HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA16: Garforth and Church Fenton

HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA16: Garforth and Church Fenton

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.

High Speed Two (HS2) Limited,
Two Snowhill
Snow Hill Queensway
Birmingham B4 6GA

Telephone: 08081 434 434

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

A report prepared for High Speed Two (HS2) Limited:

AECOM CAPITA lineco forward together

ARUP + ERM | FOSTER + PARTNERS | JACOBS RAMBOLL | TYPSA | COSTAIN

MWJV

High Speed Two (HS2) Limited has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the HS2 website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard please contact High Speed Two (HS2) Limited.

recycle

Printed in Great Britain on paper containing at least 75% recycled fibre.

Contents

List of figures

List of tables

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.

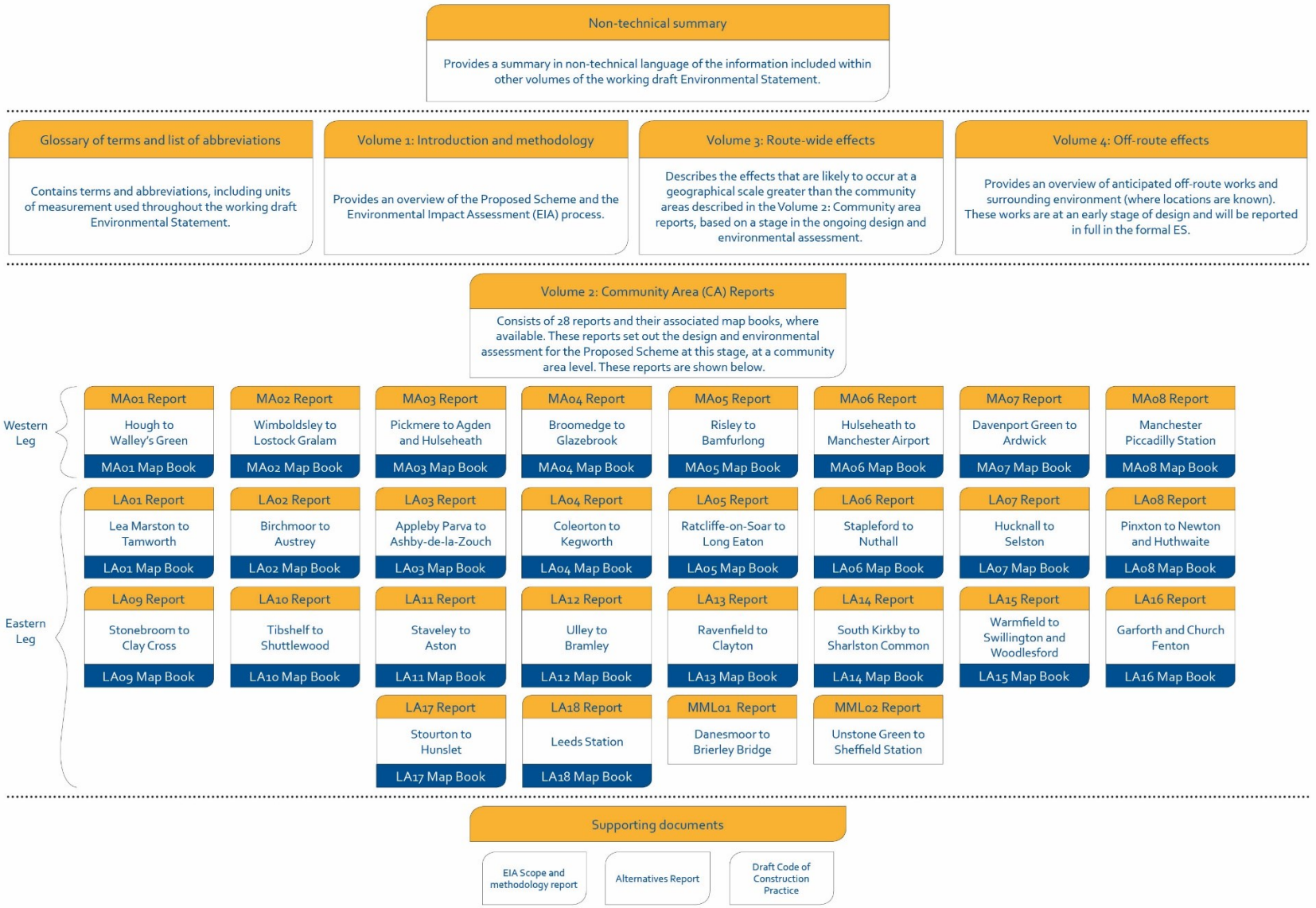
Volume 4: Off-route effects

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 would 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 would 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 would 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 initial construction works on Phase One commenced in 2017.

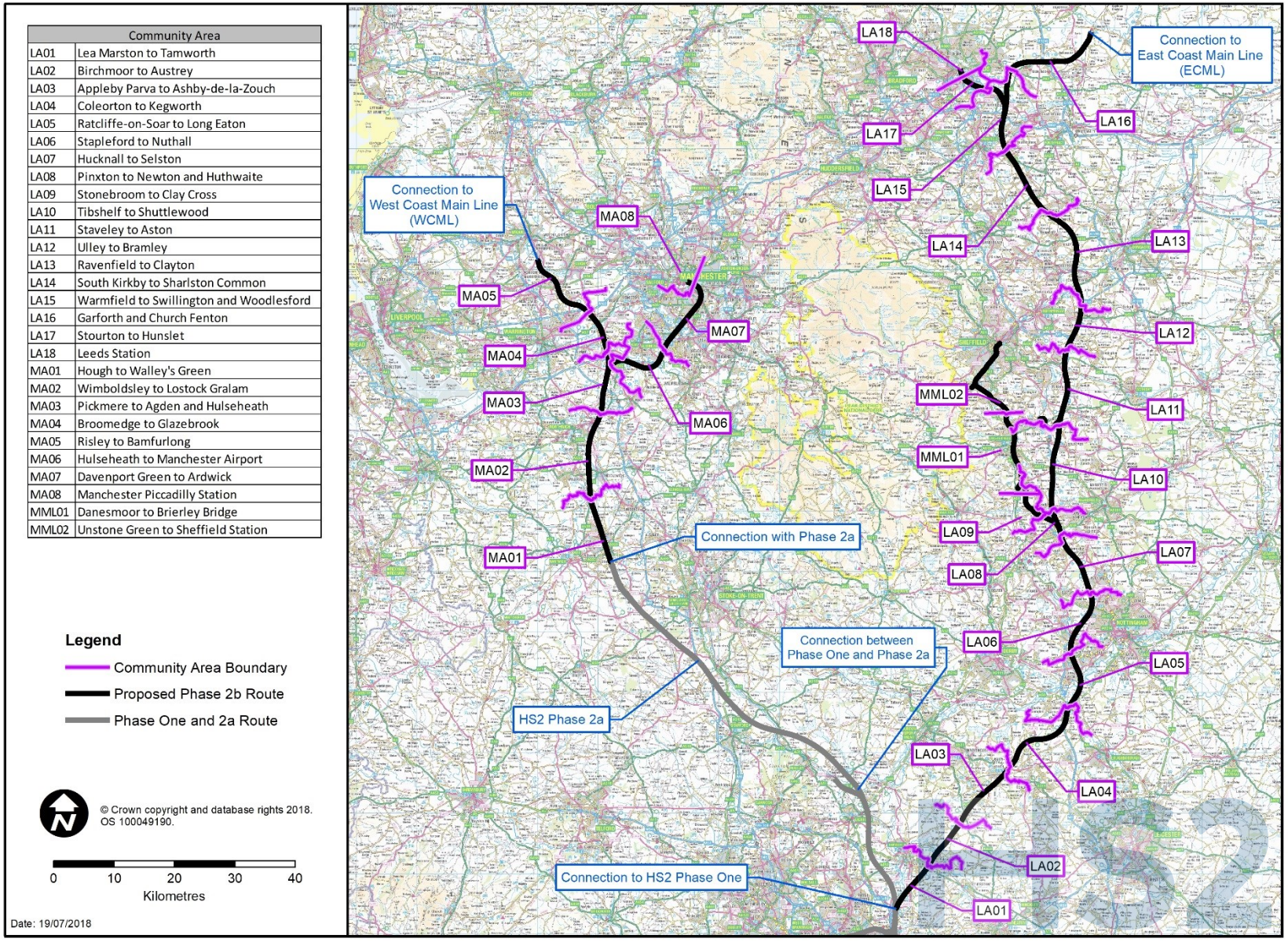
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles)) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Garforth and Church Fenton area (CA number LA16) 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 Garforth and Church Fenton area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

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

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

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

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1: an introduction to HS2 and the purpose and structure of this report;
- Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;
- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);

[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.

- air quality (Section 5);
- community (Section 6);
- ecology (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 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 Environmental Impact Assessment (EIA) Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Garforth and Church Fenton area are provided in a separate corresponding document entitled Volume 2: LA16 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: LA16 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

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

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 Garforth and Church Fenton area (LA16) would be approximately 16.2km in length and lie within the local authority areas of Leeds City Council (LCC), Selby District Council (SDC) and North Yorkshire County Council (NYCC).

