and road overbridges, as well as ancillary features such as New Sharlston embankment satellite compound, which would be at variance with the expansive, rural character of the landscape. Large-scale earthworks and temporary material stockpile areas would noticeably alter landscape character. Woodland would be removed east of Kirkthorpe and at the dismantled railway near Warmfield, which would noticeably erode aesthetic qualities and reduce the strength of character. There would also be the removal of arable farmland, and construction works for the Proposed Scheme would alter the landscape pattern, reduce field size and change field shape. Construction movements and machinery would reduce tranquillity, introduce visual disturbance in panoramic views and detract from the rural landscape, although this would be in the context of the A655 Wakefield Road, the Pontefract to Wakefield Line and existing Hallam Line. The Proposed Scheme would result in noticeable changes to key characteristics, in particular the removal of landmark woodland at the dismantled railway near Warmfield. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Newland Parkland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The small to medium-scale field pattern, bowl-like landform, intimate rural character and wooded ridgeline of the former parkland landscape have a medium to high susceptibility to change arising from the Proposed Scheme. The central part of this relatively small LCA would be directly affected by construction works for the Normanton viaduct, embankment and cutting and the PRoW overbridges, which would be at considerable variance with the intimate, rural character. There would be a substantial alteration to key	**Level of effect:** Major adverse (significant)

characteristics, particularly due to excavation works and vegetation removal for Normanton cutting along the distinctive ridgeline south of Birkwood Road. The historic parkland would be severed and construction works would alter the size and shape of the small to medium-scale historic field pattern, which would substantially alter the sense of historic continuity. In addition, new embankments and temporary material stockpile areas would be prominent within the bowl-like landform. Construction activity and machinery would reduce tranquillity, introduce visual disturbance into this small-scale area and substantially alter the rural character. There would therefore be a high magnitude of change and a major adverse effect.	
Altofts River Calder Valley	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The flat to gently sloping landform, vegetation along the River Calder and the remote, rural qualities of the landscape have a medium to high susceptibility to change arising from the Proposed Scheme. Construction works for Normanton cutting, the River Calder embankment and viaduct and Birkwood Road overbridge would directly affect the LCA and would be at considerable variance with the remote, rural character. Large-scale earthworks and temporary material stockpile areas would be prominent in the gently sloping valley side. Removal of mature woodland, trees and shrubs would open up the landscape along the river corridor, reduce the sense of enclosure and erode aesthetic qualities. Construction works would alter the size and shape of the small to medium-scale field pattern, and construction activity and machinery would reduce tranquillity and adversely alter the rural character. There would be a substantial alteration to key characteristics, particularly due to the construction of the approximately 23m high River Calder viaduct, which would be a prominent feature across the skyline and would interrupt the flow of views along the valley. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Oulton and Methley Parkland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The large woodland blocks, small to medium-scale field pattern, scenic quality, parkland trees and gently sloping landform of the former parkland landscape have a medium to high susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works associated with the Scholey Hill embankment and cutting, the River Aire embankment and viaduct, the Clumpcliffe Covert embankment and cutting and the Moss Carr Wood and Oulton Beck viaducts, which would be at considerable variance with the scenic, parkland character. Ancillary features such as the River Aire embankment satellite compound would introduce further visual disturbance. Key characteristics would be substantially altered as mature woodland, parkland trees and the small to medium-scale historic field pattern would be substantially removed. The removal of these features and severance of the parkland would reduce the scenic quality, sense of enclosure and historic continuity, including within Oulton Beck Special Landscape Area. Removal of woodland and excavation works along the ridgeline would alter the prominent and highly visible horizon. In addition, large-scale earthworks and temporary material stockpile areas would be prominent in the gently sloping landscape, and construction activity and machinery would reduce tranquillity and adversely alter the scenic, parkland character. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Water Haigh Woodland Park	**Medium susceptibility and sensitivity**
Susceptibility to change: The restoration woodland blocks, relatively flat landform, small-scale intimate rural fringe landscape and level of tranquillity have a medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for the River Aire viaduct, Woodlesford cutting	**Level of effect:** Major adverse (significant)

and the Woodlesford tunnel southern porous portal, as well as ancillary features such as the Woodlesford cutting satellite compound, which would be at considerable variance with the small-scale, intimate, rural fringe character. Excavation and tunnelling works for the Woodlesford tunnel southern porous portal would dominate the small-scale landscape character near the West Riding County Football Association grounds. Construction of the approximately 28m high River Aire viaduct would be a new prominent landscape feature due to the large scale of the structure. There would be a substantial alteration to key characteristics, in particular the removal of woodland would result in a more open landscape and would erode the sense of enclosure and aesthetic qualities. In addition, construction activity and machinery would reduce tranquillity, introduce visual disturbance into this small-scale area and adversely alter the intimate, rural fringe character. There would therefore be a high magnitude of change and a major adverse effect.	
Leventhorpe and Swillington Parkland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The small-scale field pattern, water features and mature woodland blocks within the intimate, scenic, parkland landscape have a medium to high susceptibility to change arising from the Proposed Scheme. Construction works for the approximately 28m high River Aire viaduct would directly affect the LCA and would be uncharacteristic in the gently sloping, intimate, parkland landscape. There would be a substantial alteration to key characteristics, in particular the removal of mature woodland, trees and shrubs within Swillington Park. This would result in a more open landscape and would reduce the scenic quality, sense of enclosure and historic continuity, including within the Swillington/ Leventhorpe Special Landscape Area. In addition, construction works would result in the severance of the parkland landscape at Swillington Park, and would alter the size and shape of the historic, small-scale field pattern. Construction activity and machinery would reduce tranquillity, introduce visual disturbance into this small-scale area and substantially alter the intimate, rural, parkland character. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Rothwell and Skelton Grange Coalfields	**Medium susceptibility and sensitivity**
Susceptibility to change: The tranquil, intimate, gently sloping canal corridor, and woodland and grassland habitats within Rothwell Country Park have a medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for the Woodlesford tunnel northern porous portal and the Rothwell Country Park cutting, which would be at considerable variance with the tranquil, intimate character within the river valley. Ancillary features such as the Rothwell Country Park cutting satellite compound would introduce further visual disturbance. There would be a substantial alteration to key characteristics, in particular the removal of mature woodland, trees and shrubs along the Aire and Calder Navigation (main line), eroding aesthetic qualities and reduce the sense of enclosure and strength of character. Construction works within Rothwell Country Park would limit its recreational use in some areas and result in the removal of woodland. In addition, construction movements and noise would reduce tranquillity and increase perception of movement along the canal corridor and within Rothwell Country Park. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Kippax and Swillington Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, isolated woodland blocks and otherwise open, expansive character have a medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for Swillington cutting and embankment, West Garforth north and south embankments, the West Garforth cutting and the Leeds to Selby overbridge, as well as ancillary features such as the West Garforth cutting main compound, which would be at variance with the expansive, rural character (some features are within the boundary of LA16 Garforth and Church Fenton). Large-scale earthworks and temporary material stockpiles would noticeably alter landscape character. Excavation of the West Garforth cutting, which would be up to 24m	**Level of effect:** Moderate adverse (significant)

deep, and removal of mature beech trees along the Leeds Country Way would alter the prominent and highly visible horizon. Partial removal of Parkinson's Wood and Carr Wood (within LA16 Garforth and Church Fenton) would erode aesthetic qualities and reduce the strength of character. In addition, the former parkland landscape at Barrowby Hall would be bisected by construction works, which would erode the historic continuity in the landscape slightly. Arable farmland would be removed and field size and shape altered due to construction works. Construction movements and machinery would reduce tranquillity, introduce visual disturbance in panoramic views and detract from the rural landscape, although this would be in the context of traffic on the M1. The Proposed Scheme would result in noticeable changes to key characteristics, in particular landform at West Garforth cutting and the associated removal of vegetation, and severance of the former parkland landscape. There would therefore be a medium magnitude of change and a moderate adverse effect.	

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 The construction phase potentially significant visual effects based on the current design of the Proposed Scheme are described below in Table 30. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA15 Map Book.

Table 30: Construction phase potentially significant visual effects

Views north-east from residences, Warmfield-cum-Heath Bridleway 3 and Warmfield-cum-Heath Footpath 8 at Heath (VPs 422-02-020, 422-03-033 (Map Number LV-03-422b) and 423-03-003 (Map Number LV-03-423))	**High sensitivity receptors**
Occupants of residences and users of PRoW would experience a noticeable change in long distance views as construction works associated with New Sharlston embankment, Kirkthorpe cutting and the A655 Wakefield Road viaduct would introduce new and uncharacteristic features in rural views north-east. Ancillary features such as the New Sharlston embankment satellite compound, site haul routes and temporary material stockpile areas would also reduce scenic quality, as would the removal of mature trees across the landscape. Construction works would generally be viewed against the backdrop of undulating farmland. Existing landform and vegetation would screen views towards construction works further south. Views towards construction works from PRoW within farmland to the north of the A655 Wakefield Road would be elevated and relatively open, whereas views from common land at Heath and residences along Hell Lane would be more filtered by intervening vegetation. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Views north from Hell Lane at Wakefield (VP 422-04-021 (Map Number LV-03-422b))	**Medium sensitivity receptors**
Users of Hell Lane would experience a substantial change in near distance views as construction machinery and earth moving associated with New Sharlston cutting would be visually prominent to the north. In addition, construction works for New Sharlston embankment and Kirkthorpe cutting would adversely change the rural character of middle to long distance views north. Ancillary features such as the New Sharlston cutting satellite compound, site haul routes and temporary material stockpile areas would add to the uncharacteristic features in the rural view. Construction works would generally be viewed against a backdrop of undulating farmland; however, they would be visible above the skyline at Kirkthorpe cutting. The appearance of the landscape would be more open due to the removal of intermittent mature trees. Existing landform and vegetation would screen views further north. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east and west from Warmfield-cum-Heath Bridleways 14 and 9 in Wakefield and Warmfield (VPs 423-03-006, 423-03-007, 423-03-011 and 423-03-015 (Map Number LV-03-423))	**High sensitivity receptors**
Construction works for Kirkthorpe cutting and embankment would result in a substantial change in near distance views from the PRoW as construction machinery and earth moving activity would reduce scenic quality. Construction works for New Sharlston embankment and the associated satellite compound would also be visually prominent in rural views south from PRoW near the A655 Wakefield Road. In addition, the removal of mature trees across the landscape and woodland at the dismantled railway near Warmfield would be highly apparent and would change the character of rural views. Construction works would generally be viewed against the skyline. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from residences at Warmfield (VP 423-02-009 (Map Number LV-03-423))	**High sensitivity receptors**
Occupants of residences would experience a noticeable change in elevated, middle to long distance views as construction works for the A655 Wakefield Road viaduct and New Sharlston embankment would introduce new and uncharacteristic features in rural views west. Ancillary features such as New Sharlston embankment satellite compound and transfer node south would also detract from the rural view. Removal of mature trees across the landscape would open up and change the character of views. Construction works would generally be viewed against a backdrop of undulating farmland, with views towards construction works for Kirkthorpe cutting screened by intervening landform. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views north-east from residences at East Moor and Stanley Footpath 27 (VP 424-02-001 (Map Number LV-03-424))	**High sensitivity receptors**
Users of PRoW and occupants of residences would experience a noticeable change in long distance views as uncharacteristic construction works for Normanton cutting and the River Calder embankment and viaduct would reduce the scenic quality of views north-east. The Normanton cutting and River Calder embankment satellite compounds, site haul routes and temporary material stockpile areas would also alter the rural appearance of the landscape. Removal of vegetation along the distinctive ridgeline at Newland Hall would be readily apparent. Construction works would generally be viewed against a backdrop of undulating farmland. Landform at Welbeck landfill site would screen views of construction works further south. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west and east from Newland with Woodhouse Moor Bridleway 1, Newland with Woodhouse Moor Footpaths 6 and 5 and Normanton Footpath 3 near Newland Hall (VPs 423-03-029, 423-03-031, 424-03-002, 424-03-004 and 424-03-008 (Map Number LV-03-424))	**High sensitivity receptors**
Construction works for Normanton embankment, cutting and viaduct would be visually prominent to the west or east and would result in a substantial change in near to middle distance views from PRoW, which are currently rural in character. Construction works for Normanton cutting would be most prominent as it would be up to 28m in depth and there would be the associated removal of mature trees along the ridgeline. The Normanton embankment main compound, satellite compounds, transfer nodes, site haul routes and	**Level of effect:** Major adverse (significant)

temporary material stockpile areas would add to the uncharacteristic features in the rural view. There would also be views towards construction works for new overbridges such as the Normanton Footpath 29 overbridge. Generally, construction works would be visible above the skyline. There would therefore be a high magnitude of change and a major adverse effect.	
Views west from residences at Altofts (VP 424-02-013 (Map Number LV-03-424))	**High sensitivity receptors**
Occupants of residences would experience a substantial change in near distance views as construction works, machinery and earth moving associated with Normanton cutting, Birkwood Road overbridge and the River Calder embankment and viaduct would be highly apparent in the rural landscape. Ancillary features such as Normanton cutting satellite compound, site haul routes and temporary material stockpile areas would also detract from predominantly rural views. Views towards construction works would be open due to demolition of farmstead buildings at Top Farm and removal of hedgerows and mature trees along Birkwood Road. Construction works would be viewed against the skyline. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views east from Birkwood Road at Normanton (VPs 424-04-014 (Map Number LV-03-424))	**Medium sensitivity receptors**
Construction works for Normanton cutting, Birkwood Road overbridge and the River Calder embankment would result in a substantial change in near to middle distance views from Birkwood Road as construction works, machinery and earth moving activity would reduce scenic quality. Construction works for the River Calder viaduct would also introduce uncharacteristic features into long distance, rural views north. The Normanton cutting satellite compound and site haul routes would adversely affect the rural character of near distant views south, as would the removal of hedgerows and trees along Birkwood Road. Removal of mature trees along the ridgeline to the south would be prominent in views. Construction works would be viewed against a backdrop of undulating farmland to the south and east, and viewed against the skyline to the north. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east and west from Normanton Footpaths 5 and 1 and residences in Altofts (VPs 424-03-016 and 424-03-017 (Map Number LV-03-424))	**High sensitivity receptors**
Occupants of residences and users of PRoW would experience a substantial change in near distance views as construction works, machinery and earth moving associated with the River Calder viaduct and embankment would be visually prominent to the east or west. There would also be a substantial change in middle to long distance views north due to activity associated with the construction of the northern end of the River Calder viaduct, and south from PRoW west of Altofts due to excavation works at Normanton cutting. The River Calder embankment satellite compound, site haul routes and temporary material stockpile areas would detract from rural views, as would the removal of mature trees and hedgerows across the landscape. Construction works would be viewed against the skyline due to the large-scale nature of the River Calder viaduct. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views east from residences in Stanley (VP 425-02-002 (Map Number LV-03-425))	**High sensitivity receptors**
Occupants of residences would experience a substantial change in long distance views as construction works for Normanton cutting, Birkwood Road overbridge and the River Calder embankment and viaduct would introduce new and uncharacteristic features across the rural landscape. The River Calder embankment satellite compound, site haul routes and temporary material stockpile areas would also detract from rural views, as would the removal of mature trees and hedgerows across the landscape and mature trees along the prominent ridgeline to the south. Construction works would be viewed against a backdrop of undulating farmland to the south and east, and viewed against the skyline to the north. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views east and west from the Aire and Calder Navigation (Wakefield branch) towpath, Stanley Footpath 12 and Rothwell Footpath 39 in Altofts (VPs 424-03-019, 424-03-018, 424-03-020 (Map Number LV-03-424), 424-03-021, 425-03-007, 425-03-008 and 425-03-010 (Map Number LV-03-425))	**High sensitivity receptors**
Construction works for the River Calder viaduct would reduce the scenic quality of rural views and result in a	**Level of effect:**