2.1.2 The Proposed Scheme would pass through the parishes of Swillington, Austhorpe, Barwick in Elmet and Scholes, Parlington, Garforth, Sturton Grange, Micklefield, Lotherton cum Aberford, Huddleston with Newthorpe, Sherburn in Elmet, Barkston Ash, Church Fenton, Saxton with Scarthingwell and Ulleskelf.

2.1.3 The Swillington and Austhorpe parish boundaries form the south-western boundary of the Garforth and Church Fenton area. The north-eastern boundary of the area is located in Ulleskelf parish, where the route would join the existing York to Church Fenton railway line at Ulleskelf, to the north of Church Fenton. The Garforth and Church Fenton area is the northernmost area on the eastern leg of the HS2 main line.

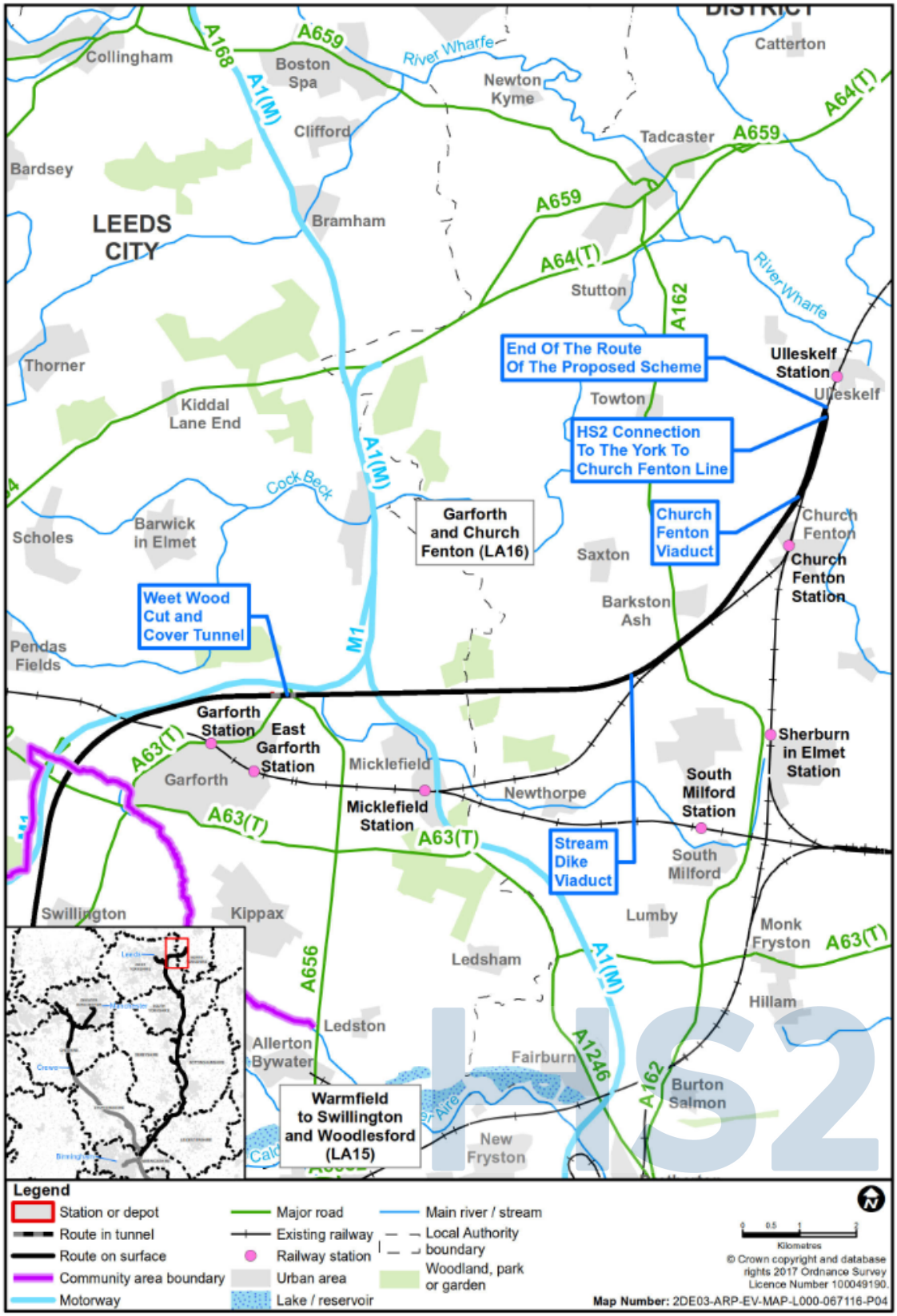
2.1.4 As shown in Figure 3, the Warmfield to Swillington and Woodlesford area (LA15) lies to the south of the Garforth and Church Fenton area.

Settlement, land use and topography

2.1.5 The Garforth and Church Fenton area is predominantly rural in character. Much of the area encompasses gently undulating lowland and settled river valley landscapes and floodplain pasture at lower levels. A number of settlements are located within the Garforth and Church Fenton area, including Austhorpe, Garforth, Sherburn in Elmet, Micklefield, Barkston Ash, Church Fenton and Ulleskelf. These settlements are interspersed with isolated dwellings and farmsteads.

2.1.6 Between Garforth and Barkston Ash, the landform is typically gently undulating, with heights ranging between approximately 90m above Ordnance Datum (AOD) and 40m AOD. The highest land occurs on an outcrop at Barrowby Hall, whilst the lowest land is located within the Stream Dike valley to the south-west of Barkston Ash.

Figure 3: Community area context map



2.1.7 Land use within the Garforth and Church Fenton area is characterised by arable farmland, pasture, parkland and commercial and ancient woodland. Other land uses within the area include a wind farm, equestrian facilities, the Scarthingwell Golf Course, sand and gravel extraction, and historic mining and landfill activities. Leeds East Airport, formerly RAF Church Fenton, is located to the north-east of Church Fenton.

2.1.8 Barrowby Hall, a Grade II listed building, and a Grade II listed Milepost close to the M1 at Junction 47, are located in the proximity of the Proposed Scheme.

Key transport infrastructure

2.1.9 The M1 passes through the area on an east-west alignment to the north of the route of the Proposed Scheme, with the M1 junction 46 located approximately 290m from the southern boundary of the Garforth to Church Fenton area. To the north of Micklefield, the route of the Proposed Scheme would also cross the A1(M), which runs on a north-south alignment.

2.1.10 At East Garforth, the route of the Proposed Scheme would cross the A642 Aberford Road and the A656 Ridge Road. The A642 Aberford Road passes through the area on a south-west to north-east alignment. The A656 Ridge Road passes through the area on a south-east to north-west alignment. These roads connect to settlements including Garforth to the south, and to the M1 junction 47 and the B1217 Aberford Road to the north. The route of the Proposed Scheme would also cross the A162 London Road to the south of Barkston Ash.

2.1.11 The route of the Proposed Scheme would cross the existing Leeds to Selby railway line to the north-east of Barrowby Hall and would run adjacent to this railway line between Coldhill Lane and Barkston Ash. The existing Leeds to Selby railway line meets the existing York to Church Fenton Line to the south of Church Fenton and both lines continue northwards in parallel. The route of the Proposed Scheme would connect with the existing Leeds to Selby railway line to the north of Church Fenton.

2.1.12 The route would cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide important links between scattered dwellings and surrounding villages in the Garforth and Church Fenton area.

Socio-economic profile

2.1.13 The Garforth and Church Fenton area lies within the LCC and SDC areas. The main employment sectors within the LCC area are the professional, scientific and technical sectors, which account for the largest proportion of businesses (16%), with the construction (10%) and business administration and support services (10%) sectors also accounting for relatively large proportions[4]. The main employment sectors within the SDC area are: professional, scientific and technical (14%); agriculture, forestry and fishing (12%) and construction (11%) sectors also accounting for relatively large proportions.

[4] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk

2.1.14 Approximately 443,000 people work in the LCC area[5], and 37,000 people work in the SDC area[6]. According to the Office for National Statistics Business Register and Employment Survey 2016, the top five sectors in terms of employment in the LCC area were: health (17%); business administration and support services (12%); professional, scientific and technical (11%); education (9%) and retail (7%). In the SDC area, the top five sectors in terms of employment were: manufacturing (19%); transport and storage (including postal) (12%); education (9%); professional, scientific and technical (8%) and business administration and support services (8%)[7].

2.1.15 According to the Annual Population Survey (2017)[8], the employment rate[9] within the LCC area was 74% (376,000 people), and 84% (44,000 people) within the SDC area.

2.1.16 According to the Annual Population Survey (2016)[10], 34% of residents in the LCC area aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 10% of residents had no qualifications. In the SDC area, 31% of residents aged 16-64 were qualified to NVQ4 and above, with 9% of its residents having no qualifications.

Notable community facilities

2.1.17 The main concentrations of community facilities are located in Garforth and Sherburn in Elmet. Micklefield, Barkston Ash, Church Fenton and Ulleskelf are villages that provide a smaller number of local services and community facilities.

2.1.18 Community facilities in the village of Garforth include Meadowbrook Manor nursing home, Springfield Home Care Services, a number of schools including St. Benedict's Catholic Primary School and East Garforth Infant and Primary School, and religious facilities and/or places of worship including Dayspring Church, Evangelical Church and St. Benedict's Parish Centre.

2.1.19 St. Mary's Church is a community facility located within the settlement of Micklefield.

2.1.20 Barkston Ash is a village and has notable community facilities including Barkston Ash Primary School, Barkston Ash Holy Trinity Church, Rainbow Nursery, Highfield Nursing Home and two public houses.

2.1.21 Notable community facilities in the village of Church Fenton include a Methodist Church, St. Mary's Church, Kirk Fenton Primary School, Jigsaw Nursery and a restaurant.

2.1.22 Ulleskelf has community facilities that include a church, a public house (the Ulleskelf Arms), a Post Office, and a village hall.

[5] Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk
[6] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk
[7] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk
[8] Annual Population Survey (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[9] The proportion of working age (16-64 year olds) residents that is in employment.
[10] Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk

Recreation, leisure and open space

2.1.23 The Garforth and Church Fenton area is predominantly rural, with areas of open space, woodland and farmland. It is crossed by local bridleways, footpaths and several PRoW, including Leeds Country Way (62 mile footpath around Leeds) which is a promoted PRoW.

2.1.24 Recreational facilities and areas of open space in Garforth include Barrowby Lane Stables, Garforth Golf Club, Amaranth Football and Cricket Club, Garforth Town Football Club, Hawk's Nest Wood and Parlington Hollins, which is an area of publically accessible woodland just north of Garforth.

2.1.25 Ringhay Wood and Weet Wood is a publically accessible area of woodland that lies north-east of the village of Micklefield.

2.1.26 There are some outdoor recreational facilities just north of Barkston Ash, including Scarthingwell Park and Scarthingwell Golf Course. Recreational facilities and areas of open space in Church Fenton, to the east, include Church Fenton Bowling Club, and Sandwath Lake, which is used recreationally for fishing by members of the Leeds and District Amalgamated Society of Anglers.

Policy and planning context

Planning framework

2.1.27 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.

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

- Leeds Core Strategy (2014)[11];
- Natural Resources and Waste Local Plan (2013)[12];
- Policies Map for Leeds (2016)[13];
- Aire Valley Leeds Area Action Plan (2017)[14];
- Saved Policies of the Leeds Unitary Development Plan (2001) and Unitary Development Plan Review (2006)[15];

[11] Leeds City Council. (2014). Leeds Core Strategy. Available at http://www.leeds.gov.uk/council/Pages/Core-Strategy-Introduction-Page.aspx
[12] Leeds City Council. (2013). Adopted Natural Resources and Waste Local Plan – Leeds Local Development Framework. Available at http://www.leeds.gov.uk/council/Pages/Natural%20Resources%20and%20Waste%20Local%20Plan.aspx
[13] 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
[14] 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
[15] 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

- West Yorkshire Transport Strategy 2014 (2017)[16];
- Barwick in Elmlet and Scholes Neighbourhood Plan 2017-2028 (2017)[17];
- Selby District Core Strategy Local Plan (2013)[18];
- Saved Policies of the Selby District Local Plan (2005)[19];
- Saved Policies of the North Yorkshire Minerals Local Plan (1997)[20];
- Saved Policies of the North Yorkshire Waste Local Plan (2006)[21]; and
- North Yorkshire Local Transport Plan 2016-2045 (2016)[22].

2.1.29 Emerging policies are not generally included within this report unless a document has been submitted to the secretary of state for examination. This is the case with the North Yorkshire Minerals and Waste Joint Plan[23], which was submitted to the Secretary of State on 28 November 2017, and the Leeds Sites Allocations Plan, which was submitted to the Secretary of State on 05 May 2017.

Committed development

2.1.30 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.

2.1.31 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.

2.1.32 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.

2.1.33 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.

[16] West Yorkshire Combined Authority, (2017), Transport Strategy 2040. Available online at: https://www.westyorks-ca.gov.uk/transport/transport-strategy/
[17] Barwick in Elmet & Scholes Parish Council, (2017), Barwick in Elmet & Scholes Neighbourhood Plan. Available online at: https://www.leeds.gov.uk/docs/01%20Barwick%20Referendum%20Plan%20LR.pdf
[18] Selby District Council, (2013), Selby District Core Strategy Local Plan. Available online at: http://www.selby.gov.uk/adopted-core-strategy
[19] Selby District Council, (2005), Selby District Local Plan. Available online at: http://www.selby.gov.uk/selby-district-local-plan-sdlp-2005
[20] North Yorkshire County Council, (1997), North Yorkshire Minerals Local Plan. Available online at: https://www.northyorks.gov.uk/local-plan-minerals
[21] North Yorkshire County Council, (2006), North Yorkshire Waste Local Plan. Available online at: https://www.northyorks.gov.uk/local-plan-waste
[22] North Yorkshire County Council, (2016)), North Yorkshire Local Transport Plan 2016-2045. Available online at: https://www.northyorks.gov.uk/local-transport-plan
[23] North Yorkshire County Council, City of York Council, North York Moors National Park, (2016), Minerals and Waste Joint Plan. Available online at https://www.northyorks.gov.uk/minerals-and-waste-joint-plan-examination

Ongoing design development

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

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage area;
- identification of temporary and permanent utility diversions;
- identification of railhead locations;
- refinement of the realignment of road and PRoW crossing the Proposed Scheme;
- 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 auto-transformer stations.

2.2 Description of the Proposed Scheme

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

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

2.2.3 In general, features are described from south to north along the route, and east to west for features that cross the Proposed Scheme.

Overview

2.2.4 The Proposed Scheme through the Garforth and Church Fenton area would be approximately 16.3km long. The route would extend from west of Garforth in the south and travel north-east towards Barkston Ash and Church Fenton.

2.2.5 This section of route is illustrated on maps CT-06-495b to CT-06-496 in the Volume 2: LA16 Map Book.

2.2.6 All dimensions in the sections below are approximate.

2.2.7 In the Garforth and Church Fenton area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 2.4km (Stream Dike and Church Fenton viaducts);
- cuttings for a total length of 4.4km (West Garforth, East Garforth, Micklefield, Weet Wood, A1(M) and Ringhay Wood cuttings);
- embankments for a total length of 8.9km (West Garforth North, Micklefield, Ringhay Wood, Barkston Ash, and Church Fenton embankments); and
- tunnels (including porous portals) for a total length of 440m (Weet Wood cut and cover tunnel).

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

2.2.9 In general, features are described along the route of the Proposed Scheme from south-west to north-east and to the southern and northern sides of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA16 Map Book.

West Garforth North embankment to East Garforth cutting

2.2.10 From the boundary with the Warmfield to Swillington and Woodlesford Area (LA15) to the south, the route of the Proposed Scheme would continue north-eastwards on the West Garforth North embankment, towards East Garforth. The route of the Proposed Scheme would then continue into the West Garforth cutting before joining the Leeds to Selby overbridge and the East Garforth cutting.

2.2.11 This section of route is illustrated on maps CT-06-495b to CT-06-496 in the Volume 2: LA16 Map Book.

2.2.12 Key features of this 2.2km section would include:

- continuation of the West Garforth North embankment, 589m in length and up to 16m in height in this section, with associated landscape mitigation planting to the north and south to help integrate the Proposed Scheme into the surrounding landscape and woodland habitat creation to the south to provide replacement habitat (see Volume 2: Map CT-06-495b, G5 to I6);
- the Carr Wood North culvert would be located 600m north-east of the A63 Selby Road to carry Tributary of The Beck 1 under the route of the Proposed Scheme (see Volume 2: Map CT-06-495b, H5);
- a balancing pond for railway drainage would be located to the south of the route of the Proposed Scheme at the end of the West Garforth North embankment. Access to the balancing pond would be from a new access road via Barrowby Lane. Woodland habitat creation would be provided to the north and south of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-496, B6 to C7);
- a pumping station associated with the railway balancing pond would be

provided at the end of West Garforth cutting to the south of the Proposed Scheme (see Volume 2: Map CT-06-496, B6);

- West Garforth cutting, 683m in length, 163m in width and up to 24m in depth (see Volume 2: Map CT-06-496, B6 to E5);
- realignment of Leeds Bridleway 125, 82m south of its current alignment for 525m, crossing the route of the Proposed Scheme on the Leeds Bridleway 125 accommodation overbridge, 150m in length, to provide agricultural accommodation access. The National Route 66 (part of the National Cycle Network) would also cross the Proposed Scheme at this location. Woodland and hedgerow habitat creation would be provided to the north and south to provide replacement habitat (see Volume 2: Map CT-06-496, D5 to D6);
- Leeds to Selby line overbridge, 52m in length, 17m in width crossing the Leeds to Selby line (see Volume 2: Map CT-06-496, F5); and
- East Garforth cutting, 921m in length, up to 96m in width and up to 17m in depth with associated landscape mitigation planting to the north and south to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-496 to CT-06-497, F5 to J6).

2.2.13 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 West Garforth cutting main compound, which is described in Section 2.3, and shown on map CT-05-496, A4 to C5 in the Volume 2: LA16 Map Book.

East Garforth Cutting to Weet Wood cut and cover tunnel

2.2.15 The route of the Proposed Scheme would continue onto Micklefield embankment where it would pass under Barwick Road overbridge. The route of the Proposed Scheme would then enter Micklefield cutting before entering Weet Wood cut and cover tunnel.