substantial change in near to long distance views east or west from the PRoW, with the greatest change in near distance, open views from the towpath of the Aire and Calder Navigation (Wakefield branch). Views from the canal would be sequential with construction works viewed at varying distances. Earth moving associated with the River Calder embankment would be prominent in middle to long distance views south, as would excavation works for Normanton cutting and the associated removal of mature trees along the ridgeline. The River Calder embankment satellite compound, site haul routes and temporary material stockpile areas would also detract from rural views, as would the removal of mature trees and hedgerows across the landscape. Construction works would generally be viewed against the skyline due to users being located within the base of the valley at a lower level. There would therefore be a high magnitude of change and a major adverse effect.	Major adverse (significant)
Views south-east from residences at Bottom Boat (VP 425-02-029 (Map Number LV-03-425))	**High sensitivity receptors**
Occupants of residences would experience a noticeable change in long distance views as construction works for Normanton cutting, Birkwood Road overbridge and the River Calder embankment and viaduct would be highly apparent as uncharacteristic features in the rural valley to the south-east. Temporary material stockpile areas and site haul routes would also detract from the predominantly rural view, as would the removal of mature trees and shrubs across the landscape. Excavation works for Normanton cutting and the associated removal of mature trees along the distinctive ridgeline would be prominent and visible above the skyline. Elsewhere, construction works would be viewed against the backdrop of buildings and vegetation in Altofts. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east from residences on Newmarket Lane, Methley (VP 425-02-012 (Map Number LV-03-425))	**High sensitivity receptors**
Occupants of residences would experience a substantial change in near distance views as uncharacteristic construction works for the River Calder viaduct, auto-transformer feeder station and grid supply point would reduce scenic quality to the east, as would the River Calder viaduct batching plant and satellite compound. Removal of mature trees and shrubs across the landscape, particularly the linear vegetation belt along the Trans Pennine Trail, would open up and change the character of views. Demolition of buildings at Saville Park Farm would also detract from views. Construction works would generally be viewed against a backdrop of buildings and vegetation in Altofts to the south and woodland blocks to the east. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from residences and Rothwell Footpath 40 at Methley Lanes (VPs 425-02-014 and 425-03-011 (Map Number LV-03-425))	**High sensitivity receptors**
Large-scale construction works for the River Calder viaduct would be visually prominent to the west and would result in a substantial change in near distance views for occupants of residences and users of PRoW. Views would become enclosed by a combination of construction works and the existing M62 embankments. Construction works would be in the context of the NewCold Advanced Cold Logistics warehouse in views from Rothwell Footpath 40. The removal of mature trees and shrubs along Newmarket Lane and the Trans Pennine Trail, and demolition of buildings at Saville Park Farm, would open up and change the character of views. Due to the approximately 23m high viaduct, construction works would be viewed against the skyline. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from the Leeds Country Way on Hungate Lane (VP 425-03-017 (Map Number LV-03-425))	**High sensitivity receptors**
Construction works for the River Calder viaduct and Scholey Hill embankment would introduce new and uncharacteristic features into rural views west and would result in a noticeable change in middle distance views from the PRoW. Due to the height of the River Calder viaduct above the existing M62, construction works would generally be visible against the skyline. The presence of the Scholey Hill embankment satellite compound, temporary material stockpile areas and site haul routes would also detract from views, although in the context of moving traffic on the M62. Removal of mature individual trees and hedgerow field and road boundaries would open up and change the character of views. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Views east from Rothwell Footpaths 35 and 38 and residences at Moss Carr Farm, Methley (VPs 425-03-023, 425-03-025 and 425-03-030 (Map Number LV-03-425))	**High sensitivity receptors**
Occupants of residences and users of PRoW would experience a noticeable change in middle distance views as uncharacteristic construction works for the River Calder viaduct and Scholey Hill embankment would be visually prominent in fields to the east. Construction works would generally be viewed against a backdrop of buildings within the Wakefield Europort industrial estate. Temporary material stockpile areas and site haul routes would also detract from views, although in the context of moving traffic on the M62. Removal of mature trees and woodland within the Methley estate would adversely change the character of rural, parkland views and reduce enclosure. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from Rothwell Footpath 83 at the Methley estate (VPs 425-03-021 (Map Number LV-03-425) and 426-03-002 (Map Number LV-03-426))	**High sensitivity receptors**
Users of PRoW would experience a substantial change in near distance views as construction works for the River Calder viaduct and Scholey Hill embankment would reduce the scenic quality of rural, parkland views west. Further north along the PRoW, construction works, machinery and earth moving associated with Scholey Hill cutting and Moss Carr Wood viaduct would be prominent in views. Temporary material stockpile areas and site haul routes would also detract from rural views, as would the removal of distinctive parkland trees and woodland blocks within the Methley estate. Due to the height of new structures, the tallest being the River Calder viaduct at up to 23m, construction works would be viewed against the skyline. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views east from Rothwell Footpaths 89 and 35 at Methley (VPs 426-03-004, 426-03-005 and 426-03-007 (Map Number LV-03-426))	**High sensitivity receptors**
Construction works, machinery and earth moving associated with Clumpcliffe Covert embankment and cutting, Moss Carr Wood viaduct and the A639 Methley Road underbridge would be visually prominent in rural views east and would result in a substantial change in near distance views from PRoW. Temporary material stockpile areas, site haul routes and the Clumpcliffe Covert cutting transfer node would be highly apparent in adjacent fields to the east. Removal of distinctive vegetation blocks such as parts of Moss Carr Wood would adversely change the character of rural views and open up views towards construction works in places. Construction works would generally be viewed against a backdrop of woodland blocks within the Methley estate. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views east and west from the Trans Pennine Trail and non-definitive footpaths in Water Haigh Woodland Park and residences in Woodlesford (VPs 426-03-011, 426-02-012, 426-03-016 (Map Number LV-03-426), 426-03-020 and 427-03-004 (Map Number LV-03-427))	**High sensitivity receptors**
Users of PRoW and occupants of residences would experience a substantial change in near distance views. Construction works, machinery and earth moving associated with Clumpcliffe Covert embankment, Oulton Beck viaduct and embankment and Fleet Lane overbridge would be prominent in views from PRoW and residences near Fleet Lane, with works viewed against a backdrop of woodland, sloping farmland and/or buildings within Woodlesford. Excavation for the Woodlesford cutting and Woodlesford tunnel southern porous portal would substantially reduce the scenic quality of views from near the West Riding County Football Association grounds. Construction works for the River Aire viaduct would be highly apparent from PRoW at the eastern end of Fleet Lane, although views north would be screened by vegetation. The northern end of the viaduct construction would be highly apparent in views from the north-eastern edge of Woodlesford and the Trans Pennine Trail along the Aire and Calder Navigation (main line), with works viewed against the skyline. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from non-definitive footpaths in Water Haigh Woodland Park and the Aire and Calder Navigation (main line) towpath and residences at Methley (VPs 426-03-015, 426-03-025 and 426-02-027 (Map Number LV-03-426))	**High sensitivity receptors**
Construction works and machinery associated with the River Aire viaduct would be visually prominent to the west and would result in a substantial change in near distance, rural views from PRoW. The River Aire viaduct satellite compound and site haul routes would also detract from rural views. Removal of woodland within Water Haigh Woodland Park and along the Aire and Calder Navigation (main line) would open up and	**Level of effect:** Major adverse (significant)

adversely change the character of views. Due to the approximately 23m high elevation of the viaduct, construction works would be viewed against the skyline. There would therefore be a high magnitude of change and a major adverse effect.	
Views south from Leeds Bridleway 259 near Skelton Lake (VPs 460-03-006 (Map Number LV-03-460a) and 461-03-003 (Map Number LV-03-461a))	**High sensitivity receptors**
Users of PRoW would experience a substantial change in near distance views as construction works for Rothwell Country Park cutting would introduce uncharacteristic features into rural views south, which would be viewed against a backdrop of elevated land at Rothwell. The Rothwell Country Park cutting satellite compound, site haul routes and temporary material stockpile areas would also detract from rural views. Removal of mature trees, shrubs and woodland along the existing Hallam Line and Aire and Calder Navigation (main line) would adversely change the character of views and open up views towards construction works. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views south from the Trans Pennine Trail (VPs 427-03-022, 427-03-023 (Map Number LV-03-427) and 460-03-005 (Map Number LV-03-460a))	**High sensitivity receptors**
Construction works for the Rothwell Country Park cutting and Woodlesford tunnel northern porous portal would reduce the scenic quality of rural views within the Aire valley, and result in a substantial change in near distance views from the Trans Pennine Trail. Removal of mature trees, shrubs and woodland along the existing Hallam Line and Aire and Calder Navigation (main line) would adversely change the character of views and open up views towards construction works. Ancillary features such as the Woodlesford tunnel satellite compound and temporary material stockpile areas would also introduce uncharacteristic features into rural views. Construction works would be viewed against a backdrop of steeply sloping landform at Rothwell. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north from Bullough Lane (VP 460-04-004 (Map Number LV-03-460a))	**Medium sensitivity receptors**
Users of Bullough Lane would experience a substantial change in near distance views as construction works, machinery and earth moving associated with the Rothwell Country Park cutting would be visually prominent to the north. Removal of mature trees, shrubs and woodland along the existing Hallam Line and Aire and Calder Navigation (main line) would adversely change the character of views and open up views towards construction works. Views of construction works further west and east would largely be screened by vegetation along Bullough Lane, although temporary material stockpile areas would be apparent in adjacent fields to the west. Construction works would generally be viewed against a backdrop of sloping farmland north of the River Aire. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from Swillington Footpath 33, a non-definitive footpath and Great and Little Preston Footpath 14 at St Aidan's Nature Reserve (VPs 426-03-017, 427-03-002 and 427-03-003 (Map Number LV-03-427))	**High sensitivity receptors**
Users of PRoW would experience a noticeable change in middle distance views as construction works for the River Aire viaduct would be visually prominent within the rural valley. Intermittent removal of vegetation along the northern valley side would open up views slightly. Removal of larger woodland blocks within Water Haigh Woodland Park would be more apparent and would reduce enclosure in views south. Construction works would be viewed against a backdrop of woodland, sloping farmland and buildings in Woodlesford from the higher points of St Aidan's Nature Reserve, with works viewed against the skyline closer to the River Aire due to the scale of the viaduct structure. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from Swillington Organic Farm (VP 427-03-032 (Map Number LV-03-427))	**High sensitivity receptors**
Visitors to Swillington Organic Farm would experience a substantial change in near distance views as construction activity and machinery associated with the River Aire viaduct would reduce the scenic quality of views west across the enclosed and tranquil landscape. Due to the scale of the viaduct structure, construction works would be viewed against the skyline. Removal of woodland within Cockpit Round, parkland trees within pasture fields and linear boundary vegetation along the River Aire, A642 Wakefield Road and Swillington Bridleway 25 would substantially change the character of views and open up views to construction works.	**Level of effect:** Major adverse (significant)

There would therefore be a high magnitude of change and a major adverse effect.	
Views west and east from residences, a non-definitive footpath, Swillington Bridleways 39 and 11, and Swillington Footpaths 38 and 13 at Swillington (VPs 427-02-009, 427-02-012, 427-03-005, 427-02-007, 427-03-027, 427-03-029 (Map Number LV-03-427), 428-03-003 and 428-03-017 (Map Number LV-03-428))	**High sensitivity receptors**
Construction works, machinery and earth moving associated with Swillington cutting and embankment and PRoW bridges such as Swillington Footpath 14 overbridge would introduce uncharacteristic features into rural views east or west, and would result in a noticeable change in middle distance views for occupants of residences and users of PRoW. Ancillary features such as Swillington embankment satellite compound, site haul routes and temporary material stockpile areas would also be prominent in rural views. Construction works would be relatively well contained by the undulating landform and viewed against a backdrop of farmland and intermittent vegetation. Users of PRoW near Leventhorpe Hall would also have views towards construction works and machinery associated with the River Aire viaduct within the rural valley. Removal of field boundary hedgerows and small copses within the farmland would adversely change the character of views slightly. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from residences at Swillington Common (VP 428-02-014 (Map Number LV-03-429a))	**High sensitivity receptors**
Occupants of residences would experience a noticeable change in middle distance views as construction works, machinery and earth moving associated with the A63 Selby Road viaduct and the West Garforth south and north embankments would be visually prominent to the north, west and south (some features are within the boundary of LA16 Garforth and Church Fenton). In addition, the West Garforth south embankment satellite compound would be present as an uncharacteristic feature in fields adjacent to the residences to the south. Construction works would be viewed against the skyline to the south and west, although in the context of the four lane A63 Selby Road. To the north, works would be viewed against a backdrop of woodland and undulating farmland. Removal of mature hedgerows along field boundaries would change the character of views slightly, with the partial removal of Carr Wood (within LA16 Garforth and Church Fenton) to the north reducing the enclosure of views. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate 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. 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

11.4.13 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, users of PRoW and local roads within the study area.

11.4.14 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- major adverse landscape effects in relation to six LCAs;
- moderate adverse landscape effects in relation to two LCAs;

- major adverse visual effects on views from six residential viewpoint locations;
- major adverse visual effects on views from 36 recreational viewpoint locations;
- moderate adverse visual effects on views from eight residential viewpoint locations;
- moderate adverse visual effects on views from 14 recreational viewpoint locations; and
- moderate adverse visual effects on views from three transport 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 New Sharlston embankment and Goosehill embankment) and cuttings 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;
- compensatory woodland habitat creation in areas of loss, using the same species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the partial loss of Clumpcliffe Wood and Moss Carr Wood, and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well as connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments;
- hedgerow habitat creation 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;
- compensation for loss of field ponds with wetland habitat creation at Oulton Beck and within the River Aire corridor; and
- provision of landscape mitigation planting to replace open green space at the intersection of the Woodlesford tunnel southern porous portal and Fleet Lane overbridge at Water Haigh Woodland Park and within Rothwell Country Park.

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 Goosehill, Normanton, River Calder, Moss Carr Wood and River Aire viaducts, several overbridges, the permanent highway diversion of Kirkthorpe Lane, the presence of earthworks, and the auto-transformer feeder station and grid supply point at the B6135 Newmarket Lane. 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 currently anticipated that the LCAs described in Table 31 would be significantly affected during operation of the Proposed Scheme.

Table 31: Operational phase significant landscape effects

Sharlston Coalfield Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, isolated woodland blocks and otherwise open, expansive, rural character have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the approximately 12m high New Sharlston embankment, which would be prominent within the relatively flat landscape south of the A655 Wakefield Road. There would also be an indentation up to 24m deep in the hillside at Kirkthorpe cutting. New earthworks would be at variance with the existing rural landscape character. Woodland loss to the east of Kirkthorpe and at the dismantled railway near Warmfield would noticeably erode aesthetic qualities and reduce the sense of enclosure and strength of character, in particular at the dismantled railway near Warmfield which currently forms a landmark in the landscape. There would be the permanent loss of arable land and hedgerow field boundaries, severance of the landscape pattern, a reduction in field size and a change in field shape. Limited changes would be required to the PRoW network. Moving trains would reduce tranquillity; however, this would be in the context of the A655 Wakefield Road, the Pontefract to Wakefield Line and existing Hallam Line. The Proposed Scheme would result in noticeable changes in key characteristics, in particular the addition of prominent landform features and the loss of landmark woodland. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Due to the maturing vegetation present in the landscape, effects would reduce to non-significant by year 15.	**Level of effect:** non-significant
Newland Parkland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The small to medium-scale field pattern, bowl-like landform, intimate rural character and wooded ridgeline of the former parkland landscape have a medium to high susceptibility to change arising from the Proposed Scheme. **Year 1:** The centre of this relatively small LCA would be directly affected by Normanton cutting, which would be up to 28m in depth and would substantially alter the shape of the distinctive ridgeline south of Birkwood Road. In addition, the loss of mature trees along the ridgeline would erode aesthetic qualities and reduce the sense of enclosure and strength of character. Earthworks at Normanton embankment and viaduct would introduce uncharacteristic raised features into the bowl-like landform. The Proposed Scheme would result in the bisection of the parkland landscape, loss of historic features such as the dry stone boundary wall and alteration of the size and shape of the small to medium-scale historic field pattern, which would erode the sense of historic continuity. Moving trains would reduce tranquillity. The Proposed Scheme would be at considerable variance with the intimate, rural, parkland character. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: Mitigation planting would help to integrate earthworks and structures into the surrounding landscape, replace vegetation lost, and reduce the magnitude of change to medium. However, the change in shape in the distinctive ridgeline would still be highly apparent, there would remain noticeable changes in key characteristics, and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Altofts River Calder Valley	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The flat to gently sloping landform, vegetation along the River Calder and the remote, rural qualities of the landscape have a medium to high susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the River Calder viaduct, which would be up to 23m in height.	**Level of effect:** Major adverse (significant)