2.2.16 This section of the route is illustrated on maps CT-06-496 to CT-06-498 in the Volume 2: LA16 Map Book.

2.2.17 Key features of this 2.2km section would include:

- realignment of Barwick Bridleway 10 36m south of its current alignment for 165m, crossing the route of the Proposed Scheme on the Leeds Bridleway 123 accommodation overbridge (see Volume 2: Map CT-06-496, F5 to G6);
- realignment of Leeds Bridleway 123 on its current alignment for 30m, crossing the route of the Proposed Scheme on the Leeds Bridleway accommodation overbridge (see Volume 2: Map CT-06-496, F5);
- Leeds Bridleway 123 accommodation overbridge, 110m in length (see Volume 2: Map CT-06-496, F5 to G6);

- closure of Leeds Footpath 122 where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-496, F5);
- realignment of Barwick Road 45m to the west of its existing alignment, for a length of 990m, crossing the route of the Proposed Scheme on Barwick Road overbridge, 125m in length up to 12.7m above existing ground level, and 11m above track level. Access would be retained to existing properties on the existing Barwick Road both sides of the route of the Proposed Scheme. Landscape mitigation planting would be provided on all sides on the Barwick Road overbridge to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-497, D2 to C9);
- a balancing pond for highway drainage would be located to the north of the Proposed Scheme, to the west of Barwick Road. Access to the balancing pond would be via Barwick Road (see Volume 2: Map CT-06-497, C2);
- a balancing pond for highway drainage would be located to the south of the Proposed Scheme, to the east of Barwick Road. Access to the balancing pond would be via the existing Barwick Road (see Volume 2: Map CT-06-497, C8 to D8);
- a balancing pond for railway drainage would be located, to the south-east of Barwick Road. Access to the balancing pond would be via the existing Barwick Road (see Volume 2: Map CT-06-497, D6);
- a replacement floodplain storage area would be located to the east of Barwick Road on the north side of the route of the Proposed Scheme. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-497, D2 to D4);
- Barnbow Common drop inlet culvert, located 200m east of Barwick Road, to maintain cross drainage of surface water under the route of the Proposed Scheme (see Volume 2: Map CT-06-497, D5);
- Hawk's Nest Auto-Transformer Station, on the southern side of the route of the Proposed Scheme, 225m east of Barwick Road realignment. Access would be provided via the existing Barwick Road to the east (see Volume 2: Map CT-06-497, D6);
- Micklefield embankment, 980m in length, up to 2.5m in height with associated grassed areas to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-497, D5 to H5);
- diversion of Garforth Footpath 7a/Parlington Non Definitive Bridleway, onto the realigned Barwick Road, 36m north of its current alignment, for 73m (see Volume 2: Map CT-06-497, C8);
- diversion of Garforth Footpath 8/Parlington Non-Definitive Bridleway to Barwick Road, 460m to the south-west of its existing junction with Barwick Footpath 9, for 410m (see Volume 2: Map CT-06-497, E5);
- diversion of Sturton Grange Footpath 1 to the south of the Proposed Scheme,

to Garforth Footpath 8, 175m to the south-west of its existing junction with Garforth Footpath 9, for 215m (see Volume 2: Map CT-06-497, F5);

- Hawk's Nest Wood drop inlet culvert, 530m east of the realigned Barwick Road to carry Tributary of The Beck 3 under the Micklefield embankment (see Volume 2: Map CT-06-497, F5);
- diversion of Sturton Grange Footpath 1 to the north of the Proposed Scheme, to Sturton Grange Footpath 6, 585m to the north of its existing junction with Ash Lane, for 670m (see Volume 2: Map CT-06-497, C6 to F6 and F5 to I5);
- diversion of Parlington Bridleway 5, onto the proposed Barwick Road, north of its current alignment (see Volume 2: Map CT-06-497 to CT-06-498);
- Micklefield cutting 740m in length, up to 108m in width and 13m in depth. Woodland habitat creation would be provided to the south of the cutting to replace habitat (see Volume 2: Map CT-06-497, C4 to D4);
- realignment of Sturton Grange Footpath 6, crossing the route of the Proposed Scheme on its current alignment on the Sturton Grange Footpath 6 accommodation overbridge, 60m in length to provide agricultural accommodation access (see Volume 2: Map CT-06-497, I6);
- a tunnel portal building[24] and rescue area at the western end of the Weet Wood cut and cover tunnel to the north of the Proposed Scheme. Access would be provided from Sturton Grange Footpath 6 accommodation access road (see Volume 2: Map CT-06-498, C5);
- a porous portal 100m in length at the western end of the Weet Wood cut and cover tunnel (see Volume 2: Map CT-06-498, D6);
- Weet Wood cut and cover tunnel, 240m in length and up to 12m in depth, crossing under the A642 Aberford Road and the A656 Ridge Road with associated landscape mitigation planting to the north and south to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-498 D6 to E6);
- a porous portal 100m in length at the eastern end of Weet Wood cut and cover tunnel, with a headwall 75m long at the southern end of the portal cutting (see Volume 2: Map CT-06-498, F6); and
- a rescue area at the eastern end of the Weet Wood cut and cover tunnel to the south of the Proposed Scheme. Access will be provided from the A656 Ridge Road (see Volume 2: Map CT-06-498, F6).

2.2.18 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.

[24] Tunnel portal building houses equipment, such as control equipment for the tunnel and ventilation fans for rail tunnel operations.

2.2.19 Construction of this section would be managed from the West Garforth cutting main compound, Micklefield embankment satellite compound, Micklefield cutting satellite compound which is described in Section 2.3, and shown on map CT-05-496 to map CT-05-498 in the Volume 2: LA16 Map Book.

Weet Wood cut and cover tunnel to Ringhay Wood Embankment

2.2.20 The Proposed Scheme would continue east into Weet Wood cutting before passing under the Great North Road and the A1(M) in the A1(M) cutting. The Proposed Scheme would then enter Ringhay Wood Cutting before rising up onto Ringhay Wood embankment.

2.2.21 Key features of this 6km section would include:

- Weet Wood cutting up to 1.2km in length, 80m in width and 12m in depth. With grassed areas to the north and south of the cutting to help to helpintegrate the Proposed Scheme into the surrounding landscape. Hedgerow habitat creation would take place to the south to provide replacement habitat (see Volume 2: Map CT-06-498, F6 to 499, E6);
- a balancing pond for highway drainage would be located to the east of the A656 Ridge Road. Access to the balancing pond would be via the existing A656 Ridge Road (see Volume 2: Map CT-06-498, F9);
- Sturton Dyke drop inlet culvert located 440m east of Weet Wood cut and cover tunnel. The culvert would carry Sturton Dyke watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-498, F6);
- realignment of Ridge Road, by 110m, 55m to the east of its existing alignment. The realigned Ridge Road would cross the route of the Proposed Scheme on Ridge Road overbridge, 64m in length up to 4.9m above existing ground level and 12.7m above track level. The existing Ridge Road would be closed where it would cross the route of the Proposed Scheme, with access retained to existing properties on both sides of the route (see Volume 2: Map CT-06-499, C4 to C9);
- landscape mitigation planting would be provided on all sides of the realigned Ridge Road to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-499, C4 to C8);
- a balancing pond for highway drainage would be located to the south of Ridge Road. Access to the balancing pond would be via the realigned Ridge Road (see Volume 2: Map CT-06-499, C8);
- a balancing pond for highway drainage would be located to the west of the Great North Road. Access to the balancing pond would be via Great North Road (see Volume 2: Map CT-06-499, F9);
- A1(M) cutting, 172m length, 22m in width and 15m in depth (see Volume 2: Map CT-06-499, E6);
- Great North Road overbridge, 25m in length, at existing ground level and

13.2m above track level (see Volume 2: Map CT-06-499, E6);

- A1(M) Northbound overbridge,25m in length at existing ground level and 13.3m above track level (see Volume 2: Map CT-06-499, E6);
- A1(M) Southbound overbridge, 24m in length and up to 1m above existing ground level and 12.2m above track level (see Volume 2: Map CT-06-499, E6);
- Ringhay Wood cutting, up to 714m in length, 71m in width and 12m in depth (see Volume 2: Map CT-06-499, E6 to 500, F5); and
- landscape mitigation planting and grassed areas would be provided on all sides on the Ringhay Wood cutting to help integrate the Proposed Scheme into the surrounding landscape. Areas of woodland habitat creation would be provided to the east of Weet Wood, to provide replacement habitat (see Volume 2: Map CT-06-499, E6 to 500, F5).

2.2.22 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.

2.2.23 Construction of this section would be managed from the West Garforth cutting main compound, Micklefield cutting satellite compound, Weet Wood cutting satellite compound Ringhay Wood cutting satellite compound, which are described in Section 2.3, and shown on map CT-05-496 to map CT-05-499 in the Volume 2: LA16 Map Book.

Ringhay Wood embankment to Stream Dike viaduct

2.2.24 The Proposed Scheme would continue onto Ringhay Wood embankment before passing onto Stream Dike viaduct. The Proposed Scheme would then pass onto Barkston Ash embankment, moving onto Stream Dike viaduct.

2.2.25 Key features of this 5.9km section would include:

- realignment of Micklefield Footpath 11, 24 m west of its existing alignment, for 310m, crossing the route of the Proposed Scheme on the Micklefield Footpath 11 accommodation overbridge, 43m in length, 7.2m in width to provide agricultural accommodation access (see Volume 2: Map CT-06-500, B5 to A6);
- diversion of Micklefield Footpath 1 to the south of the Proposed Scheme, for 335m, to the west of its current alignment, to meet Micklefield Footpath 11 (see Volume 2: Map CT-06-500, A7 to C7);
- diversion of Micklefield Footpath 1 to the north of the Proposed Scheme, for 550m, to the west of its current alignment, to meet Micklefield Footpath 11 (see Volume 2: Map CT-06-500, B4 to D5);
- Weet Wood culvert, located 379m east of Micklefield Footpath 11 accommodation overbridge, to carry an unnamed watercourse under Ringhay Wood embankment (see Volume 2: Map CT-06-500, C5);

- Micklefield Auto-Transformer Station, on the northern side of the route of the Proposed Scheme, 462m east of Weet Wood culvert. Access would be provided via Coldhill Lane to the east utilising existing tracks (see Volume 2: Map CT-06-500, F5);
- Ringhay Wood embankment, 3.6km in length and up to 11m in height. Landscape mitigation planting and grassed areas would be provided on all sides of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-500, F5 to CT-06-502 to E6);
- Near Fox culvert, located 1.4km east of Weet Wood culvert to carry Weet Wood Drain under Ringhay Wood Embankment (see Volume 2: Map CT-06-501, B5);
- Middle Fox culvert, located 725m east of Near Fox culvert to carry an unnamed watercourse under Ringhay Wood Embankment (see Volume 2: Map CT-06-500, to Map CT-06-501, F5);
- Far Fox Covert underbridge, 16m in length and 15m in width to provide accommodation access along an existing track (see Volume 2: Map CT-06-501, G5);
- Far Fox culvert, located 248m east of Far Fox Covert underbridge. The culvert would maintain cross drainage of surface water under Ringhay Wood Embankment (see Volume 2: Map CT-06-500, to Map CT-06-501, H5);
- realignment of Coldhill Lane, by 510m, 30m north-west of its current alignment crossing under the route of the Proposed Scheme via Coldhill Lane Underbridge, 28m in length at existing ground level and 12.8m below track level (see Volume 2: Map CT-06-502, C4 to D8);
- a balancing pond and pumping station for highway drainage would be located to the south of the Proposed Scheme, south of Coldhill Lane realignment. Access to the balancing pond would be from the east via Coldhill Lane (see Volume 2: Map CT-06-502, D7 to D8);
- a balancing pond for railway drainage would be located to the south of the Proposed Scheme, east of Coldhill Lane realignment. Access to the balancing pond would be from the west via Coldhill Lane (see Volume 2: Map CT-06-502, E6 to E7);
- a replacement floodplain storage area would be located to the east of Coldhill Lane, on the north side of the Proposed Route. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-502, D4 to E5);
- proposed bridge over Stream Dike, 28m in length and 8m in width, for HS2 and Copley Lane Quarry access (see Volume 2: Map CT-06-502, E5); and
- Stream Dike Viaduct, up to 190m in length and 20m in height crossing Stream Dike (see Volume 2: Map CT-06-502, E6 to F6).

2.2.26 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.

2.2.27 Construction of this section would be managed from the West Garforth cutting main compound, Ringhay Wood cutting satellite compound, Stream Dike embankment satellite compound which is described in Section 2.3, and shown on map CT-05-496 and map CT-05-502 in the Volume 2: LA16 Map Book.

Stream Dike viaduct to Church Fenton Embankment

2.2.28 The route of the Proposed Scheme would continue onto Barkston Ash embankment passing onto Church Fenton viaduct. The route of the Proposed Scheme would then pass onto the Church Fenton embankment where it would connect to the Leeds lines of the existing York to Church Fenton Line.

2.2.29 Key features of this 3.1km section would include:

- Barkston Ash embankment, 2.8km in length and up to 21m in height. Landscape mitigation planting would be provided on all sides of Barkston Ash Embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-502, F6 to Map CT-06-506, E6);
- A162 London Road underbridge, 24m in length at existing ground level and 12m below track level, to allow A162 London Road to cross under the route of the Proposed Scheme on its current alignment (see Volume 2: Map CT-06-503, C5);
- diversion of Barkston Ash Footpath 35.4/5/2, to the west of the Proposed Scheme, 80m to the north of its current alignment, for 204m (see Volume 2: Map CT-06-503, E5 to F5);
- Bishop Dike culvert, located 570m to the east of A162 London Road underbridge, to carry pass Bishops Dike under Barkston Ash Embankment (see Volume 2: Map CT-06-503, F5);
- Saw Wells Lane underbridge, 24m in length, 17m in width to allow Saw Wells Lane to pass under the Proposed Scheme (see Volume 2: Map CT-06-503, F6);
- Barkston Moor culvert located 268m to the east of Saw Wells Lane underbridge. The culvert would pass Tributary of Barkston Drain 1 under Barkston Ash Embankment (see Volume 2: Map CT-06-503, G6);
- Barkston Ash culvert located 236m to the east of Barkston Moor Culvert. The culvert would pass an unnamed watercourse under Barkston Ash embankment (see Volume 2: Map CT-06-503, H5);
- Barkston Auto-Transformer Station, on the western side of the Proposed Scheme, 277m north of Barkston Ash culvert. Access would be provided from Common Lane to the north (see Volume 2: Map CT-06-504, B5);
- a balancing pond and pumping station for railway drainage would be located to the east of the Proposed Scheme, south of Common Lane realignment.

Access to the balancing pond would be from the north via Common Lane realignment (see Volume 2: Map CT-06-504, C6 to C7);

- Church Fenton viaduct, up to 2.3km in length and up to 18m in height, to cross over Sandwath Lane (see Volume 2: Map CT-06-504, E6 to Map CT-06-504, F6);
- realignment of Common Lane, by 840m, 32m north of its current alignment. The realigned Common Lane would cross beneath the route of the Proposed Scheme via Church Fenton viaduct, up to 4m below existing ground level and 11m below track level. Landscape mitigation planting would be provided to the south of Common Road and west of the Proposed Scheme to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-504, D5 to F6);
- a balancing pond and pumping station for highway drainage would be located to the north of the Proposed Scheme, west of Common Lane realignment. Sandwath Lane, to the east of the Proposed Scheme, will remain open. Access to the balancing pond would be from the south via Common Lane (see Volume 2: Map CT-06-504, D5);
- a replacement floodplain storage area would be located to the north of Common Road, on the west side of the Proposed Scheme. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-504, E4 to G4);
- closure of Sandwath Lane where it would cross the route of the Proposed Scheme, access to properties would be retained to the sections that remain on either side. To the north of the Proposed Scheme, Sandwath Lane would be diverted for 812m to the west to join Common Road realignment (see Volume 2: Map CT-06-504, E5 to I5);
- a replacement floodplain storage area would be located to the west of Bridleway 35.55/14/2, on the west side of the Proposed Scheme. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-504-L1, F6 to J8);
- a noise fence barrier, east of the route of the Proposed Scheme, 1140m in length and up to 2m in height above rail, along the Church Fenton viaduct, to provide acoustic screening for properties in Church Fenton (see Volume 2: CT-06-504, E6 to J6 and CT-06-505, A5 to C5);
- a balancing pond for existing railway drainage would be located east of Sandwath Lane, between the Proposed Scheme and the existing York to Church Fenton Line railway. Access to the balancing pond would be from the south via Sandwath Lane. Woodland, wetland and hedgerow habitat creation would be provided to replace the habitat (see Volume 2: Map CT-06-504, J6 to J7, to Map CT-06-505, B6);
- areas of woodland and hedgerow habitat creation and grassed areas north of Sandwath Lane, between the Proposed Scheme and the existing York to

Church Fenton Line Railway, would provide replacement habitat to aid integration into the surrounding landscape (see Volume 2: Map CT-06-504, I5 to J7, to Map CT-06-505, B6);

- a replacement floodplain storage area would be located to the north of Station Road, on the east side of the Proposed Scheme, to the east of the existing York to Church Fenton Line Railway. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-505, C9 to G10, to Map CT-06-505-R1, C2 to D7);
- modifications to the existing York to Church Fenton Line Railway, to accommodate the connection of the Proposed Scheme with the conventional rail network. This includes realignment of the tracks between Church Fenton and Ulleskelf and works to the conventional railway continuing beyond Ulleskelf (see Volume 2: Map CT-06-505, C7 to J5 to CT-06-506, A5 to I5);
- areas of woodland and hedgerow habitat creation east and west of the York to Church Fenton Line existing railway, to provide replacement habitat (see Volume 2: Map CT-06-505, C7 to J5 to CT-06-506, A5 to I5);
- a HS2 access footbridge over the realigned York to Church Fenton Line existing railway to the west of the Proposed Scheme, HS2 access will be provided via New Road (see Volume 2: Map CT-06-505, H5);
- Ulleskelf Mires South culvert, located 50m to the east of the HS2 access footbridge to carry Tributary of Dorts Dike 3 under Church Fenton viaduct (see Volume 2: Map CT-06-505, I5);
- Church Fenton embankment, up to 843m in length and 8m in height, woodland and hedgerow habitat creation on all sides to provide replacement habitat (see Volume 2: Map CT-06-506, B5 to E5);
- Ulleskelf Mires North inverted siphon would be located 337m north of Ulleskelf Mires South culvert. The inverted siphon would carry Tributary of Dorts Dike 4 beneath the Church Fenton embankment (see Volume 2: Map CT-06-506, C5);
- a balancing pond for railway drainage would be located directly to the west of the Proposed Scheme, north of the Ulleskelf Mires North inverted siphon. Access to the balancing pond would be from the north via New Road. Woodland and hedgerow habitat creation would be provided to replace habitat (see Volume 2: Map CT-06-506, E5); and
- a replacement floodplain storage area would be located to the west of the York to Church Fenton line, on the west side of the Proposed Scheme. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-506, D1 to G4).