The viaduct would substantially alter the landscape character of the rural valley as it would form a large-scale feature across the skyline and would interrupt the flow of views along the valley. In addition, earthworks at the River Calder embankment and Normanton cutting would be prominent in the gently sloping valley side. Loss of mature woodland, trees and shrubs within the valley would result in a more open landscape and would reduce the sense of enclosure and erode aesthetic qualities. There would be the permanent loss of arable or pasture land, severance of the landscape pattern, a reduction in field size and a change in field shape. Moving trains would reduce tranquillity. The Methley Lanes settlement and surrounding farmland would be dominated by the River Calder viaduct and existing M62 embankments, and the grid supply point and auto-transformer feeder station would be new, prominent features in the northern part of the LCA. The Proposed Scheme would be at considerable variance with the existing remote, rural character. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15: Mitigation planting would help to integrate earthworks and structures into the surrounding landscape to a degree. However, due to the large-scale, uncharacteristic nature of the River Calder viaduct and embankment in the rural landscape, there would be a substantial change in key characteristics, and a high magnitude of change and a major adverse effect would remain.	**Level of effect:** Major adverse (significant)
Oulton and Methley Parkland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The large woodland blocks, small to medium-scale field pattern, scenic quality, parkland trees and gently sloping landform of the former parkland landscape have a medium to high susceptibility to change arising from the Proposed Scheme. **Year 1:** The centre of the LCA would be directly affected by the Proposed Scheme, which would create 'islanded' parcels of land. There would be a substantial alteration in key characteristics, particularly due to the approximately 18m high Scholey Hill embankment, which would be prominent in the gently sloping landform. The adjacent Moss Carr Wood viaduct would introduce an uncharacteristic man-made structure into the rural landscape at approximately 13m in height. The parkland landscape would be bisected by the Proposed Scheme and the historic field pattern substantially altered by further reducing the small to medium-scale field size and changing field shape. In addition, the loss of woodland and parkland trees would reduce scenic quality and historic continuity, including within the Oulton Beck Special Landscape Area. Moving trains would reduce tranquillity. The loss of woodland and indentation in the ridgeline at Scholey Hill cutting would alter the prominent and highly visible horizon. The Proposed Scheme would be at considerable variance with the existing scenic, parkland character. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: Mitigation planting would help to integrate earthworks and structures into the surrounding landscape to a degree. However, there would be the permanent loss of key features such as mature parkland trees and woodland, and severance of the former parkland landscape. There would be a substantial change in key characteristics, and a high magnitude of change and a major adverse effect would remain.	**Level of effect:** Major adverse (significant)
Water Haigh Woodland Park	**Medium susceptibility and sensitivity**
Susceptibility to change: The restoration woodland blocks, relatively flat landform, small-scale intimate rural fringe landscape and level of tranquillity have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the River Aire viaduct, which would be approximately 28m in height and would introduce a substantial structure into the small-scale, intimate, rural fringe landscape. On the Leeds Spur, there would be adverse changes in landform due to the Woodlesford cutting, which would be up to 9m deep. Greater changes would arise from the Woodlesford tunnel southern porous portal, which would represent an uncharacteristic feature in the landscape and would dominate the local landscape around the West Riding County Football Association grounds. Loss of restoration woodland within Water Haigh Woodland Park would result in a more open landscape and would reduce the sense of enclosure and erode aesthetic qualities. Moving trains would reduce tranquillity. There would be a substantial change in key characteristics particularly due to the River Aire viaduct, which would form a large-scale feature across the	**Level of effect:** Major adverse (significant)

skyline. The Proposed Scheme would be at considerable variance with the existing intimate, rural fringe character. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15: Mitigation planting would help to integrate earthworks and structures into the surrounding landscape, replace vegetation lost, and reduce the magnitude of change to medium. However, the large-scale River Aire viaduct would be prominent within this relatively small LCA, there would remain noticeable changes in key characteristics, and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Leventhorpe and Swillington Parkland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The small-scale field pattern, water features and mature woodland blocks within the intimate, scenic parkland landscape have a medium to high susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the large-scale River Aire viaduct, which would be approximately 28m in height. The viaduct would be a substantial feature within the intimate, rural, parkland landscape and would be prominent across the skyline. Loss of mature woodland belts and parkland trees within Swillington Park would substantially reduce scenic quality, historic continuity and the sense of enclosure, including within the Swillington/ Leventhorpe Special Landscape Area. In addition, the Proposed Scheme would bisect the parkland landscape and alter the historic field pattern by reducing the small to medium-scale field size and changing field shape. Moving trains would reduce tranquillity in this rural and tranquil LCA, although in the context of background noise from the M62 and M1. The Proposed Scheme would be at considerable variance with the existing parkland character. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: Mitigation planting would help to integrate the River Aire viaduct into the surrounding landscape to a degree. However, due to the uncharacteristic scale of the River Aire viaduct within the rural valley and the severance of historic parkland, there would be a substantial change in key characteristics, and a high magnitude of change and a major adverse effect would remain.	**Level of effect:** Major adverse (significant)
Rothwell and Skelton Grange Coalfields	**Medium susceptibility and sensitivity**
Susceptibility to change: The tranquil, intimate, gently sloping canal corridor, and woodland and grassland habitats within Rothwell Country Park have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the Proposed Scheme, mainly due to changes in landform and vegetation. There would be noticeable changes to key characteristics, particularly due to the loss of mature woodland, trees and shrubs to accommodate the Woodlesford tunnel northern porous portal and Rothwell Country Park cutting. Vegetation loss would open up the landscape, reduce the sense of enclosure and intimacy and erode aesthetic qualities. The Proposed Scheme would also alter the landform due to the Rothwell Country Park cutting, which would be up to 5m in depth. Moving trains would reduce tranquillity within the River Aire valley, although in the context of existing trains on the existing Hallam Line and traffic on the M1. Generally, due to the already modified nature of the landscape and the presence of the existing Hallam Line within the existing landscape, the Proposed Scheme would be more readily integrated into the surrounding landscape. The Proposed Scheme would be at variance with existing landscape character. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Due to the maturing vegetation present in the landscape, effects would reduce to non-significant by year 15.	**Level of effect:** non-significant
Kippax and Swillington Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, isolated woodland blocks and otherwise open, expansive character have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the West Garforth south and north embankments and the	**Level of effect:** Moderate adverse

Swillington cutting and embankment, which would noticeably alter landscape character (some features are within the boundary of LA16 Garforth and Church Fenton). The West Garforth cutting would result in an indentation in the prominent ridgeline near Barrowby Hall and the loss of distinctive mature beech trees along the Leeds Country Way. Partial loss of woodland at Parkinson's Wood and Carr Wood (within LA16 Garforth and Church Fenton) would erode aesthetic qualities and reduce the strength of character. In addition, the former parkland landscape at Barrowby Hall would be bisected, eroding the sense of historic continuity in the landscape. The Proposed Scheme would result in the permanent loss of arable land and hedgerow field boundaries, and an alteration of the historic field pattern due to a reduction in field size and a change in field shape. Limited changes would be required to the PRoW network. There would be a reduction in tranquillity due to moving trains; however, this would be in the context of traffic on the M1. There would be noticeable changes to key characteristics due to large-scale earthworks, woodland loss and severance of the former parkland landscape. The Proposed Scheme would be at variance with the existing expansive, rural character. There would therefore be a medium magnitude of change and a moderate adverse effect.	(significant)
Year 15: Due to the maturing vegetation present in the landscape, effects would reduce to non-significant by year 15.	**Level of effect:** non-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 32 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: LA15 Map Book.

Table 32: Operation phase significant visual effects

Views north-east from residences, Warmfield-cum-Heath Bridleway 3 and Warmfield-cum-Heath Footpath 8 at Heath (VPs 422-02-020, 422-03-033 (Map Number LV-04-422b) and 423-03-003 (Map Number LV-04-423))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences and users of PRoW would experience a noticeable change in long distance views at both winter and summer of year 1. The New Sharlston embankment would be prominent within the relatively flat landscape and Kirkthorpe cutting would be visible as a break in the rounded hillside. The A655 Wakefield Road viaduct, overhead line equipment and moving trains would also be readily apparent, as would the loss of distinctive mature trees across the landscape. The Proposed Scheme would generally be viewed against a backdrop of undulating farmland. Views of the Proposed Scheme from PRoW within farmland to the north of the A655 Wakefield Road would be elevated and relatively open, whereas views from common land at Heath and residences along Hell Lane would be more filtered by intervening vegetation. Existing landform and vegetation would screen views further south. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views north from Hell Lane at Wakefield (VP 422-04-021 (Map Number LV-04-422b))	**Medium sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near distance views from Hell Lane at both winter and summer of year 1 as New Sharlston cutting would be directly adjacent and highly visible as an indentation in the hillside, with overhead line equipment and moving trains running below Hell Lane overbridge. There would also be middle to long distance views towards overhead line equipment and moving trains at New Sharlston embankment, which would be a prominent feature within the relatively flat landscape. In addition, Kirkthorpe cutting would be visible as a break in the rounded hillside. New features would generally be viewed against a backdrop of undulating farmland except where viewed above the skyline at Kirkthorpe cutting. Loss of hedgerow field boundaries and distinctive mature trees would change the character of views. Existing landform and vegetation would screen views further north. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a 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
Views east and west from Warmfield-cum-Heath Bridleways 14 and 9 in Wakefield and Warmfield (VPs 423-03-006, 423-03-007, 423-03-011 and 423-03-015 (Map Number LV-04-423))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near distance views from the PRoW at both winter and summer of year 1. The change in shape of the rounded hillside at Kirkthorpe cutting would be highly visible to the east or west. Kirkthorpe embankment, moving trains and overhead line equipment would be visible to the north, particularly due to the loss of woodland at the dismantled railway near Warmfield. New Sharlston embankment and the A655 Wakefield Road viaduct would be visible above the skyline from PRoW near the A655 Wakefield Road and would be prominent in the relatively flat landscape. Loss of mature trees across the landscape would change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, views towards earthworks and structures would be filtered by mitigation planting, reducing the magnitude of change to medium. However, the scale of Kirkthorpe cutting and the presence of New Sharlston embankment would remain noticeable in the relatively flat landscape, and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from residences at Warmfield (VP 423-02-009 (Map Number LV-04-423))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences would experience a noticeable change in middle to long distance views at both winter and summer of year 1. There would be elevated, middle distance views south-west towards the A655 Wakefield Road viaduct and New Sharlston embankment, which would be prominent in the relatively flat landscape. Associated overhead line equipment and moving trains would also be readily apparent, although new features would generally be viewed against a backdrop of undulating farmland. The Kirkthorpe cutting and views further north would be screened by existing landform. Loss of hedgerow field boundaries and distinctive mature trees would change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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

Views north-east from residences at East Moor and Stanley Footpath 27 (VP 424-02-001 (Map Number LV-04-424))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences and users of PRoW would experience a noticeable change in long distance views at both winter and summer of year 1. Normanton cutting would be visible to the north-east as an indentation in the distinctive ridgeline, particularly due to the loss of mature trees. The River Calder viaduct, which would be approximately 23m high, moving trains and overhead line equipment, would be visible in the rural valley. New features would generally be viewed against a backdrop of undulating farmland. Landform at Welbeck landfill site would screen views of the Proposed Scheme further south. There would therefore be a medium magnitude of change and a 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
Views west and east from Newland with Woodhouse Moor Bridleway 1, Newland with Woodhouse Moor Footpaths 6 and 5 and Normanton Footpath 3 near Newland Hall (VPs 423-03-029, 423-03-031, 424-03-002, 424-03-004 and 424-03-008 (Map Number LV-04-424))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near to middle distance views from the PRoW at both winter and summer of year 1. Normanton cutting would be the most prominent feature as it would be up to 28m in depth and there would be an indentation in the distinctive ridgeline and the loss of mature trees. Further south along the PRoW, there would be near distance views towards Normanton embankment and Normanton viaduct, which would be highly visible within the rural landscape and bowl-like landform. In addition, moving trains and overhead line equipment would be visible above the skyline. Loss of hedgerow field boundaries and mature trees would change the character or views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would help to filter views towards Normanton viaduct, cutting and embankment, and bridges such as the Normanton Footpath 29 overbridge. This would reduce the magnitude of change to medium; however, large-scale earthwork features and structures would remain highly visible in the rural landscape and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from residences at Altofts (VP 424-02-013 (Map Number LV-04-424))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences would experience a substantial change in near distance views at both winter and summer of year 1. Normanton cutting would be visible to the south-west as an indentation in the distinctive ridgeline, particularly due to the loss of mature trees. The River Calder embankment would be prominent in the gently sloping valley side to the north-west. The River Calder viaduct, which would be approximately 23m high, moving trains and overhead line equipment, would be visible in the rural valley. New features would generally be viewed against the skyline. Loss of farmstead buildings at Top Farm and hedgerows and mature trees along Birkwood Road would change the character of views. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would help to filter views towards Normanton cutting and the River Calder embankment and viaduct. This would reduce the magnitude of change to medium; however, the large-scale earthworks and structures would remain highly visible in the rural valley and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Views east from Birkwood Road at Normanton (VPs 424-04-014 (Map Number LV-04-424))	**Medium sensitivity receptors**
Year 1 – winter and summer: Users of Birkwood Road would experience a noticeable change in middle to long distance views at both winter and summer of year 1. There would be middle distance views south towards Normanton cutting, which would be visible as an indentation in the ridgeline, particularly due to the loss of mature trees. The River Calder embankment would be visible to the east, which would be a prominent feature in the gently sloping valley side. Birkwood Road overbridge, overhead line equipment and moving trains would also be readily apparent, and there would be middle to long distance views north towards the River Calder viaduct in the rural valley. New features would be viewed against a backdrop of undulating farmland to the south and east, and viewed against the skyline to the north. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views east and west from Normanton Footpaths 5 and 1 and residences in Altofts (VPs 424-03-016 and 424-03-017 (Map Number LV-04-424))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences and users of PRoW would experience a substantial change in near, middle and long distance views at both winter and summer of year 1. There would be near distance views towards the River Calder embankment, which would be a prominent feature in the gently sloping valley side. There would also be near to long distance views towards the River Calder viaduct as it extends across the rural valley. The viaduct would be highly prominent as it would be approximately 23m in height and there would be open views towards overhead line equipment and moving trains. Generally, earthworks, structures, moving trains and overhead line equipment would be visible above the skyline. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would filter views towards the River Calder embankment and viaduct, overhead line equipment and moving trains, reducing the magnitude of change to medium. However, the large-scale earthworks and River Calder viaduct would remain highly apparent in the landscape as they would form uncharacteristic features in the rural valley, and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east from residences in Stanley (VP 425-02-002 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in long distance views at both winter and summer of year 1. Normanton cutting would be visible as an indentation in the distinctive ridgeline to the south, particularly due to the loss of mature trees. The River Calder embankment would be prominent above the gently sloping valley side at the edge of Altofts. There would also be long distance views towards the River Calder viaduct which would be approximately 23m high, with open views towards overhead line equipment and moving trains. New features would be viewed against a backdrop of undulating farmland to the south and east, and viewed against the skyline to the north. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views east and west from the Aire and Calder Navigation (Wakefield branch) towpath, Stanley Footpath 12 and Rothwell Footpath 39 in Altofts (VPs 424-03-019, 424-03-018, 424-03-020 (Map Number LV-04-424), 424-03-021, 425-03-007, 425-03-008 and 425-03-010 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a substantial change in near, middle and long	**Level of effect:**

distance views at both winter and summer of year 1. There would be near to long distance views towards the River Calder viaduct which would be approximately 23m high, with open views of overhead line equipment and moving trains. There would also be views south towards the River Calder embankment, which would be prominent above the gently sloping valley side. New features would generally be visible above the skyline due to users being located within the base of the valley. The greatest change in views would be from the towpath of the Aire and Calder Navigation (Wakefield branch), with views from other PRoW more filtered by existing vegetation. Views from the canal would be sequential and the Proposed Scheme would be viewed at varying distances. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would help to filter views towards the River Calder embankment and viaduct, overhead line equipment and moving trains, reducing the magnitude of change to medium. However, the large-scale earthworks and River Calder viaduct would remain highly prominent as they would form uncharacteristic features in the rural valley, and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from residences at Bottom Boat (VP 425-02-029 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences would experience a noticeable change in long distance views at both winter and summer of year 1. There would be long distance views south-east towards Normanton cutting, which would be visible as an indentation in the ridgeline, particularly due to the loss of mature trees. In addition, the River Calder embankment would be a prominent feature in the gently sloping valley side. There would also be long distance views towards the River Calder viaduct which would be approximately 23m high, with open views towards overhead line equipment and moving trains. New features at Normanton cutting would be viewed against the skyline. Elsewhere they would be viewed against a backdrop of buildings and vegetation in Altofts. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views east from residences on Newmarket Lane, Methley (VP 425-02-012 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences would experience a substantial change in near distance views at both winter and summer of year 1. The River Calder viaduct, which would be approximately 23m in height, would be visible above the skyline to the east, with open views towards overhead line equipment and moving trains. The auto-transformer feeder station and grid supply point would also be highly visible in fields to the east. Loss of mature trees and shrubs across the landscape, particularly along the Trans Pennine Trail, would change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would help to filter views towards the River Calder viaduct and the overhead line equipment and moving trains, reducing the magnitude of change to medium. However, the River Calder viaduct would remain highly prominent in the rural valley and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from residences and Rothwell Footpath 40 at Methley Lanes (VPs 425-02-014 and 425-03-011 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences and users of PRoW would experience a substantial change in near distance views at both winter and summer of year 1. There would be views towards the River Calder viaduct which would be approximately 23m in height and viewed against the skyline, with open views towards overhead line equipment and moving trains. The viaduct would be taller than the nearby M62 embankments and the combination of new and existing earthworks and structures would notably change the character of views. In addition, the character of views would be more open due to mature trees and shrubs lost along Newmarket Lane and the Trans Pennine Trail, and buildings lost at Saville Park Farm. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would	**Level of effect:** Major adverse (significant)