2.2.30 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.

2.2.31 Construction of this section would be managed from the West Garforth cutting main compound, Stream Dike embankment satellite compound, Barkston Ash embankment satellite compound, Church Fenton viaduct satellite compound, Church Fenton embankment east satellite compound and Church Fenton embankment west satellite compound, which are described in Section 2.3, and shown on map CT-05-496 and map CT-05-402 to 506 in the Volume 2: LA16 Map Book.

2.2.32 In order to accommodate HS2 rail services to York station and beyond, a HS2 connection to Network Rail would be provided between Ulleskelf and Church Fenton. This section of conventional railway has four lines, two of which are used to serve Ulleskelf Station on the eastern side of the alignment (York to Church Fenton railway line). The connection is being made to the western side of the alignment onto the two lines bypassing Ulleskelf station (Leeds East and West railway lines). No alignment modifications would be required on the two lines serving the station. Modifications would be required to the signalling, telecommunications and electrification systems. To accommodate these systems, minor modifications maybe required at this station.

2.2.33 The HS2 connection would be onto the Leeds eastbound and westbound railway lines via a grade separated junction north of Church Fenton. The junction would pass the route of the Proposed Scheme over a single Network Rail line, which would be realigned. No track realignments are required through Church Fenton Station. To facilitate wider modifications to the signalling, telecommunications and electrification systems, minor modifications maybe required at this station.

2.2.34 To facilitate the connection, the Leeds lines would be realigned and spaced apart to provide a connection point between Network Rail and the Proposed Scheme. To regulate movements, a number of crossings will be required between Ulleskelf and where the lines merge with the East Coast Main Line.

2.2.35 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.

2.2.36 Construction of this section would be managed from the West Garforth main compound, which is described in Section 2.3, and shown on map CT-05-495b and map CT-05-496 in the Volume 2: LA16 Map Book.

Demolitions

2.2.37 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.

2.2.38 At this stage of the design development, it is anticipated that demolition of five existing residential properties, five commercial/business properties (including farm outbuildings) and one other structure would be required to construct the permanent features in the Garforth and Church Fenton 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 Garforth and Church Fenton 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[25] 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 roads, 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.

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:

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

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

Advance works

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

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

Engineering works

Introduction

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

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

2.3.14 The construction of track and railway systems works in open areas would include the installation of track form, rails, infill material, 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.

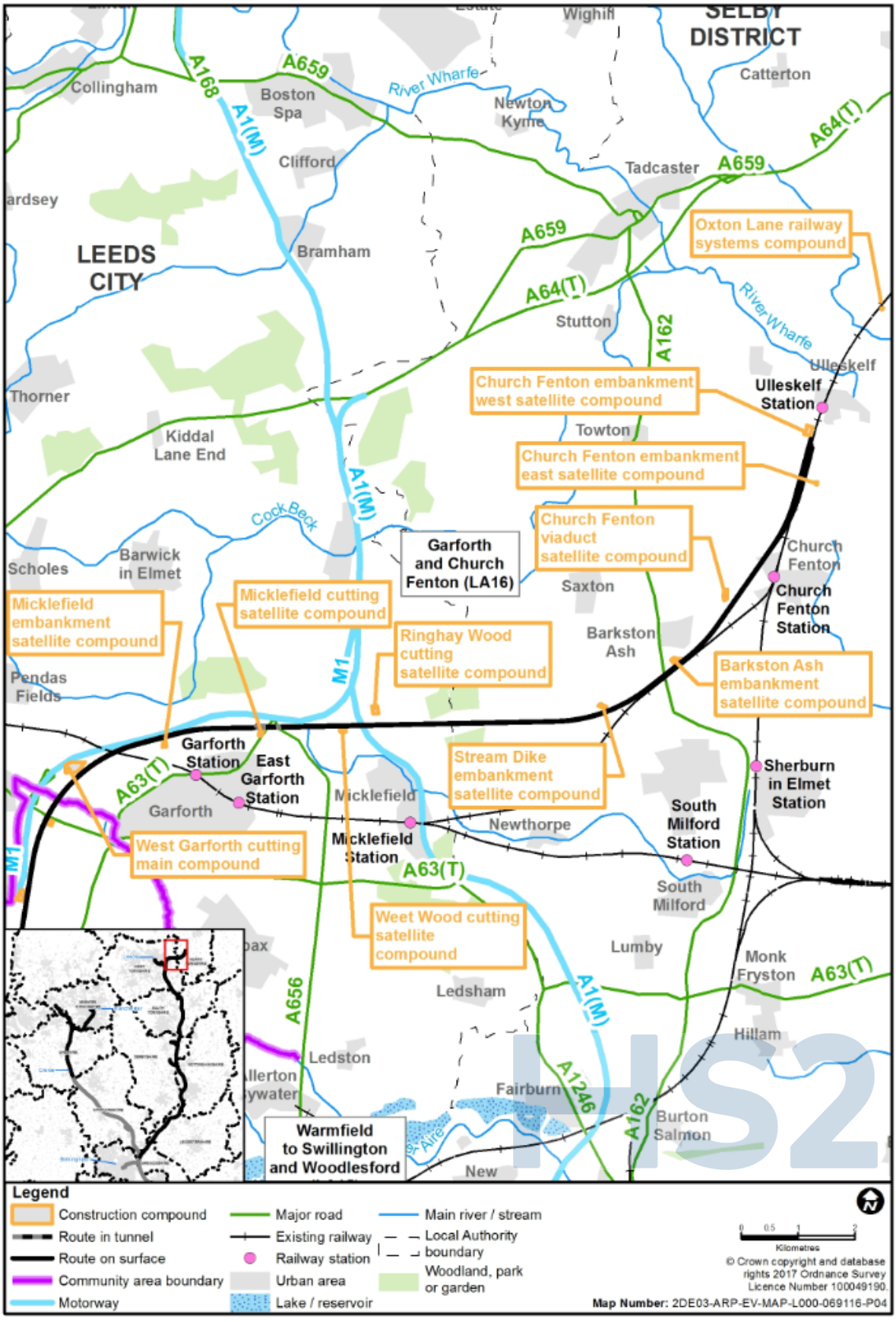
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.18 One main civil engineering compound, the West Garforth cutting main compound, would be located in the Garforth and Church Fenton area. This would manage nine civil engineering satellite compounds in the Garforth and Church Fenton area.

2.3.19 Nine civil engineering satellite compounds would be located in the Garforth and Church Fenton area. Following the completion of civil engineering works, two of these compounds will continue to be used, along with two additional compounds, as railway installation satellite compounds. Sherburn Railhead will also be used to manage the movement of imported track ballast and railway installation materials, by rail, throughout the eastern leg of the Proposed Scheme.

2.3.20 The location of construction compounds in the Garforth and Church Fenton area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA16 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Garforth and Church Fenton area



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

2.3.22 In the Garforth and Church Fenton area there would be worker accommodation at West Garforth cutting main compound for the construction workforce.

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-05-495b to CT-05-507, in the Volume 2: LA16 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 Garforth and Church Fenton 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 Map CT-05-495b, Map CT-05-498, Map CT-05-499, and Map CT-05-506 in the Volume 2: LA16 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 Garforth and Church Fenton area, as illustrated in Figure 5, and railway system work as illustrated in Figure 6. All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works

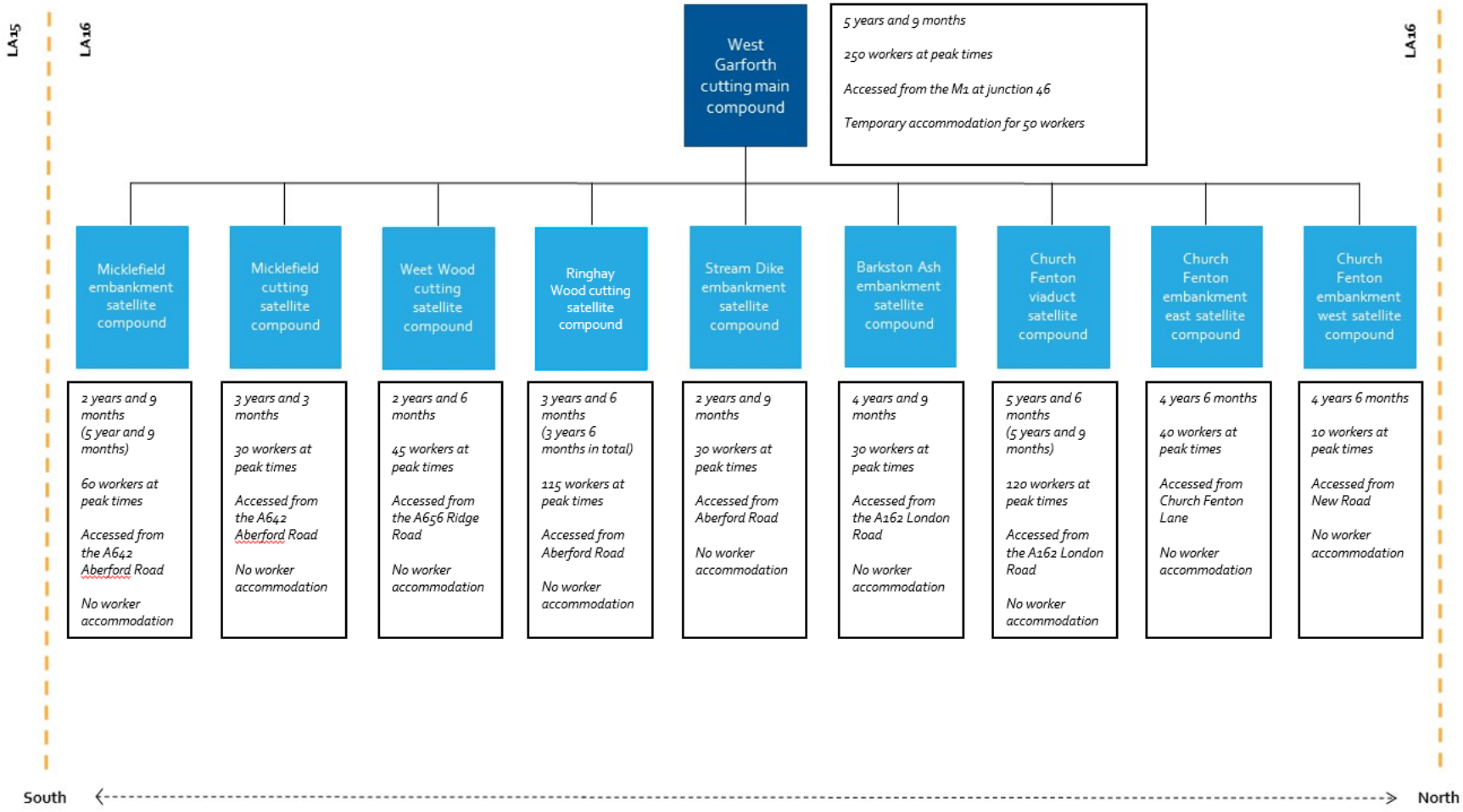
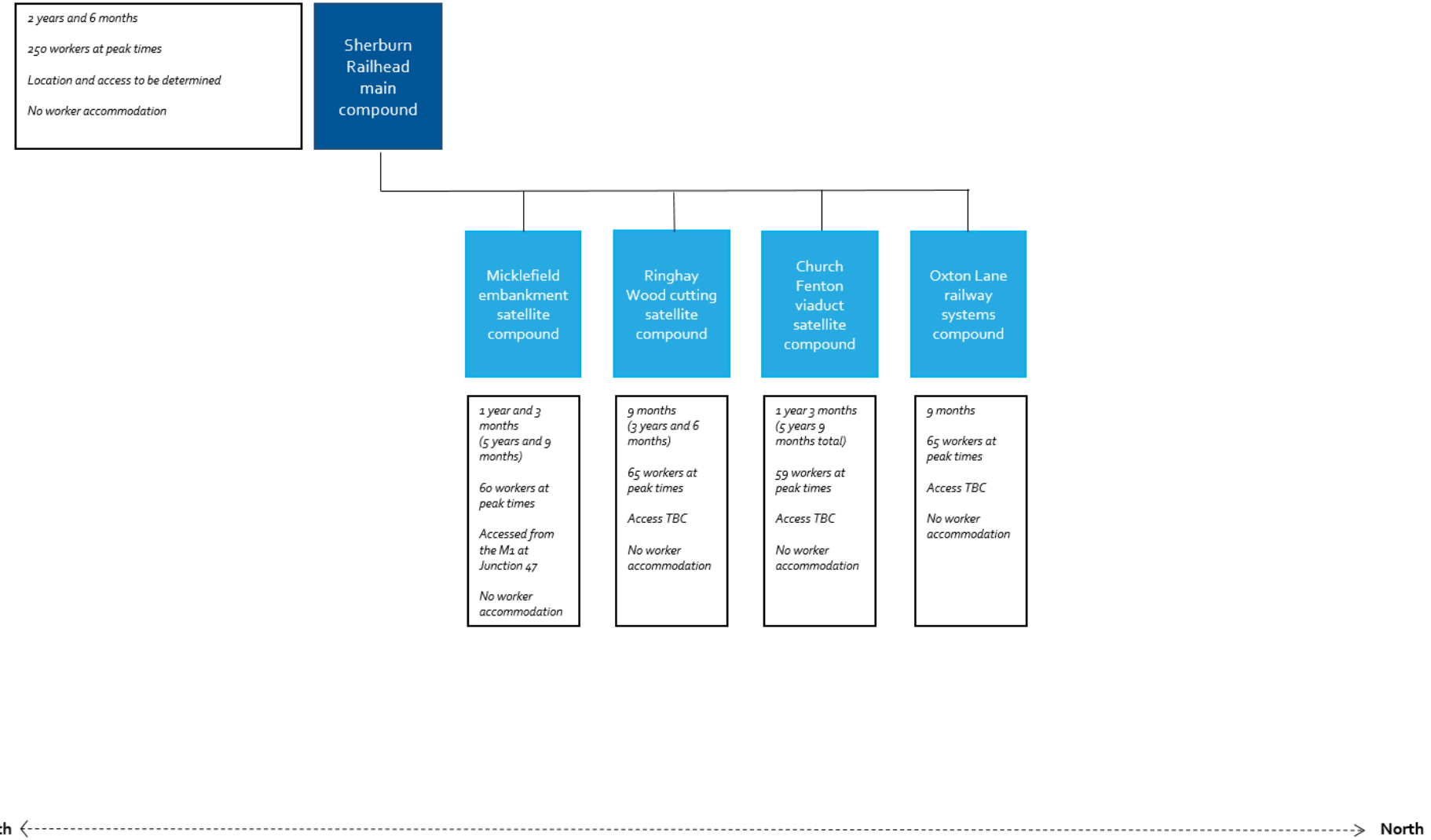


Figure 6: Construction compounds for railway systems works



West Garforth cutting main compound

2.3.30 This compound would be used to manage civil engineering works in the Garforth and Church Fenton Area, as illustrated in Figure 5 and Figure 6 (see Volume 2: Map CT-05-495b, I3 to J5).

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

Table 1: Demolitions required as a result of the works to be managed from the West Garforth cutting main compound

Description	Location	Feature resulting in the demolition
Commercial		
Farm outbuildings	Barrowby Hall, West Garforth	West Garforth cutting

2.3.32 The compound would provide temporary workers accommodation for up to 50 workers. This would provide accommodation and welfare facilities for the construction workforce for up to five years and nine months.

2.3.33 The compound would be used to manage the construction of the Leeds Bridleway 125 accommodation overbridge, which would take six months to complete.

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

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

2.3.35 The compound would be used to manage the construction of the Leeds to Selby line overbridge, which would take six months to complete.

2.3.36 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 junction 46 of the M1 and via site haul routes (Volume 2: Map CT-05-495b)

2.3.37 The works to be managed from this compound would require the temporary diversion of Leeds Bridleway 125 around the construction works for a period of six months. On completion of construction, the bridleway would be permanently realigned to cross the route of the Proposed Scheme via Leeds Bridleway 125 accommodation overbridge.

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

- Carr Wood North culvert, to carry Tributary of The Beck 1 under the route of the Proposed Scheme, which would take six months to complete; and
- Carr Wood South culvert, to carry surface water under the route of the Proposed Scheme, which would take six months to complete.

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

Micklefield embankment satellite compound

2.3.40 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-497, C6 to C7), for a period of two years and nine months. On completion of civil engineering works, the compound would be used as a satellite compound for railway systems installations works for a period of one year and three months.

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

Table 2: Demolitions required as a result of the works to be managed from the Micklefield embankment satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Barwick Road, north of Garforth	Barwick Road realignment

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

- Barwick Road overbridge, which would take one year to complete and would be constructed offline[26]; and
- Leeds Bridleway 123 accommodation overbridge, which would take nine months to complete.

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

- East Garforth cutting, which would take one year to complete; and
- Micklefield embankment, which would take one year and three months to complete.

2.3.44 Barwick Road would be permanently re-aligned, 40m to the west of its existing alignment, as a result of the works to be managed from this compound. The existing bridge over the M1 would be demolished as a consequence of the re-alignment of Barwick Road.

2.3.45 The work to be managed from this compound would also include the re-alignment of Barwick Road over the M1 via a new bridge. The A1(M) Northbound and Southbound overbridges would be constructed using standard construction techniques. To maintain safe operation of the motorway it would be necessary to undertake the works under traffic management. The construction of the motorway crossing would be programmed to reduce the overall duration of disruption to motorway users. The traffic management would operate for a period of one year, and would be likely to

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

include temporary speed restrictions, temporary use of the hard shoulder, and reduced lane widths. Night-time closures are also likely to be required to enable installation of the deck over the carriageways and modifications to the existing motorway signage.