therefore be a high magnitude of change and a major adverse effect.	
Year 15 – summer: By summer year 15, views towards the River Calder viaduct and associated overhead line equipment and moving trains would be filtered by mitigation vegetation, reducing the magnitude of change to medium. However, the tall viaduct structure in combination with existing earthworks at the M62 would notably change the character of views and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from the Leeds Country Way on Hungate Lane (VP 425-03-017 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in middle distance views at both winter and summer of year 1. The River Calder viaduct would be highly visible as it crosses the M62, as would the Scholey Hill embankment; the structures would be approximately 23m and 18m in height respectively. Overhead line equipment and moving trains would also be readily apparent and would be visible above the skyline. Loss of mature trees and hedgerow field and road boundaries would change the character of views, with more open views towards moving traffic on the M62. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views east from Rothwell Footpaths 35 and 38 and residences at Moss Carr Farm, Methley (VPs 425-03-023, 425-03-025 and 425-03-030 (Map Number LV-04-425))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences and users of PRoW would experience a noticeable change in middle distance views at both winter and summer of year 1. There would be views south-east towards the River Calder viaduct as it crosses the M62, with more open views of moving traffic on the M62 due to vegetation loss. The Scholey Hill embankment would be prominent in the gently sloping landscape and overhead line equipment and moving trains would be visible above the skyline. In addition, the character of views would be more open due to mature trees and woodland lost within the Methley estate. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views west from Rothwell Footpath 83 at the Methley estate (VPs 425-03-021 (Map Number LV-04-425) and 426-03-002 (Map Number LV-04-426))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a substantial change in near distance views at both winter and summer of year 1. The Scholey Hill embankment, which would be up to 18m in height, would be highly prominent in views to the west, with overhead line equipment and moving trains visible above the skyline. Further south along the PRoW, there would be views towards the River Calder viaduct as it crosses the M62, with more open views of moving traffic on the M62 due to vegetation loss. Further north along the PRoW, there would be views west towards the Scholey Hill cutting and Moss Carr Wood viaduct. The loss of mature parkland trees, woodland blocks and hedgerow field boundaries would change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would help to filter views of the River Calder viaduct, Scholey Hill embankment and cutting, the Moss Carr Wood viaduct, overhead line equipment and moving trains. This would reduce the magnitude of change to medium; however, the large-scale structures and earthworks would remain highly prominent in views and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Views east from Rothwell Footpaths 89 and 35 at Methley (VPs 426-03-004, 426-03-005 and 426-03-007 (Map Number LV-04-426))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near and middle distance views at both winter and summer of year 1. The Clumpcliffe Covert embankment, which would be up to 12m in height, would be prominent in views to the east. There would also be views south-east towards the Clumpcliffe Covert cutting, with the embankments and bridge at the Moss Carr Wood viaduct visible in the background. Overhead line equipment and moving trains would generally be visible above the skyline except where screened by the Clumpcliffe Covert cutting. New structures and earthworks and loss of distinctive vegetation blocks such as parts of Moss Carr Wood would change the character of previously rural views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, views towards Clumpcliffe Covert cutting and embankment, Moss Carr Wood viaduct and overhead line equipment and moving trains would be filtered by mitigation planting. This would reduce the magnitude of change to medium; however, the large-scale structures and earthworks would remain highly prominent in previously rural views and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east and west from the Trans Pennine Trail and non-definitive footpaths in Water Haigh Woodland Park and residences in Woodlesford (VPs 426-03-011, 426-03-016, 426-02-012, (Map Number LV-04-426), 426-03-020 and 427-03-004 (Map Number LV-04-427))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW and occupants of residences would experience a substantial change in near and middle distance views at both winter and summer of year 1. Clumpcliffe Covert embankment, Oulton Beck viaduct and embankment and Fleet Lane overbridge would be highly visible in views from PRoW and residences near Fleet Lane, and would form prominent man-made features within the rural landscape. Generally, new features would be viewed against a backdrop of woodland, sloping farmland and/or buildings within Woodlesford. The Woodlesford cutting and Woodlesford tunnel southern porous portal would notably change the character of views and would be highly visible to users of PRoW near the West Riding County Football Association grounds. The River Aire viaduct, which would be approximately 28m high, overhead line equipment and moving trains would be highly visible above the skyline from the north-eastern edge of Woodlesford and the Trans Pennine Trail along the Aire and Calder Navigation (main line). Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting would filter views towards Clumpcliffe Covert embankment, Oulton Beck viaduct and embankment, Fleet Lane overbridge, Woodlesford tunnel southern porous portal and the River Aire viaduct, as well as associated overhead line equipment and moving trains. This would reduce the magnitude of change to medium; however, due to the scale of structures and earthworks, the Proposed Scheme would remain highly prominent in the landscape and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from non-definitive footpaths in Water Haigh Woodland Park and the Aire and Calder Navigation (main line) towpath and residences at Methley (VPs 426-03-015, 426-03-025 and 426-02-027 (Map Number LV-04-426))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a substantial change in near distance views at both winter and summer of year 1. There would be views towards the River Aire viaduct, which would be approximately 28m high, and associated overhead line equipment and moving trains. These features would be highly visible above the skyline. Loss of woodland blocks within Water Haigh Woodland Park would open up and change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, views towards the River Aire viaduct, overhead line equipment and moving trains would be filtered by mitigation planting, reducing the magnitude of change to medium. However, the Proposed Scheme would remain highly prominent in the landscape due to the uncharacteristic scale of the River Aire viaduct and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Views south from Leeds Bridleway 259 near Skelton Lake (VPs 460-03-006 (Map Number LV-04-460a) and 461-03-003 (Map Number LV-04-461a))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in near distance views at both winter and summer of year 1. Rothwell Country Park cutting would be visible as a break in landform to the south. Moving trains and overhead line equipment would be partially screened by the cutting, except in shallower sections where these features would be visible in combination with the existing Hallam Line. Views of the Proposed Scheme would be against a backdrop of farmland to the north of Rothwell. The character of views would be more open due to the loss of woodland along the existing Hallam Line and Aire and Calder Navigation (main line). Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views south from the Trans Pennine Trail (VPs 427-03-022, 427-03-023 (Map Number LV-04-427) and 460-03-005 (Map Number LV-04-460a))	**High sensitivity receptors**
Year 1 – winter and summer: Users of the Trans Pennine Trail would experience a substantial change in near distance views at both winter and summer of year 1. The Woodlesford tunnel northern porous portal would be highly visible to the south, as would the Rothwell Country Park cutting, which would be visible as a break in landform. Near Woodlesford tunnel, moving trains and overhead line equipment would be screened by Rothwell Country Park cutting. Further west, these features would be visible in combination with the existing Hallam Line, although viewed against a backdrop of sloping farmland. Loss of vegetation along the existing Hallam Line and Aire and Calder Navigation (main line) would open up views towards the railway corridor. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation vegetation along the Proposed Scheme and in fields to the north of Rothwell would help to integrate the new earthworks and structures into the landscape and filter views towards moving trains and overhead line equipment. This would reduce the magnitude of change to medium; however, the Woodlesford tunnel northern porous portal would remain highly prominent in the landscape and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views north from Bullough Lane (VP 460-04-004 (Map Number LV-04-460a))	**Medium sensitivity receptors**
Year 1 – winter and summer: Users of Bullough Lane would experience a noticeable change in near distance views at both winter and summer of year 1. Rothwell Country Park cutting would be visible as a break in landform to the north and would partially screen moving trains and overhead line equipment. However, in shallower sections of the cutting these features would be visible, albeit viewed against a backdrop of sloping farmland. The existing railway corridor would appear wider due to a combination of the Proposed Scheme and the existing Hallam Line. Views would also be more open in character due to the loss of woodland along the existing Hallam Line and the Aire and Calder Navigation (main line). Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views west from Swillington Footpath 33, a non-definitive footpath and Great and Little Preston Footpath 14 at St Aidan's Nature Reserve (VPs 426-03-017, 427-03-002 and 427-03-003 (Map Number LV-04-427))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in long distance views at both winter and summer of year 1. The River Aire viaduct, which would be approximately 28m high, would be prominent as it crosses the rural landscape, including the associated overhead line equipment and moving trains. These features would be viewed against a backdrop of woodland, sloping farmland and buildings in Woodlesford from the higher points of St Aidan's Nature Reserve, with the Proposed Scheme viewed against the skyline	**Level of effect:** Moderate adverse

closer to the River Aire due to the scale of the viaduct structure. Loss of woodland within Water Haigh Woodland Park would open up and change the character of views south. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a moderate adverse effect.	(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
Views west from Swillington Organic Farm **(VP 427-03-032 (Map Number LV-04-427))**	**High sensitivity receptors**
Year 1 – winter and summer: Visitors to Swillington Organic Farm would experience a substantial change in near distance views at both winter and summer of year 1. The River Aire viaduct, which would be approximately 28m high, overhead line equipment and moving trains would be visually prominent within the enclosed and tranquil landscape, and these features would be viewed against the skyline. The loss of woodland at Cockpit Round, parkland trees within pasture and linear boundary vegetation along the River Aire, A642 Wakefield Road and Swillington Bridleway 25 would open up and change the character of views, as the parkland landscape would be less enclosed and scenic quality would be reduced. In addition, views would be foreshortened by the viaduct structure. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: By summer year 15, mitigation planting along Swillington Bridleway 25 would help to restore some enclosure in views to the north. However, the River Aire viaduct would foreshorten and substantially change the character of views west. There would remain a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west and east from residences, a non-definitive footpath, Swillington Bridleways 39 and 11, and Swillington Footpaths 38 and 13 at Swillington **(VPs 427-02-009, 427-02-012, 427-03-005, 427-02-007, 427-03-027, 427-03-029 (Map Number LV-04-427), 428-03-003 and 428-03-017 (Map Number LV-04-428))**	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences and users of PRoW would experience a noticeable change in middle distance views at both winter and summer of year 1. There would be views east or west towards Swillington embankment and cutting and bridges such as Swillington Footpath 14 overbridge, which would be prominent in farmland west of Swillington. Overhead line equipment and moving trains would be visible, although generally viewed against a backdrop of undulating farmland and intermittent vegetation. Users of PRoW near Leventhorpe Hall would also have views towards the River Aire viaduct, with open views towards overhead line equipment and moving trains against the skyline. Loss of field boundary hedgerows and small copses would change the character of views slightly. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a 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
Views west from residences at Swillington Common **(VP 428-02-014 (Map Number LV-04-429a))**	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residences would experience a noticeable change in middle distance views at both winter and summer of year 1. The A63 Selby Road viaduct, which would be up to 12m above the existing road level, would be prominent in views west. The West Garforth south and north embankments would foreshorten views, and overhead line equipment and moving trains would also be visible (some features are within the boundary of LA16 Garforth and Church Fenton). South of the A63 Selby Road, these features would be visible above the skyline; to the north, they would be viewed against a backdrop of woodland and undulating farmland. Loss of mature hedgerow field boundaries would change the character of views slightly, with the partial loss of Carr Wood (within LA16 Garforth and Church Fenton) to the north more prominent in views. Immature mitigation planting would provide limited screening or landscape integration at this stage. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Year 15 – summer: By summer year 15, mitigation planting along the West Garforth south and north embankments and at the A63 Selby Road viaduct would filter views and help to integrate the Proposed Scheme into the surrounding landscape. However, there would be a foreshortening of views and a medium magnitude of change and a moderate adverse effect would 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 have been 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 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:

- major adverse landscape effects in relation to three LCAs;
- moderate adverse landscape effects in relation to two LCAs;
- major adverse visual effects in relation to one recreational viewpoint location;
- moderate adverse visual effects on views from six residential viewpoint locations; and
- moderate adverse visual effects in relation to 33 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 Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Leeds City Council (LCC) 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: LA15 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 (SMR)[138].

12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (for example 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.

12.2.3 Businesses may experience isolation effects as a result of the Proposed Scheme. Likely significant isolation effects 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 Warmfield to Swillington and Woodlesford area. It lies within the administrative area of Wakefield Metropolitan

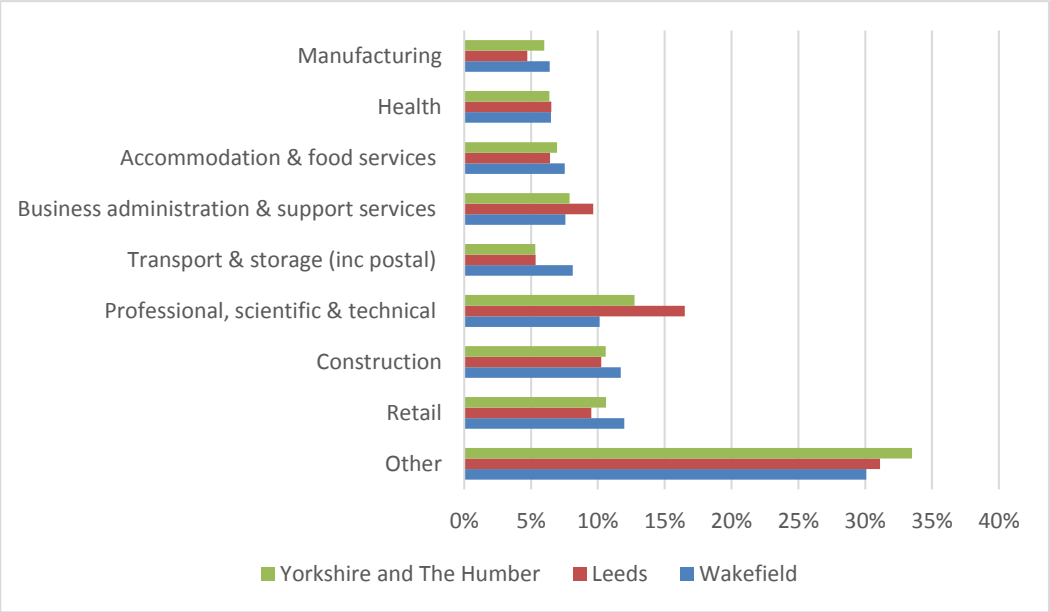
[138] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

District Council (WMDC) and LCC. It also falls entirely within the Leeds City Region Local Enterprise Partnership (LEP) area[139] and Yorkshire and the Humber region.

Business and labour market

12.3.2 Within the WMDC area, retail accounts for the largest proportion of businesses (12%), with construction (12%), and professional, scientific and technical (10%) sectors also accounting for relatively large numbers of businesses within the district. In the LCC area, the professional, scientific and technical sector accounts for the largest proportion of businesses (17%), with the construction (10%) and business administration and support services (10%) sectors also accounting for relatively large proportions. This is shown in Figure 9. For comparison, within the Yorkshire and the Humber region, professional, scientific and technical sector (13%) accounts for the largest number of businesses, with retail (11%) and construction (11%) also accounting for relatively large numbers of businesses.

Figure 9: Business sector composition in the WMDC and LCC areas and Yorkshire and the Humber[140]

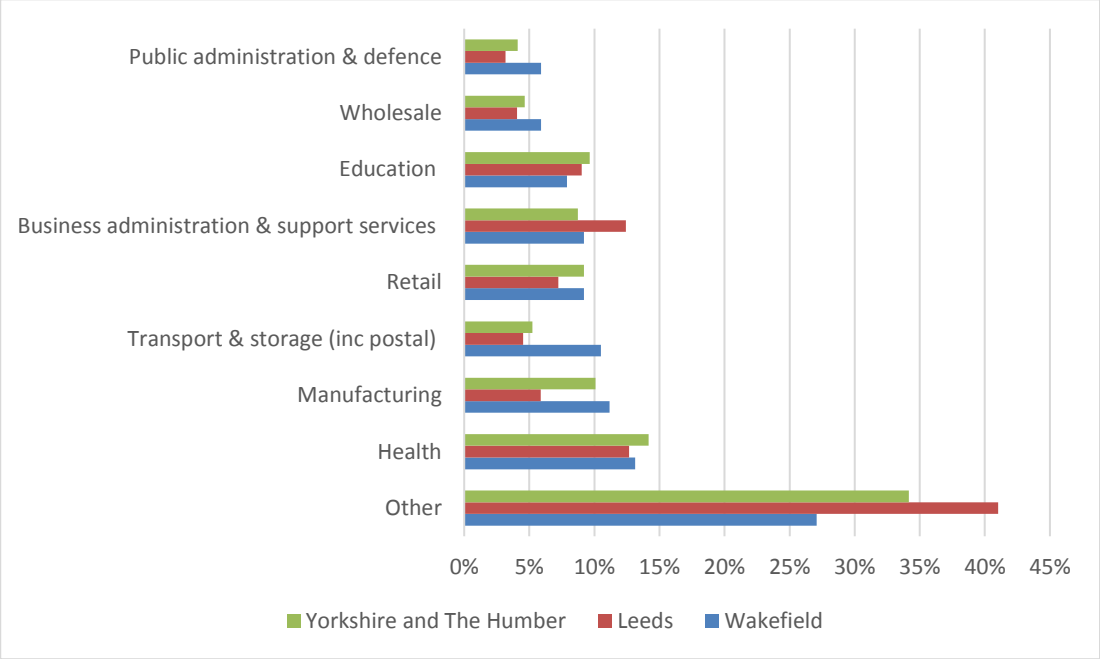


12.3.3 In 2016, approximately 151,000 people worked in the WMDC area and 443,000 people worked in the LCC area[141]. According to the Office for National Statistics Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in the WMDC area were: health (13%); manufacturing (11%); transport and storage (including postal) (11%); retail (9%); and business administration and support services (9%). In the LCC area, the top five sectors were: health (13%); business administration and support services (12%); professional, scientific and

[139] Leeds City Region Local Enterprise Partnership – Strategic Economic Plan (2016). Available online at: http://www.the-lep.com/LEP/media/New/SEP%20documents/SEP-2016-2036-FINAL.pdf
[140] "Other" includes: Arts, entertainment, recreation & other services; Motor trades; Wholesale; Information & communication; Property; Education; Financial & insurance; Agriculture, forestry & fishing; Public administration & defence; and Mining, quarrying & utilities
[141] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available online at: https://www.nomisweb.co.uk –this number includes both residents and non-residents of LCC who work within its boundaries

technical (11%); education (9%); and retail (7%) sectors. These compare with the top five sectors for the Yorkshire and the Humber region, which were: health (14%); manufacturing (10%); education (10%); retail (9%); and business administration and support services (9%). This is shown in Figure 10[142].

Figure 10: Employment by Industrial Sector in the WMDC and LCC areas and Yorkshire and the Humber[143]



12.3.4 According to the Annual Population Survey (2016)[144], the employment rate[145] within the WMDC area was 73% (152,000) and LCC area was 74% (376,000 people). These compare with the recorded rates for Yorkshire and the Humber region (72%) and England (74%). In 2016, the unemployment rate[146] was 6% in the WMDC and 4% in the LCC area, which is higher and lower respectively when compared to both Yorkshire and the Humber region (5%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[147], 25% of WMDC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the Yorkshire and Humber region and 38% in England, while 11% of WMDC residents had no qualifications, which was higher than Yorkshire and the

[142] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available online at: https://www.nomisweb.co.uk –this number includes both residents and non-residents of LCC who work within its boundaries
[143] "Other" includes: Construction; Accommodation & food services; Professional, scientific & technical; Arts, entertainment, recreation & other services; Motor trades; Information & communication; Property; Mining, quarrying & utilities; Financial & insurance; and Agriculture, forestry & fishing
[144] Annual Population Survey (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[145] The proportion of working age (16-64 year olds) residents that is in employment.
[146] 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.
[147] Annual Population Survey (2016), NOMIS. Available online at: http://www.nomisweb.co.uk

Humber region (10%) and England (8%). In the LCC area, 34% of residents aged 16-64 were qualified to NVQ4 and above, with 10% of its residents having no qualifications.

Property

12.3.6 A review of employment land supply identified 256ha in the WMDC area[148], this is set against a requirement of 346.5ha[149]. A review of employment land supply identified 844ha in the LCC area[150], this is set against a maximum forecast employment land requirement of 526 ha for B2/B8 (Industry / Warehousing) and 706,250m² for B1 (Office)[151].

12.3.7 The average vacancy rate for industrial and warehousing property in the WMDC area in October 2017 has been assessed as 13% based on marketed space against known stock. The average vacancy rate for industrial and warehousing property in the LCC area was 15%[152].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[153] includes a range of provisions that would help mitigate socioeconomic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5 of the draft CoCP);
- 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 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

[148] Wakefield Local Development Framework Annual Monitoring Report (2016) (page 36). Available online at: http://www.wakefield.gov.uk/Documents/planning/planning-policy/information-monitoring/annual-monitoring-reports/annual-monitoring-report-2016.pdf
[149] Wakefield Employment Land Technical Paper (January 2008): http://www.wakefield.gov.uk/Documents/planning/planning-policy/local-plan/core-strategy/employment-land-technical-paper.pdf
[150] Leeds Local Development Framework Authority Monitoring Report (2016) (page 12). Available online at: http://www.leeds.gov.uk/docs/2016%20AMR%20Final%20vash.pdf
[151] Leeds City Council (August 2011) Leeds Employment Land Review, 2010 Update: The document shows need as a range from 460ha to 526ha. Available online at: https://www.leeds.gov.uk/SiteAllocationMaps/Evidence%20Base%20Documents/Employment%20Land%20Review%20%202010%20Update.pdf
[152] 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).
[153] Supporting document: Draft Code of Construction Practice

- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

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 (for example air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations. Both effects 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

In-combination effects

12.4.3 Businesses within the Warmfield to Swillington and Woodlesford area may experience air quality, noise and vibration or construction traffic impacts as a result of construction of the Proposed Scheme. Taken in combination, the residual effects from these other topic assessments may amount to a significant change in the environment. In-combination effects will be reported in the formal ES.

Isolation

12.4.4 Non-agricultural businesses may experience significant isolation effects as a result of the Proposed Scheme in the Warmfield to Swillington and Woodlesford area. Isolation effects will be reported in the formal ES.

Construction employment

12.4.5 It is currently expected that there would be one main construction compound at Normanton embankment along with 17 satellite compounds in the Warmfield to Swillington and Woodlesford area. These sites could result in the creation of up to 3,990 person years of construction employment opportunities[154], broadly equivalent to 400 full-time jobs[155], 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).

12.4.6 Direct construction employment could also lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from expenditure by construction

[154] 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.
[155] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

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).

12.4.7 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

12.4.8 Businesses directly affected, comprising those that lie within land that will be used for the construction of 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.

12.4.9 Two business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These two units are:

- Swillington Estate (land associated with one unit engaged in retailing conifer trees and organic produce); and
- Saville Park Farm, Newmarket Lane, Methley (one unit engaged in road haulage activities).

12.4.10 It is currently anticipated that no businesses in the area would experience significant permanent direct effects as a result of the land required by the Proposed Scheme. An estimated 10 jobs would either be displaced or possibly lost in the wider Warmfield to Swillington and Woodlesford 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 WMDC area (approximately 152,000 jobs) and in the LCC area (approximately 376,000 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 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 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 expected 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 assessed and reported at a route wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.6 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Summary of likely residual significant effects

12.5.7 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 Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford 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[156]; and
- 'non-residential receptors'[157] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas[158]; 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[159], planning policy, planning practice guidance on noise (PPGN)[160] and EIA Regulations as described in the Scope and Methodology Report[161] (SMR).

13.1.3 Engagement has been undertaken with Wakefield Metropolitan District Council (WMDC) and Leeds City Council (LCC) 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 Warmfield to Swillington and Woodlesford area showing the location of the key environmental features (Map Series CT-10), key

[156] '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.
[157] 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.
[2] '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.
[159] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[160] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[161] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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 be found in the Volume 2: LA15 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 (Sections 8 and 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 noise levels will be published in the formal ES.

13.3.2 The area is characterised by a number of towns, villages, isolated residential properties and farmhouses in a rural/urban fringe setting. The sound environment is generally dominated by transport noise, including local and distant road traffic, existing rail lines and local neighbourhood sources. Additionally, there are contributions from both natural sources such as wildlife, trees and waterways, and sound associated with farming and agriculture, such as vehicle and animal noise.

13.3.3 Several main roads contribute to the sound environment of the Warmfield to Swillington and Woodlesford area: the M62; the A655 Wakefield Road; the A639 Methley Lane/Leeds Road; the A63 Selby Road; and the A642 Aberford Road/ Wakefield Road. One rail line contributes to the sound environment of the area: the existing Hallam Line.

13.3.4 Sound levels close to these main transportation routes are high during the daytime, but are 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 will 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 noise 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[162], Roads[163] or Railways[164]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA15 Map Book) shows any noise Important Areas in the Warmfield to Swillington and Woodlesford 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)[165]. 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 assumptions have also been made in relation to the construction methods specific to the Warmfield to Swillington and Woodlesford area.

13.4.3 At Woodlesford tunnel, tunnelling support activities would be undertaken from Woodlesford cutting satellite compound. These activities would include: erection of the tunnel boring machine (TBM), support for the TBM as it excavates, excavated material handling, installation of tunnel lining and tunnel fit-out and would require 24 hour working for reasons of safety, engineering practicability or to reduce the impact on existing transport.

[162] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs
[163] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs
[164] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs
[165] Supporting document: Draft Code of Construction Practice

13.4.4 As the rotating head of the TBM 'cuts' through the ground, the TBM could give rise to ground-borne noise and vibration that is perceptible, albeit only for short periods of time (generally a matter of days as the TBM approaches and passes) in the nearest receptors. The project will use modern TBMs that control vibration and ground-borne noise generation at source. In line with the draft CoCP, any residual temporary ground-borne noise or vibration effects would be mitigated by community engagement including advanced notification to residents. Taking account of this mitigation and the short duration of potential ground-borne noise or vibration effects, significant effects on residential receptors are considered unlikely. The potential effects of vibration and ground-borne noise on non-residential receptors is being assessed and will be presented in the formal ES.

13.4.5 Equipment and materials (including tunnel lining segments) are likely to be transported from the surface to the TBM using a low speed construction railway. Excavated material is likely to be transported to the surface by conveyor. Similar measures to those used by Crossrail (such as rolling stock suspension, management of rail joints and resilient elements between rail and tunnel) would control ground-borne noise and vibration otherwise caused by the construction railway. No likely significant effects are therefore anticipated on residential receptors. The potential effects of vibration and ground-borne noise arising on non-residential receptors due to the construction railway are being assessed and will be reported in the formal ES.

13.4.6 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

13.4.7 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;
- 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; 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 will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will 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; and
- Contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.8 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. Further work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures, which will be reported in the formal ES.

13.4.9 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 any 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

13.4.10 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: LA15 Map Book):

- Warmfield, arising from construction activities such as cutting formation, balancing pond construction and landscape bund construction;
- Kirkthorpe, arising from construction activities such as embankment formation, balancing pond construction, ecological pond construction, use of transfer nodes and landscape bund construction;
- Goosehill, arising from construction activities such as use of transfer nodes, embankment formation, ecological pond construction and landscape bund construction;
- Altofts, arising from construction activities such as cutting works, embankment formation, balancing pond construction, overbridge construction, road realignment and landscape bund construction;

- Methley Lanes, arising from construction activities such as demolition , embankment formation, viaduct construction and balancing / ecological pond construction;
- Scholey Hill, arising from construction activities such as embankment formation, viaduct construction, balancing pond construction and landscape bund construction;
- Oulton, arising from construction activities such as demolition, cutting formation, use of transfer nodes, embankment formation, tunnel portal construction, tunnelling site works, shaft construction, cut and cover tunnel construction, balancing pond construction, road realignment and landscape bund construction;
- Woodlesford, arising from construction activities such as demolition, use of transfer nodes, cutting formation, tunnel portal construction, tunnelling site works, shaft construction, cut and cover tunnel construction, road realignment and landscape bund construction;
- John O' Gaunts in Rothwell, arising from construction activities such as cutting formation;
- Swillington, arising from construction activities such as demolition, use of transfer nodes, cutting formation, embankment formation, balancing pond construction, ecological pond construction and landscape bund construction;
- Hollinthorpe, arising from construction activities such as use of transfer nodes, cutting formation and landscape bund construction; and
- Swillington Common, arising from construction activities such as use of transfer nodes, embankment formation, viaduct construction and landscape bund construction.

13.4.11 Map Series SV01 (Volume 2: LA15 Map Book) shows key non-residential properties that have been identified within the study area. Of these, The Bridge Farm Hotel, Woodlesford is likely to experience significant effects (to be confirmed in the formal ES).

13.4.12 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.

13.4.13 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:

- Kirkthorpe Lane, Warmfield Lane and Croft Head Lane between Kirkthorpe and New Sharlston;
- Birkwood Road and Ferry Lane between Altofts and Stanley Ferry;
- B6135 Newmarket Lane between Methley Lanes and A642 Aberford Road;
- Bullerthorpe Lane, between A642 Wakefield Road and Colton Common; and

- Swillington Lane and Leeds Lane between Swillington and A642 Wakefield Road.

13.4.14 The magnitude and extent of effect will depend on the level of construction traffic using the road. Any residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.15 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

13.4.16 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary indirect effects from construction traffic.

13.4.17 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. Any likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

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 2.3 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 Warmfield to Swillington and Woodlesford area.

13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to nine trains per hour in each direction on the main lines south of the Leeds spur with an operating speed of 330kph for 90% of services and 360kph for 10% of services. At the point of the spur into Leeds, the operating speed on the main lines reduces to around 320kph. Progressing north on the main lines, past the spur into Leeds, there would be up to four trains per hour in each direction and the operating speed would reduce to around 230kph by the northern end of the area. There would be up to five trains per hour in each direction on the spur into Leeds with an operating speed of around 230kph. 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.

13.5.6 The Proposed Scheme would incorporate noise 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: LA15 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 discretionary criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where[166] 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[167] or the maximum noise level criteria[168] defined in the

[166] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[167] World Health Organization (2010), *Night time Noise Guidelines for Europe*.

SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.10 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Ground-borne noise and vibration

13.5.11 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

13.5.12 Specifically, in the tunnels under Woodlesford, a low-vibration trackform is assumed to be used to mitigate ground-borne noise and vibration from the passage of trains.

Assessment of impacts and effects

13.5.13 Map Series SV-01 (Volume 2: LA15 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.

13.5.14 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.

13.5.15 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.16 Likely significant airborne noise effects arising from permanent changes to existing roads, will be reported in the formal ES.

[168] Dependent on the number of train passes.

Other mitigation measures

13.5.17 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

13.5.18 Mitigation, including noise barriers, described in Volume 1 Section 9, Section 2.2 and presented in Map Series SV-01 (Volume 2: LA15 Map Book) and Map Series CT-06 (Volume 2: LA15 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.

13.5.19 Taking account of the avoidance and mitigation measures this initial assessment has identified effects on a precautionary basis with the potential to be considered significant on a community basis due to increased airborne noise levels in line with the SMR at or around:

- Kirkthorpe: occupants of residential properties on Park Avenue, located closest to the route of the Proposed Scheme, identified by LA15-C01 on Map SV-01-397b;
- Goosehill: occupants of residential properties on Goosehill Lane, located closest to the route of the Proposed Scheme, identified by LA15-C02 on Map SV-01-397b; and
- Altofts: occupants of residential properties on Birkwood Road, located closest to the route of the Proposed Scheme, identified by LA15-C03 on Map SV-01-398.

13.5.20 The initial assessment indicates that, 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 levels criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme at Newland Hall and Newland Park, in the vicinity of Newland Lane (identified on Map SV-01-398 in the Volume 2: LA15 Map Book).

13.5.21 The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this area as a result of operational noise.

13.5.22 Further assessment work is being undertaken to identify operational sound and vibration significant effects. This will be reported in the formal ES.

13.5.23 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

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

13.5.25 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.

13.5.26 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 Warmfield to Swillington and Woodlesford area.

14.1.2 Engagement with Highways England, Wakefield Metropolitan District Council (WMDC), Leeds City Council (LCC) and West Yorkshire Combined Authority (WYCA) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology.

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: LA15 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 (SMR)[169].

14.2.2 The study area for traffic and transport includes the settlements at Warmfield, Altofts, Scholey Hill, Woodlesford, Rothwell, Oulton and Swillington.

14.2.3 The study area for traffic and transport includes all roads potentially affected by the Proposed Scheme including, the M62 and the M1, which are the only two strategic roads in the area. It also includes the following local roads: A63 Selby Road; the A639 Methley Lane/Leeds Road; the A642 Aberford Road/Wakefield Road; the A655 Wakefield Road; the B6135 Newmarket Lane; Hell Lane; Kirkthorpe Lane/Warmfield Lane; Croft Head Lane; Birkwood Road; Fleet Lane; Eshald Lane; Bullough Lane; Bullerthorpe Lane; Jinny Moor Lane; Swillington Lane and Leeds Lane.

14.2.4 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme, 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.

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

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, WMDC, LCC and WYCA (including 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 June, July, October and November 2017. These data have been supplemented by existing traffic data from other sources, including from WMDC, LCC and Highways England. Assessment of the data indicates that the peak hours in the area are 07:30-08:30 and 16:30-17:30. However, there are only small differences (3% to 4%) 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 periods have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and September 2017 and April 2018 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 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 users, such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are the M62 and the M1. The strategic road network in and around the Warmfield to Swillington and Woodlesford area is busy at peak times and delays can be experienced, particularly at the M62 junction 31.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A63 Selby Road; the A639 Methley Lane/Leeds Road; the A642 Wakefield Road/Aberford Road; the A655 Wakefield Road/Pontefract Road; the B6135 Newmarket Lane; Hell Lane; Kirkthorpe Lane/Warmfield Lane; Croft Head Lane; Newland Lane; Birkwood Road; Hungate Lane; Fleet Lane; Eshald Lane; Bullough Lane; Jinny Moor Lane; Bullerthorpe Lane; Swillington Lane and Leeds Lane. The local road network in this area generally operates well although some localised delays can be experienced, particularly at peak times on the A655 Pontefract Road approach to the M62 junction 31 and on the A642 Wakefield Road/Aberford Road.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[170]. Data for the three-year period (mid-2014 to mid-2017) has been assessed and any identified clusters (i.e. where there are 9 or more accidents in the three year period) have been examined.

14.3.7 One accident cluster was identified within the Warmfield to Swillington and Woodlesford area, at the M62 junction 30 with the A642 Wakefield Road (10 accidents, including one with serious casualties).

14.3.8 The route of the Proposed Scheme would cross eight roads with footways within the Warmfield to Swillington and Woodlesford area. These are: the A63 Selby Road; the A639 Methley Lane; the A642 Aberford Road/the A642 Wakefield Road; the A655 Wakefield Road; the B6135 Newmarket Lane; Kirkthorpe Lane/Warmfield Lane; Birkwood Road; Hungate Lane and Fleet Lane. In addition, Eshald Lane has no footway but was observed to be used by pedestrians.

Parking and loading

14.3.9 There is no parking or loading identified in the Warmfield to Swillington and Woodlesford area that is expected to be impacted by the Proposed Scheme. Consequently, this topic is not considered further in this assessment.

Public transport network

14.3.10 Twenty-four bus routes operate on seven roads that are crossed by the route of the Proposed Scheme in the Warmfield to Swillington and Woodlesford area. There are also bus stops primarily located to serve the main built up areas. The bus routes that could be affected by the Proposed Scheme include:

- the A655 Wakefield Road: Service 149 (Wakefield - New Sharlston - Pontefract - Knottingley); Service 183 (Wakefield - Normanton - Pontefract); Service 187 (Wakefield - Kirkthorpe - Normanton - Pontefract); and Service 189 (Wakefield - Warmfield - Normanton - Leeds);
- Kirkthorpe Road/Warmfield Lane: Service 188 (Wakefield - Kirkthorpe - Normanton - Pontefract);
- Birkwood Road: Service 125 (Wakefield - Altofts - Pontefract); Service 146 (Wakefield - Castleford - Pontefract); Service 147 (Wakefield - Altofts - Normanton - Pontefract); and Service 157 (Wakefield - Altofts - Normanton - Pontefract);
- B6135 Newmarket Lane: Service 153 (Castleford - Methley - Rothwell); and Service 173A (Wakefield - Woodlesford - Wetherby);
- A639 Methley Lane: Service 173A (Wakefield - Woodlesford - Wetherby); Service 189 (Wakefield - Warmfield - Normanton - Leeds); and Service 410 (Leeds - Methley - Pontefract - Eastbourne);

[170] Department for Transport; Crashmap.co.uk; www.crashmap.co.uk. CrashMap provides accident data for the UK.

- A642 Aberford Road/ Wakefield Road: Service 9 (White Rose Centre Rothwell - Swillington - Seacroft); Service 9A (Horsforth - White Rose Centre Rothwell - Swillington - Seacroft); Service 22 (Rothwell - Garforth - Seacroft); Service 167/168 (combined service) (Leeds - Swillington - Castleford); Service 173A (Wakefield - Woodlesford - Wetherby); Service 174/ 174A (Wakefield - Woodlesford - Swillington - Wetherby); and Service 175/ 175A (Wakefield - Woodlesford - Swillington - Castleford); and
- A63 Selby Road: Service 19/19A (Ireland Wood - Leeds - Garforth - East Garforth); Service 22 (Rothwell - Garforth - Seacroft); Service 163 (Leeds - Garforth - Castleford); Service 166 (Leeds - Halton - Garforth - Castleford); Service 402 (Leeds - Garforth - Selby); Service 403 (Leeds - Garforth - Selby); and Service X60 (Leeds - Great Preston - Selby).

14.3.11 The M62 is also used by a number of inter-city coach services.

14.3.12 National and local rail services are accessible via Wakefield Westgate and Wakefield Kirkgate Stations and local rail services are accessible via Wakefield Kirkgate, Normanton and Woodlesford Stations. Wakefield Westgate Station provides access to national services to London, Birmingham, Edinburgh and Glasgow. Wakefield Kirkgate Station provides access to national services to London and local services to Leeds, Sheffield, Huddersfield and Nottingham. Normanton Station provides access to local services to Leeds and Sheffield. Woodlesford Station provides access to local services to Leeds, Sheffield and Knottingley.

Non-motorised users

14.3.13 There are pedestrian footways adjacent to many of the roads in the built-up areas of Warmfield, Kirkthorpe, Altofts, Woodlesford, Oulton, and Swillington. 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.

14.3.14 The route of the Proposed Scheme would cross the route of 29 PRoW within the Warmfield to Swillington and Woodlesford 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 ten people per day recorded on nine of the PRoW The routes with the greatest usage during the survey day were: Fleet Lane used by 95 pedestrians and 72 cyclists; Bullough Lane used by 104 pedestrians and 56 cyclists; Jinny Moor Lane used by 33 pedestrians and 161 cyclists; the A63 Selby Road used by 42 pedestrians and 61 cyclists; and the Aire and Calder Navigation Main Line (navigable waterway and towpath) used by 104 pedestrians, 82 cyclists and 11 equestrians.

14.3.15 In the Warmfield to Swillington and Woodlesford area, National Route 67 (part of the National Cycle Network) would be crossed by the route of the Proposed Scheme between Bottom Boat and Methley along Rothwell Footpath 41. This section of National Route 67 was used by 29 cyclists during the survey day.

Waterways and canals

14.3.16 There are four navigable waterways in the Warmfield to Swillington and Woodlesford area; the River Aire, the River Calder, the Aire and Calder Navigation (Wakefield Branch) and the Aire and Calder Navigation (main line). The River Calder and the Aire and Calder Navigation (Wakefield Branch) meet at Whitwood (south of Methley Junction), approximately 2.5km east of the route of the Proposed Scheme. The River Aire and the Aire and Calder Navigation (main line) meet to the north-east of Mickletown, approximately 600m from the route of the Proposed Scheme. The canals are managed by the Canal & River Trust. While not navigable, Oulton Beck also passes through the area.

Air transport

14.3.17 There is no relevant air transport in the Warmfield to Swillington and Woodlesford 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 diversions 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, insofar as reasonably practicable, would 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, insofar as reasonably practicable, along the route of the Proposed Scheme;

- 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)[171] 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[172] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;

[171] Supporting document: Draft Code of Construction Practice

[172] 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.

- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Warmfield to Swillington and Woodlesford 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 and blockades on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Warmfield to Swillington and Woodlesford area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.10 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.

14.4.11 Construction activities would be managed from compounds. Details of construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA15 Map Book.

Strategic and local road network

14.4.12 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 junction 46;
- the M62 junctions 30 and 31;
- the A63 Selby Road between the M1 and the A642 Wakefield Road;
- the A639 Methley Lane/ Leeds Road between the M1 at junction 44 and west of Station Road;
- the A642 Wakefield Road/ Aberford Road between Ferry Lane and the A639 Methley Lane and between Bullerthorpe Lane and the A63 Selby Road;
- the A655 Wakefield Road;

- the B6135 Newmarket Lane between the A642 Aberford Road and Hungate Lane;
- Hell Lane;
- Warmfield Lane;
- Croft Head Lane;
- Kirkthorpe Lane;
- Birkwood Road from the A642 Aberford Road to just west of Altofts;
- Fleet Lane;
- Bullerthorpe Lane north and south of the M1;
- Leeds Lane; and
- Swillington Lane.

14.4.13 A number of these construction routes would have limited use[173] including Hell Lane Croft Head Lane, Warmfield Lane, Bullerthorpe Lane (south of the M1) and Swillington Lane.

14.4.14 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary 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:

- overnight and weekend closures of the M62 between junctions 29 and 30;
- overnight and weekend closures of the A63 Selby Road between the M1 and the A642 Wakefield Road;
- overnight and weekend closures of the A642 Wakefield Road at Jinny Moor Lane;
- overnight and weekend closures of the A655 Wakefield Road in Warmfield;
- overnight and weekend closures of the B6135 Newmarket Lane between the A642 Aberford Road and Hungate Lane;
- local realignment of Hell Lane between the A655 Wakefield Road and New Sharlston;
- local diversion of Hungate Lane via the B6135 Newmarket Lane; and
- local diversion of Bottom Boat Road.

14.4.15 Permanent changes to highways are reported under operation.

[173] Limited use refers to a low level of HGV use generally over a short length of time, for example for site set up or minor works.

14.4.16 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 will be reported in the formal ES.

14.4.17 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

14.4.18 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.

Public transport network

14.4.19 There are no temporary road closures or diversions required in this area that would substantially affect bus services or stops although any increase in general traffic delays could affect bus services. Any consequent effects will be reported in the formal ES.

14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of the Hallam Line including its rail freight services, with closures and possessions of the line required due to the work associated with the construction of the Woodlesford tunnel. Design development is focussed on minimising these possessions and closures. This would result in disruption to services, although many of the interventions would be combined to reduce the potential disruption. The effects of railway possessions and closures will be assessed and reported in the formal ES.

Non-motorised users

14.4.21 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.

14.4.22 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. It is currently expected that the following PRoW would be temporarily diverted or realigned:

- Warmfield-cum-Heath Bridleway 14 (between Warmfield and Kirkthorpe north of the A655 Wakefield Road);
- Warmfield-cum-Heath Bridleway 12 (north of the Wellbeck Landfill Access Road);
- Newland with Woodhouse Moor Footpath 6 (east of Newland Hall);
- Normanton Footpath 29 (north-east of Newland Hall);
- Normanton Footpath 1 (north of Birkwood Road);
- Aire and Calder Navigation Wakefield Branch (navigable waterway and towpath) (north-west of Altofts);

- Normanton Footpath 4 (south of Bottom Boat Road);
- Rothwell Footpath 39 (along Bottom Boat Road);
- Rothwell Footpath 41 (along Bottom Boat Road and south of the B6135 Newmarket Lane);
- Rothwell Footpath 24/ Aire and Calder Navigation main line (navigable waterway and towpath) (south-west of the A642 Aberford Road);
- Definitive Footpath Rothwell 80 (south-west of the A642 Aberford Road);
- Bullough Lane (north of Rothwell Country Park);
- Swillington Bridleway 25 (south-west of the A642 Wakefield Road);
- Definitive Footpath Swillington 21 (south-west of the A642 Wakefield Road);
- Definitive Footpath Swillington 20 (between Bullerthorpe Lane and Swillington Lane);
- Definitive Footpath Swillington 14 (between Bullerthorpe Lane and Swillington Lane);
- Swillington Bridleway 11 (between Swillington Land and the east side of the M1); and
- Definitive Swillington Footpath 1 (between Swillington Land and the east side of the M1).

14.4.23 Permanently diverted PRoW are reported under operation, although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.24 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Waterways and canals

14.4.25 It is not currently anticipated that the construction of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Warmfield to Swillington and Woodlesford area.

Permanent effects

14.4.26 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

14.4.27 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.

14.4.28 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

14.4.29 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; the M62; the A63 Selby Road; the A639 Methley Lane; the A642 Wakefield Road/ Aberford Road; the A655 Wakefield Road; the B6135 Newmarket Lane; Hell Lane; Kirkthorpe Lane/Warmfield Lane; Croft Head Lane; Birkwood Road; Fleet Lane; Bullerthorpe Lane; Swillington Lane; and Leeds Lane. Changes in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.4.30 Construction of the Proposed Scheme is also likely to result the temporary closures and diversions or realignments of the following: the M62; the A63 Selby Road; the A642 Wakefield Road; the A655 Wakefield Road; the B6135 Newmarket Lane; Hell Lane; Hungate Lane; Bottom Boat Road; and Jinny Moor Lane.

14.4.31 Construction of the Proposed Scheme has the potential to result in disruption to rail passengers and rail freight services on the Hallam Line as a result of closures and possessions on the line.

14.4.32 Construction of the Proposed Scheme would require the temporary closure, diversion or realignment of PRoW including: Warmfield-cum-Heath Bridleway 14 (north of the A655 Wakefield Road); Warmfield-cum-Heath Bridleway 12; Newland with Woodhouse Moor Footpath 6; Normanton Footpath 29; Normanton Footpath 1; Aire and Calder Navigation Wakefield Branch (navigable waterway and towpath); Normanton Footpath 4; Rothwell Footpath 39; Rothwell Footpath 41; Rothwell Footpath 24/Aire and Calder Navigation main line (navigable waterway and towpath); Definitive Footpath Rothwell 80; Bullough Lane; Swillington Bridleway 25; Definitive Footpath Swillington 21; Definitive Footpath Swillington 20; Definitive Footpath Swillington 14; Definitive Bridleway Swillington 11; and Definitive Footpath Swillington 1.

14.4.33 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 Warmfield to Swillington and Woodlesford 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:

- Hell Lane would be realigned via an overbridge to accommodate the Proposed Scheme;
- Red Lane would be realigned to the east of its existing alignment to accommodate the Proposed Scheme;
- Kirkthorpe Lane would be diverted to the south of the existing alignment to join the A655 Wakefield Road. A connection for non-motorised users would be maintained;
- Warmfield Lane would be closed where it would cross the route of the Proposed Scheme. A connection for non-motorised users would be maintained;
- Birkwood Road would be realigned via an overbridge to accommodate the Proposed Scheme;
- the A639 Methley Lane would be realigned to the north of its existing alignment, to cross the route of the Proposed Scheme via the A639 Methley Lane underbridge. The existing Methley Lane would be closed where it would cross the route of the Proposed Scheme, with a short section retained for maintenance access to the east;
- Fleet Lane would be realigned to the south of its existing alignment, to cross the route of the Proposed Scheme on the Fleet Lane overbridge. Access to residential and commercial properties would be retained, including the West Riding Football Association and Rothwell Juniors Football Club; and
- Eshald Lane would be closed with access to residential properties retained. A connection for non-motorised users would be maintained.

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. The impacts on accident risk during operation of the Proposed Scheme will be reported in the formal ES.

Public transport network

14.5.8 The permanent realignment of roads, including Kirkthorpe Lane/Warmfield Lane, could increase travel distance for bus passengers. However, as the increase in travel distance as a result of the realignments is likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport users within the Warmfield to Swillington and Woodlesford area.

Non-motorised users

14.5.9 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Warmfield-cum-Heath Bridleway 14 would be closed to the south of the A655 Wakefield Road, with users diverted to the A655 Wakefield Road via the realigned Red Lane. Warmfield-cum-Heath Bridleway 14 would also be diverted to the south of its existing alignment where it would cross the route of the Proposed Scheme via an overbridge;
- Newland with Woodhouse Moor Footpath 6 would be realigned to the south of its existing alignment (east of Newland Hall) where it would cross the route of the Proposed Scheme via an overbridge;
- Normanton Footpath 29 would be diverted to the south of its existing alignment (north-east of Newland Hall) to cross the route of the Proposed Scheme via an overbridge;
- Newland with Woodhouse Moor Footpath 5 would be closed where it would cross the route of the Proposed Scheme (north-west of Newland Hall). Users would be diverted along the realigned Normanton Footpath 29;
- Normanton Bridleway 2 would be diverted to the north-east of its existing alignment to join Birkwood Road to the east of the route of the Proposed Scheme;
- Normanton Footpath 1 would be diverted to the south-west of its existing alignment to join Birkwood Road to the west of the route of the Proposed Scheme. Normanton Footpath 1 would also be realigned to the west of its existing alignment to the east of the route of the Proposed Scheme;
- Definitive Footpath Rothwell 38 would be realigned to the south of its existing alignment, to pass beneath the River Calder viaduct and re-join its existing alignment on Hungate Lane;

- Rothwell Footpath 83 would be realigned to the east of its existing alignment (north of the B6135 Methley Lane), to divert around a balancing pond for railway drainage;
- Swillington Footpath 21 would be diverted to the east of its existing alignment (south-west of the A642 Wakefield Road), to divert around a balancing pond for railway drainage. Swillington Footpath 21 would also be realigned to the north of its existing alignment, where it would cross the route of the Proposed Scheme via an underbridge;
- Swillington Footpath 20 would be diverted to the south of its existing alignment (between Bullerthorpe Lane and Swillington Lane), to join the realigned Swillington Footpath 21 to the east of the route of the Proposed Scheme;
- Swillington Footpath 14 would be realigned via a new overbridge (between Bullerthorpe Lane and Swillington Lane);
- Swillington Bridleway 11 would be realigned via a new accommodation overbridge (between Swillington Land and the east side of the M1); and
- Swillington Footpath 1 would be realigned via a new overbridge (between Swillington Land and the east side of the M1).

14.5.10 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. No diversion is expected to require additional travel distance in excess of 500m. The assessment of the effects resulting from changes to PRoW will be reported in the formal ES.

Waterways and canals

14.5.11 It is not currently expected that the operation of the Proposed Scheme would have a significant effect on the operation of the waterways and canals in the Warmfield to Swillington and Woodlesford area.

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 impact 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 diversion and realignment or closure of: Red Lane; Hell Lane; Kirkthorpe Lane; Warmfield Lane; Birkwood Road; the A639 Methley Lane; Fleet Lane; and Eshald 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 changes in accident risk.

14.5.15 Operation of the Proposed Scheme would require the permanent realignment or diversion of PRoW including: Warmfield-cum-Heath Bridleway 14; Newland with

Woodhouse Moor Footpath 6; Normanton Footpath 29; Woodhouse Moor Footpath 5; Normanton Bridleway 2; Normanton Footpath 1; Definitive Footpath Rothwell 38; Rothwell Footpath 83; Swillington Footpath 21; Swillington Footpath 20; Swillington Footpath 14; Swillington Footpath 11; and Swillington Footpath 1. There could be an increase in journey times for some users on these routes.

14.5.16 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

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

14.5.18 There are no area-specific monitoring requirements currently proposed for traffic and transport in the Warmfield to Swillington and Woodlesford 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 Warmfield to Swillington and Woodlesford 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, the Canal & River Trust (CRT), Wakefield Metropolitan District Council (WMDC) and Leeds City Council (LCC), which are the Lead Local Flood Authorities (LLFA), and Yorkshire Water Services 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: LA15 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)[174].

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)[175].

[174] National Planning Policy Framework, DCLG, 2015.
[175] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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 of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Warmfield to Swillington and Woodlesford area, the study area has been extended by approximately 210m to the west of the Proposed Scheme to allow the inclusion of a replacement floodplain storage area upstream of the River Calder viaduct.

15.2.3 This assessment is based on desk study information, including information provided to date 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 modelling of the River Calder, the River Aire and Oulton Beck.

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 Aire and Calder management catchment of the Humber river basin district (RBD). Where the Aire and Calder Navigation is separate from the River Aire, it falls within the Humber Artificial Water Body management catchment of the Humber RBD.

15.3.2 The river basin management plan[176] identifies the chemical[177] and ecological[178] status of surface water bodies, and the quantitative[179] and chemical[180] status of groundwater bodies within this RBD.

[176] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.

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.

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 the study area is provided in Table 33. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 33: Surface water body receptors

Water body name and location[181]	**Designation**	**Q95 value (m^3/s)[182]**	**Receptor value**	**Parent WFD water body name and identification number[183]**	**Current WFD status / Objective[184]**
Tributary of Red Beck 3 WR-01-369 I5	Ordinary watercourse	<0.002	Low	Oakenshaw Beck from Source to River Calder GB104027062560	Moderate / Moderate by 2015
Tributary of River Calder 1 WR-01-369 G5-G6	Ordinary watercourse	<0.002	Low	Calder from River Chald to River Aire GB104027062632	Moderate / Moderate by 2015
Tributary of River Calder 2 WR-01-369 G5-G6	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Calder 3 WR-01-369 G5-G6	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Calder 4	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015

[177] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[178] 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 Section 7, Ecology and biodiversity;
- 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.

[179] 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.
[180] 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.
[181] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA15 Map Book figure (in this case WR-01).
[182] This is the flow within the watercourse that is exceeded for 95% of the time.
[183] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[184] Status and objectives are based on those set out in the 2015 River basin management plan.

Water body name and location[181]	Designation	Q95 value (m^3/s)[182]	Receptor value	Parent WFD water body name and identification number[183]	Current WFD status / Objective[184]
WR-01-369 G5-E6					
Aire and Calder Navigation WR-01-369 E6	Canal	n/a	High		Good / Good by 2015
River Calder WR-01-369 D5 - E6	Main river	3	High		Moderate / Moderate by 2015
Tributary of River Calder 5 WR-01-369 D5 - E6	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Calder 6 WR-01-369 D5 - E6	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of Navigation Beck 1 WR-01-369 D5	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of Navigation Beck 2 WR-01-369 D5	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of Navigation Beck 3 WR-01-369 C5	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of Navigation Beck 4 WR-01-369 C5	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Aire and Calder Navigation WR-01-370 C7	Canal	n/a	High	Aire and Calder Navigation, Wakefield Branch (canal section)	Good / Good by 2015
Almhouses Wood Drain WR-01-369 A1	Ordinary watercourse	<0.002	Low	Oulton Beck from Source to River Aire GB10427062680	Moderate / Good by 2027
Methley Lane Drain 1 WR-01-369 A1	Ordinary watercourse	<0.002	Low		Moderate / Good by 2027
Methley Lane Drain 2 WR-01-369 A1	Ordinary watercourse	<0.002	Low		Moderate / Good by 2027
Methley Lane Drain 3 WR-01-369 A1	Ordinary watercourse	<0.002	Low		Moderate / Good by 2027
Tributary of Oulton Beck 1	Ordinary watercourse	<0.002	Low		Moderate / Good by 2027

Water body name and location[181]	Designation	Q95 value (m^3/s)[182]	Receptor value	Parent WFD water body name and identification number[183]	Current WFD status / Objective[184]
Tributary of Oulton Beck 2	Ordinary watercourse	<0.002	Low		Moderate / Good by 2027
Oulton Beck WR-01-370a I4	Main river	0.03	High		Moderate / Good by 2027
Tributary of River Aire 1 WR-01-370a H4	Ordinary watercourse	<0.002	Low	Aire from Gill Beck (Baildon) to River Calder GB10427063032	Moderate / Moderate by 2015
Tributary of River Aire 2 WR-01-370a H4	Ordinary watercourse	<0.002	Moderate		Moderate / Moderate by 2015
Tributary of River Aire 3 WR-01-370a H4	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Aire 4 WR-01-370a H6	Ordinary watercourse	<0.002	Moderate		Moderate / Moderate by 2015
Aire and Calder Navigation WR-01-370 C7	Canal	n/a	Very high		Moderate / Moderate by 2015
River Aire WR-01-370a H4	Main river	2	High		Moderate / Moderate by 2015
Tributary of River Aire 5	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Aire 6	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Aire 7	Ordinary watercourse	<0.002	Moderate		Moderate / Moderate by 2015
Tributary of River Aire 8 WR-01-370a G4	Ordinary watercourse	<0.002	Low		Moderate / Moderate by 2015
Tributary of River Aire 9 WR-01-370a F4 – G4	Ordinary watercourse	0.5	Low		Moderate / Moderate by 2015

Abstractions and permitted discharges (surface water)

15.3.6 There are six licensed surface water abstractions in the study area, which are used for non-potable industrial uses. None of these are located within the land required for the construction and operation of the Proposed Scheme. Five of these are considered as high value receptors due to the daily licence quantity being above 100m3. The remaining abstraction is of moderate value, due to its daily licence quantity being less than 100m3.

15.3.7 There are five licensed surface water abstractions located just outside the study area. Four licence records are clustered together at Kirkthorpe Weir and are used for hydro-electric power generation and non-remedial wetland support. One, at Oulton Hall, is used for irrigation of the hotel's gardens. The abstractions at Kirkthorpe Weir are considered high value receptors, whilst the irrigation abstraction at Oulton Hall is a low value receptor.

15.3.8 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 are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.9 There are 32[185] consented discharges to surface waters within the study area, two of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.10 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 34. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 34 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 34: Summary of geology and hydrogeology in the study area

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[186]	WFD status objective[187]	Receptor value
Superficial deposits						
Alluvium	Vicinity of the River Aire, Oulton Beck and River Calder	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial Deposits	Area around Clumpcliffe woods, and also northern Rothwell and western Woodlesford	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate

[185] The number of consents listed in Section 10, Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default area extends 250m from the land required for the construction of the Proposed Scheme. The default study areas may be extended where the potential for wider pathways exists.
[186] As stated in the 2015 River basin management plan.
[187] As stated in the 2015 River basin management plan.

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[186]	WFD status objective[187]	Receptor value
River Terrace Deposits	North of the River Aire, south-east of Woodlesford, south of Oulton Beck, area around Hungate Lane and south and east of the River Calder	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Harrogate Till Formation	Isolated areas south-west of Clumpcliffe woods. Also area to the south of Leeds Road (A639) in the north-west of Rothwell	Gravelly clay	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Peat	Isolated areas to the north and south of the River Calder	Organic accumulations	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Bedrock						
Pennine Middle Coal Measures Formation	Majority of the study area	Interbedded mudstone, siltstone and sandstone, with coal seams	Secondary A	Aire and Calder Carb Limestone - Millstone Grit - Coal Measures (GB40402G700400) Poor	Poor by 2015	Moderate
				Don and Rother Millstone Grit and Coal Measures (GB40402G992300) Poor	Good by 2027	Moderate
Pennine Lower Coal Measures Formation	Smaller areas north of Woodlesford, west of Swillington and to the north of Swillington Common	Interbedded mudstone, siltstone and sandstone, with coal seams	Secondary A	Aire and Calder Carb Limestone - Millstone Grit - Coal Measures (GB40402G700400) Poor	Poor by 2015	Moderate

Superficial deposit aquifers

15.3.11 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 34, is outlined briefly as follows:

- alluvium, river terrace deposits and glaciofluvial deposits have been classified by the Environment Agency as Secondary A aquifers. These 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;
- the Harrogate Till Formation has been classified by the Environment Agency as a Secondary (undifferentiated) aquifer. This may supply baseflow to watercourses or store and yield limited amounts of groundwater and so has been classified as a low value receptor; and
- Peat has been classified by the Environment Agency as unproductive in this area and has therefore been assessed as a low value receptor.

Bedrock aquifers

15.3.12 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 34 is outlined briefly as the Pennine Middle Coal Measures Formation and the Pennine Lower Coal Measures Formation, which have been classified as Secondary A aquifers by the Environment Agency. These aquifers 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 as moderate value receptors.

WFD status of groundwater bodies

15.3.13 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 34. The value attributed to each of these receptors is also indicated.

15.3.14 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)

15.3.15 There are no groundwater abstractions licensed for public water supply within the study area. There are no source protection zones (SPZ) associated with licensed public water supplies within the study area.

15.3.16 There are a total of two private groundwater abstraction licences registered in the study area, as shown on Map WR-02-201. One licence is for a high value private potable water supply, which is protected by a SPZ1 and SPZ2 of 50m and 250m radius respectively. The other is considered a moderate value receptor because it is associated with water abstraction for non-potable use and the licence quantity is below 100m^3 per day.

15.3.17 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.18 There are no[188] consented discharges to groundwater within the study area.

Groundwater - surface water interactions

15.3.19 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 35 features within the study area that had potential to be springs. Access was possible to inspect eight of these features, all of which were verified as being minor land drainage features of low value.

15.3.20 The remaining 27 potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis.

15.3.21 Four of the potential spring features yet to be inspected are within the land required for the Proposed Scheme, one to the north of Clumpcliffe Farm Cottage, one to the north-west of Methley Hospital, one near Ivy Cottage and one to the south of Fishpond Lock.

15.3.22 Two of the potential spring features yet to be inspected located north of Wood End Farm (i) and south of Fishpond Lock, may support flow to a downstream ecological receptor at Canalside Ponds LNA. Further details of the ecology of this site, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

15.3.23 There are 26 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

15.3.24 The following nature conservation sites within the study area are potentially groundwater dependent:

- Water Haigh Woodland Park, a Yorkshire Wildlife Trust reserve, covering an area of 97ha. This area includes pockets of wetland, which have the potential to be groundwater fed but have yet to be surveyed. Water Haigh Woodland Park is partially located within the land required for the Proposed Scheme;

[188] The number of consents listed in Section 10, Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default area extends 250m from the land required for the construction of the Proposed Scheme. The default study areas may be extended where the potential for wider pathways exists.

- Rothwell Colliery LNA (Rothwell Country Park), covering an area of 46.8ha. The designation citation was not available at the time of writing, but from publicly available sources the site appears to contain ponds which have the potential to be groundwater fed but have yet to be surveyed. The LNA is located south of the existing Hallam Line railway, partially within the land required for the Proposed Scheme and on the boundary of LA15 and LA17;
- Leventhorpe Lagoon and Ings LNA, covering an area of 55.8ha. The designation citation was not available at the time of writing, but from available sources the site appears to contain wetland which has the potential to be groundwater fed but is yet to be surveyed. The wetland habitat likely supports assemblages of wintering, passage and breeding birds. The LNA is located on the north bank of the River Aire, and is located within land required for the Proposed Scheme; and
- Canalside Ponds LNA, covering an area of 2.3ha. The designation citation was not available at the time of writing, but from available sources the site appears to contain pond habitat which has the potential to be groundwater fed but is yet to be surveyed. The LNA is located adjacent to (south of) the Aire and Calder Navigation, partially within the land required for the Proposed Scheme.

15.3.25 The following nature conservation site within the study area which is dependent on surface water flows has the potential to be affected by the Proposed Scheme:

- Hell Lane Railway Cutting LWS, would be crossed by the route of the Proposed Scheme. This LWS includes an artificially flooded former railway cutting which has the potential to support water dependent species.

15.3.26 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

15.3.27 The Environment Agency's Flood map for planning (rivers and sea)[189] 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).

15.3.28 The updated Flood map for surface water[190] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset[191]. The British Geological

[189] Environment Agency, (2018), Flood Map for Planning. Available online at: https://flood-map-for-planning.service.gov.uk
[190] Environment Agency, (2018), Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=402498&northing=282043&address=100070518535
[191] Environment Agency, (2018), Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=402498&northing=282043&address=100070518535

Survey's (BGS) Groundwater flooding susceptibility data set[192], has been used to assess the future risk of groundwater flooding.

15.3.29 The following reports were used to help determine the baseline flood risk within the study area:

- Leeds Preliminary Flood Risk Assessment (PFRA) (2011)[193];
- Leeds Strategic Flood Risk Assessment (SFRA) (2007)[194];
- Leeds Local Flood Risk Management Strategy (LFRMS) (2014)[195];
- Calderdale Metropolitan Borough Council PFRA (2011)[196];
- Kirklees Council PFRA (2011)[197];
- WMDC SFRA (2016)[198]; and
- WMDC LFRMS (2016)[199].

River flooding

15.3.30 The study area includes substantial areas of floodplain (Flood Zones 2 and 3) associated with the River Calder, north of Altofts and the River Aire at Woodlesford. The other floodplain that would be crossed by the route of the Proposed Scheme is associated with Oulton Beck at Oulton. Table 35 shows all relevant watercourses within the study area with 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 35: River flood risk sources and receptors

Source	Location description and figure/coordinate[200]	Receptor potentially affected	Receptor value / sensitivity to flooding
River Calder	Floodplain upstream of the River Calder viaduct WR-01-369 DD, D7. D8, E6, E7, E8, F8	Residential properties along Balk Crescent	High
		Depot, works and surrounding residential properties along Ward Lane	High
		Residential Aire and Calder Cottages	High
		Commercial property on Ferry Lane	Moderate

[192] British Geological Survey (BGS) (2018) BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[193] Leeds City Council (2011), Leeds Preliminary Flood Risk Assessment
[194] Leeds City Council (2007), Leeds Strategic Flood Risk Assessment
[195] Leeds City Council (2014), Leeds Local Flood Risk Management Strategy (2014)
[196] JBA Consulting (2011), Calderdale Metropolitan Borough Council Preliminary Flood Risk Assessment
[197] Kirklees Council (2011), Kirklees Preliminary Flood Risk Assessment
[198] Wakefield Metropolitan District Council (2016), Calder Catchment Strategic Flood Risk Assessment Volumes I and II
[199] Wakefield Metropolitan District Council (2016), Wakefield Local Flood Risk Management Strategy
[200] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA15 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate[200]	Receptor potentially affected	Receptor value / sensitivity to flooding
		Residential properties along Ferry Lane	High
		Boat repair yard on Ferry Lane	Low
		Old Park Farm	High
		Open cast workings	Low
		Smalley Blight Farm	High
		Sewage works and single residential property off Water Lane	High
		Residential properties and commercial factory along Bottom Boat Road	High
		River Aire and Calder Navigation	High
	Floodplain downstream of the River Calder viaduct WR-01-369 D5, C4, D4, C3 – D3,	Two residential properties upstream and downstream of Foxholes Lane	High
		Residential properties at Methley Lanes including the Old School House	High
		Residential and commercial properties at Scholey Hill	High
		Penbank Farm	High
		Hazel House Farm, Pinder Green	High
		Two residential properties, pumping station and house west of Pinder Green	High
		Residential properties along Embleton Road, Pinder Green	High
		Residential properties along Little Church Lane/Mulberry, Methley	High
		Residential and commercial properties at The Cedars/Church side/Parish Centre, Methley	High
		Residential properties along Church Lane, Methley	High
		Residential properties along Balmoral Drive/Longbow Avenue, Methley	High
		River Aire and Calder Navigation	Low
Oulton Beck	Floodplain upstream of Oulton Beck viaduct near St John's Street and Farrer Lane off Calverley Road (A639) WR-01-370a H7, I5, I6, I7	Residential and commercial properties along St John's Street/Farrer Lane	High
	Floodplain downstream of Oulton Beck viaduct and River Aire viaduct WR-01-370a I3 – I5	Sewage works at Fleet Lane	High

Source	Location description and figure/coordinate[200]	Receptor potentially affected	Receptor value / sensitivity to flooding
River Aire	Floodplain upstream of the River Aire viaduct WR-01-370a G5-G6,	Residential and commercial properties along Juniper Avenue/Yew Tree Drive/Chestnut Grove, Woodlesford	High
		River Aire and Calder Navigation	High
	Floodplain downstream of the River Aire viaduct WR-01-370a G4, H3-H4	Marina/Storage Terminal Depot	Low
		River Aire and Calder Navigation	High

Surface water flooding

15.3.31 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 36. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 36: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[201]	Receptor potentially affected	Receptor value
Surface water flow path south of dismantled railway and Red Lane culvert	Kirkthorpe WR-01-369 G6	Agricultural land	Moderate
Surface water flow paths at Red Lane realignment	Kirkthorpe WR-01-369 H6	Red Lane, agricultural land and associated tracks	Moderate
Surface water flow path at Goosehill viaduct, south of the open cast workings	Goosehill WR-01-369 G5	Cross railway line and grassland	Very high
Surface water flow path at Normanton viaduct, north of the open cast workings	Goosehill WR-01-369 G5	Grassland	Low
Surface water flow path at Normanton viaduct, south of the disused Brick Works	Normanton WR-01-369 G6	Grassland and woodland	Low
Surface water flow path between Normanton viaduct and Newland Lane culvert	Newland Park WR-01-369 F6	Park (Nealand Park)	Low
Surface water flow path south of the River Calder viaduct	WR-01-369 E5 – E6	Agricultural land	Moderate
Surface water flow path north of the River Calder viaduct	WR-01-369 C5	M62, Newmarket Lane and agricultural land	Very high

[201] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA15 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate[201]	Receptor potentially affected	Receptor value
Surface water flow path between Moss Carr Wood viaduct and Winter Wood culvert	WR-01-369 B5	Agricultural land	Moderate
Surface water ponded at Fleet Lane Overbridge, north of Oulton Beck viaduct	WR-01-370a H5	Agricultural land	Moderate
Surface water flow path north of Fleet Lane Overbridge and south of Woodlesford Tunnel	WR-01-370a H5	Amenity grassland (football pitches)	Low
Surface water flow path between Swillington North culvert and Parkinson's Wood inverted siphon	WR-01-370a F4	Agricultural land	Moderate
Surface water flow paths south of the A63 Selby Road viaduct	WR-01-370a D4	Agricultural land	Moderate
Surface water flow paths north of the A63 Selby Road viaduct	WR-01-370a D4	Agricultural land	Moderate

Artificial water bodies

15.3.32 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. Artificial water bodies with potential implications for flood risk within the study area include the Aire and Calder Navigation, which would be crossed by the Proposed Scheme to the north of Altofts adjacent to the River Calder, and again at Woodlesford adjacent to the River Aire. The risk of an embankment failure within the study area and hence the inundation risk posed by the Aire and Calder Navigation is considered negligible.

Groundwater flooding

15.3.33 Information related to historical incidents of groundwater flooding in the Warmfield to Swillington and Woodlesford area is provided in the Leeds SFRA and the Wakefield LFRMS. The Leeds SFRA states that the risk of groundwater flooding is highly variable within the district. It is heavily dependent upon local ground conditions at a given point in time and the structures that have been constructed on them. The Wakefield LFRMS states that there is no conclusive local groundwater flooding information for the area and as such no site specific details are provided in the document.

15.3.34 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at the southern, middle and northern reaches of the study area in the River Calder and River Aire floodplains respectively and in areas where the Proposed Scheme is underlain by river terrace deposits and glaciofluvial deposits.

Land drainage

15.3.35 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. 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 of Constrtuction Practice (CoCP)[202] 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 will avoid passing along river or stream valleys, such as that of the River Calder, the River Aire and Oulton Beck 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 would 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: LA15 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 Watercourse realignments are proposed at the following locations:

- tributary of Red Beck 3 at Red Lane culvert;
- tributary of River Calder 2 at Goosehill viaduct; and
- tributary of River Aire 7 through the proposed Swillington Central culvert.

[202] Supporting document: Draft Code of Construction Practice

15.4.6 The aim will be to design these with equivalent hydraulic capacity to the existing channels. The Proposed Scheme would also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channel. Where such watercourses are natural channels, the design aim will be to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition[203].

15.4.7 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are three diversions proposed within this study area:

- tributary of the River Calder 2, diverted into the tributary of the River Calder 1, under Goosehill viaduct and around the southern end of Goosehill embankment;
- Almhouses Wood Drain will be diverted along the western toe of the Clumpcliffe Covert embankment, and then through the Winter Wood culvert; and
- tributary of River Aire 7 will be diverted along the western side of the Swillington cutting, and then through Parkinson's Wood North inverted siphon.

15.4.8 For watercourses that are not in their natural condition, the design aim for realignments and diversions will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.9 Infrastructure required within, along or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will be designed to minimise their impact on the natural hydromorphology of watercourse channels.

15.4.10 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;

[203] "Hydromorphological condition" reflects the extent to which water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats departs from that expected of a natural river or stream system.

- 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.

15.4.11 The draft CoCP also includes measures to safeguard against changes to channel hydromorphology within existing channels during construction.

15.4.12 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.

15.4.13 Permanent culverts proposed on the smaller watercourse crossings within this study area include: Red Lane culvert; Winter Woods culvert; Swillington North culvert; Swillington South culvert; Swillington Central culvert; Carr Wood South culvert; Moss Carr Wood drop inlet culvert; an inverted siphon at Parkinson's Wood on tributary of the River Aire 7; an inverted siphon at Parkinson's Wood on tributary of the River Aire 8 and Bullough Lane underbridge/ culvert. 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;
- 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.

15.4.14 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.

15.4.15 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.

15.4.16 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of

foundations, tunnels and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[204] 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;
- 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; and
- the Tunnel Boring Machine (TBM) would be operated in a closed face mode when tunnelling within water bearing strata and the tunnel lining would be designed to reduce leakage rates as far as is reasonably practicable, thereby reducing the requirements for dewatering and drainage.

15.4.17 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations, tunnels or cutting locations.

Flood risk and land drainage

15.4.18 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the intermediate pier structures on the River Calder, River Aire and Oulton Beck viaducts, and Calder South viaduct embankment which is located within the River Calder floodplain. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers, embankments, and highway realignment;
- the temporary works shown in the Volume 2: LA15 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 will cross surface water flow paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;

[204] Impermeable barrier preventing water flow

- in locations where the route of the Proposed Scheme will 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[205];
- 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 will 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 will pass in cutting, drainage measures will be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will 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 increase flood risk or impact on land drainage systems; and
- measures will 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.

15.4.19 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 will 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;

[205] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

- 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.

15.4.20 In accordance with Section 16 of the draft CoCP, monitoring will 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

15.4.21 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 will 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

15.4.22 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

15.4.23 The Woodlesford tunnel would intersect the Pennine Middle Coal Measures, River Terrace Deposits and Alluvium Secondary A aquifers. Any impact on groundwater levels and flow would be minor and localised and therefore considered to be negligible in the context of the groundwater body as a whole; there would be no significant effect. Where cut and cover construction methods are used for a section of Woodlesford tunnel, implementation of the measures set out in the draft CoCP would mean any effects on the aquifer would be negligible.

15.4.24 The proposed cuttings would intersect the Pennine Middle Coal Measures Formation, Lower Pennine Coal Measures Formation, River Terrace Deposits, Alluvium and Glaciofluvial Secondary A aquifers. While there are likely to be minor localised impacts, the implementation of the measures set out in the draft CoCP would mean that impacts on the overall status of these aquifers will not be significant.

15.4.25 Where the cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.26 The assessment has not identified any temporary significant effects related to groundwater abstractions.

Groundwater - surface water interactions

15.4.27 There is the potential for impacts upon baseflows in the River Aire, which is a high value receptor, while groundwater levels are lowered during excavation of Woodlesford tunnel where cut and cover construction methods would be used. This has been identified as a potential moderate adverse effect, which is significant.

Water dependent habitats

15.4.28 Temporary dewatering and drainage of Woodlesford cutting and portal have potential to lower the groundwater table and flow resulting in a moderate hydrological impact on wetland area within Water Haigh Woodland Park. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.29 Temporary dewatering and drainage at Woodlesford cut and cover tunnel and Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a moderate hydrological impact on Rothwell colliery LNA. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.30 Temporary dewatering and drainage at Woodlesford cut and cover tunnel and Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a moderate hydrological impact on the wetland habitat in Leventhorpe Lagoon and Ings LNA. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.31 Temporary dewatering and drainage at Woodlesford cut and cover tunnel and Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a moderate impact on Canalside Ponds LNA. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

Temporary effects - Flood risk and land drainage

15.4.32 Construction of the River Calder, River Aire and Oulton Beck 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

15.4.33 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

15.4.34 The assessment has not identified any localised impacts on surface water receptors that would give rise to permanent significant effects on surface water quality and channel hydromorphology in the Warmfield to Swillington and Woodlesford area.

Groundwater

Aquifers

15.4.35 Implementation of the avoidance and mitigation measures set out in the draft CoCP would ensure that there are no permanent significant effects related to the impact of the proposed tunnel and cuttings on water levels and quality in the aquifers that would be intercepted by the Proposed Scheme.

15.4.36 Where the impacts of the Proposed Scheme on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the effects on these have been assessed below.

Abstractions

15.4.37 The assessment has not identified any permanent significant effects related to groundwater abstractions.

Groundwater - surface water interactions

15.4.38 Oulton Beck, a high value receptor, has potential to be permanently impacted by the lowering of groundwater levels during excavation of Woodlesford cutting. Until this can be confirmed by site investigation, the assessment currently identifies the potential reduction of baseflow to this watercourse as a major adverse effect, which is significant.

15.4.39 The tributary of the River Aire 7, a moderate value receptor, has potential to be impacted by permanent lowering of groundwater levels in the vicinity of Swillington cutting. Until this can be confirmed by site investigation, the assessment currently identifies the potential drainage of this feature as a moderate adverse effect, which would be significant.

15.4.40 The spring features north of Wood End Farm (i) and south of Fishpond Lock would be permanently lost due to the construction of Rothwell Country Park cutting. These features potentially provide water flow to a downstream ecological receptor at Canalside Ponds LNA. This would result in a moderate hydrological impact. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

Water dependent habitats

15.4.41 Construction of the Marshall Hill culvert through the Kirkthorp embankment would result in the drainage of the water which is currently impounded within the dismantled railway line which forms the Hell Lane LWS. The drainage of the water retained would constitute a major impact. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.42 The permanent dewatering and drainage of Woodlesford cutting have potential to lower the groundwater table and flow resulting in moderate hydrological impact of wetland area within Water Haigh Woodland Park. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.43 The permanent dewatering and drainage at Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a moderate hydrological impact on Rothwell Colliery LNA. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.44 The permanent dewatering and drainage at Rothwell Country Park cutting have potential to lower the groundwater table and flow which results in a moderate hydrological impact on the wetland habitat in Leventhorpe Lagoon and Ings LNA. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.45 The permanent dewatering and drainage at Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a measurable change in the integrity of this attribute which results in a moderate impact on Canalside Ponds LNA. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

Permanent effects - Flood risk and land drainage

15.4.46 Draining and removing the structure impounding Hell Lane railway cutting in order to construct Kirkthorpe embankment and Marshall Hill culvert will alter the hydrological response of the surface water catchment area upstream of the proposed new culvert and lengthen the surface water flow path along the line of the existing disused railway. The resulting loss of attenuation has the potential to increase flood risk to the Network Rail infrastructure downstream. Until such time as a detailed hydrological and hydraulic analysis has been undertaken to accurately quantify the change in flood risk and determine an appropriate mitigation strategy, the potential for a moderate impact on this very high value receptor cannot be discounted. This moderate impact would result in a major adverse effect, which is significant.

15.4.47 The Calder South viaduct approach embankment is located within the River Calder floodplain, in Flood Zone 2. The Proposed Scheme makes provision for a replacement floodplain storage area to mitigate the loss of floodplain storage. There are approximately seven residential properties located upstream of Calder South viaduct at Bottom Boat Road. Until hydraulic modelling has been undertaken to verify the effectiveness of this proposed replacement floodplain storage area, the potential for a moderate impact on these high value receptors cannot be discounted. This moderate impact would result in a moderate adverse effect, which is significant.

Other mitigation measures

15.4.48 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.

Groundwater-surface water interactions

15.4.49 Additional mitigation measures for the management of groundwater baseflows to the River Aire during excavation and dewatering of Woodlesford tunnel may be required. Mitigation measures would be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- installation of a groundwater cut-off; and
- recirculation of treated water to the River Aire at an appropriate rate and location.

15.4.50 Additional mitigation measures for the management of groundwater baseflows to Oulton Beck and the tributary of the River Aire 7 during excavation and in the permanent case may be required. Mitigation measures would be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- installation of a groundwater cut-off;
- creation of a temporary section of lined channels;
- recirculation of treated water back to the watercourses at an appropriate rate and location; and
- permanent drainage measures to ensure baseflows are maintained.

15.4.51 Any such additional measures will be designed in consultation with the Environment Agency.

Flood risk and land drainage

15.4.52 Detailed hydrological and hydraulic analysis will be undertaken to quantify the change in surface water (pluvial) flood risk to Network Rail infrastructure downstream of Kirkthorpe embankment and Marshall Hill culvert. This analysis will be used to identify a range of appropriate mitigation options to be developed further in consultation with Network Rail.

15.4.53 Detailed fluvial hydraulic analysis will be undertaken to more accurately determine the extent of the floodplain and quantify the change in flood level, if any, that would be caused by the encroachment of the Calder South viaduct approach embankment into the floodplain of the River Calder. The results of this analysis will be used to design an appropriate replacement floodplain storage strategy to ensure that any significant localised flood risk effects are mitigated insofar as reasonably practicable.

Summary of likely residual significant effects

15.4.54 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a temporary moderate adverse effect related to the potential loss of baseflow from the River Aire whilst groundwater levels are lowered during excavation of the Woodlesford tunnel, which is significant;

- a permanent major adverse effect related to the potential loss of baseflow to Oulton Beck due to lowering of groundwater levels in the vicinity of Woodlesford cutting, which is significant;
- a permanent moderate adverse effect related to potential loss of baseflow to the tributary of the River Aire 7 due to lowering of groundwater levels in vicinity of Swillington cutting, which is significant;
- a permanent moderate adverse effect on surface water flood risk to Network Rail infrastructure related to the loss of attenuation within the surface water catchment upstream of Marshall Hill culvert, which is significant; and
- a permanent moderate adverse effect on flood risk related to the earthworks required to construct the Calder South viaduct approach embankment, which is significant.

15.4.55 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 (Section 16), 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 will 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 indicates that there would 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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