2.3.46 On completion of construction, temporary lane restrictions and traffic management measures would be implemented for two months to enable connection between the realigned road and the existing road.

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

- the temporary closure of Barwick Bridleway 10 for a period of six months. Users would be diverted via Nanny Goat Lane, Garforth Bridleway 6, Barwick Road, Barwick Bridleway 12 and Leeds Bridleway 123. On completion of construction, the PRoW would permanently revert to its original alignment, crossing the Proposed Scheme via Leeds Bridleway 123 accommodation overbridge;
- the temporary closure of Leeds Bridleway 123 for a period of six months. Users would be diverted via Nanny Goat Lane, Garforth Bridleway 6, Barwick Road, Barwick Bridleway 12. On completion of construction, the PRoW would permanently revert to its original alignment, crossing the Proposed Scheme via Leeds Bridleway 123 accommodation overbridge;
- permanent diversion of Garforth Footpath 8/Parlington Non Definitive Bridleway to Barwick Road, 460m to the south-west of its existing junction with Barwick Footpath 9, for 410m. The construction of the diversion would be completed prior to the closure of the existing alignment, which would take one year to complete;
- permanent diversion of Sturton Grange Footpath 1 to the south of the Proposed Scheme, to Garforth Footpath 8, 175m to the south-west of its existing junction with Garforth Footpath 9, for 215m. The construction of the diversion would be completed prior to the closure of the existing alignment;
- permanent diversion of Sturton Grange Footpath 1 to the north of the Proposed Scheme, to Sturton Grange Footpath 6, 585m to the north of its existing junction with Ash Lane, for 670m. The construction of the diversion would be completed prior to the closure of the existing alignment;
- permanent diversion of Garforth Footpath 7a/Parlington Non Definitive Bridleway, onto the existing Barwick Road, 36m north of its existing alignment, for 73m. The construction of the diversion would be completed prior to the closure of the existing alignment;
- permanent diversion of Parlington Bridleway 5, onto the proposed Barwick Road, north of its existing alignment. The construction of the diversion would be completed prior to the closure of the existing alignment; and
- temporary realignment of Parlington Bridleway 5, to the south of its existing

alignment, for a period of six months. On completion of construction the footpath would be permanently reinstated on its existing alignment.

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

- Barnbow Common drop inlet culvert, to maintain cross drainage of surface water under the route of the Proposed Scheme, which would take six months to complete; and
- Hawk's Nest Wood drop inlet culvert, to carry Tributary of The Beck 3 under the route of the Proposed Scheme, which would take six months to complete.

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

2.3.50 Key railway systems works to be managed from a separate compound would include construction and installation of an auto-transformer station, located 225m east of Barwick Road. The construction of the auto-transformer station foundations and building would take three to six months to complete. The installation of the auto-transformer station railway systems equipment would take one year to complete. Construction works for the auto-transformer station would be accessed from Barwick Road.

Micklefield cutting satellite compound

2.3.51 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-498, D6 to D7).

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

2.3.53 The compound would be used to manage the construction of the Sturton Grange Footpath 6 accommodation overbridge, which would take five months to complete.

2.3.54 The compound would be used to manage the construction of the Micklefield cutting, which would take one year to complete.

2.3.55 The compound would be used to manage the construction of the Weet Wood cut and cover tunnel, which would take one year and ten months to complete.

2.3.56 The 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 the A642 Aberford Road and via site haul routes (Volume 2: Map CT-05-498).

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

- temporary diversion of the A642 Aberford Road east of its existing alignment, for 450m, for a period of one year. During this time, the Weet Wood cut and cover tunnel would be constructed under the footprint of the A642 Aberford

Road. Following the construction of the tunnel, the road would be reinstated on its existing alignment; and

- temporary diversion of the A656 Ridge Road immediately west of its existing alignment, for a period of one year. During this time, the Weet Wood cut and cover tunnel would be constructed under the footprint of the A656 Ridge Road. Following the construction of the tunnel, the road would be reinstated on its existing alignment.

2.3.58 The works to be managed from this compound would require the temporary realignment of Sturton Grange Footpath 6/accommodation access, to the east of its existing alignment, for a period of six months. On completion of construction, the footpath would be permanently realigned to cross the route of the Proposed Scheme on the Sturton Grange Footpath 6 accommodation overbridge.

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

Weet Wood cutting satellite compound

2.3.60 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-499, C6 to D6).

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

Table 3: Demolitions required as a result of the works to be managed from the Weet Wood cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Ridge Road Farm, Ridge Road, Micklefield	Weet Wood cutting
Commercial		
Farm outbuilding	Ridge Road Farm, Ridge Road, Micklefield	Weet Wood cutting

2.3.62 The compound would be used to manage the construction of the Ridge Road overbridge, which would take one year to complete.

2.3.63 The compound would be used to manage the construction of Weet Wood cutting, which would take six months to complete.

2.3.64 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from the A656 Ridge Road and via site haul routes (Volume 2: Map CT-05-499).

2.3.65 The works to be managed from this compound would require the permanent realignment of Ridge Road, 45m to the east of its existing alignment, which would take nine months to complete and would be constructed offline[27]. On completion of construction, temporary lane restrictions and traffic management measures would be implemented for one month, to enable connection between the realigned road and the existing road.

2.3.66 The works to be managed from this compound would require the construction of Sturton Dyke drop inlet culvert to carry surface water under the route of the Proposed Scheme, which would take six months to complete.

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

Ringhay Wood cutting satellite compound

2.3.68 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-499, F3 to G4), for a period of three years. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installations works for a period of nine months.

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

Table 4: Demolitions required as a result of the works to be managed from the Ringhay Wood cutting satellite compound

Description	Location	Feature resulting in the demolition
Other		
Pylon	Land to the east of the A1 (M), north of Micklefield	Ringhay Wood cutting

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

- Great North Road overbridge, which would take three months to complete;
- A1(M) Northbound overbridge, which would take one year to complete;
- A1(M) Southbound overbridge, which would take one year to complete;
- Micklefield Footpath 11 accommodation overbridge, which would take nine months to complete; and
- Far Fox covert underbridge, which would take one year to complete.

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

- A1(M) cutting, which would take three months to complete;

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

- Ringhay Wood cutting, which would take six months to complete; and
- Ringhay Wood embankment, which would take one year and three months to complete.

2.3.72 The 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 the B1217 Aberford Road and via site haul routes (Volume 2: Map CT-05-499).

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

- temporary closure of the Great North Road for a period of one year and 10 months, with diversions along the A642 Aberford Road, the A656 Ridge Road and the A63 Selby Road;
- temporary closure of the A1(M) northbound carriageway and temporary re-alignment of the road, immediately west of its existing alignment, for a period of one year and 10 months; and
- temporary closure of the A1(M) southbound carriageway and temporary re-alignment of the road, immediately east of its existing alignment, for a period of one year and 10 months.

2.3.74 To maintain safe operation of the motorway it would be necessary to undertake the construction works under traffic management. The construction of the motorway crossing would be programmed to reduce the overall duration of disruption to the motorway users. The traffic management would operate for a period of one year and ten months and would be likely to include temporary speed restrictions, temporary use of the hard shoulder, and reduced lane widths. Night-time closures are also likely to be required to enable modifications to the motorway signage and the connection between the temporary diversion and the permanent carriageway.

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

- permanent realignment of Micklefield Footpath 11, 24m west of its existing alignment, crossing the route of the Proposed Scheme on the Micklefield Footpath 11 accommodation overbridge. The construction of the permanent realignment would be completed prior to the closure of the existing alignment;
- permanent diversion of Micklefield Footpath 1 to the south of the route of the Proposed Scheme, fto the west of its existing alignment, to meet Micklefield Footpath 11. The construction of the permanent diversion would be completed prior to the closure of the existing alignment; and
- diversion of Micklefield Footpath 1 to the north of the route of the Proposed Scheme, to the west of its existing alignment, to meet Micklefield Footpath 11. The construction of the permanent diversion would be completed prior to the closure of the existing alignment.

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

- Weet Wood culvert, to carry surface water under the route of the Proposed Scheme, which would take six months to complete;
- Near Fox culvert, to carry Weet Wood Drain under the route of the Proposed Scheme, which would take six months to complete;
- Middle Fox culvert, to maintain cross drainage of surface water under the route of the Proposed Scheme, which would take six months to complete; and
- Far Fox Covert culvert, to maintain cross drainage of surface water under the route of the Proposed Scheme, which would take six months to complete.

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

2.3.78 Key railway systems works to be managed from this compound would include construction and installation of an auto-transformer station, located 300m south of Ringhay Wood. The construction of the auto-transformer station foundations and building would take three months to complete. The installation of the auto-transformer station railway systems equipment would take one year to complete. Construction works for the auto-transformer station would be accessed from the B1217 Aberford Road.

Stream Dike embankment satellite compound

2.3.79 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-502, D4 to D5).

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

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

- Coldhill Lane underbridge, which would take one year to complete; and
- Stream Dike viaduct, which would take one year and three months to complete.

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

2.3.83 The works to be managed from this compound would require the permanent realignment of Coldhill Lane, 35m to the north-east of its existing alignment, which would take ten months to complete and would be constructed offline[28]. On completion of construction, temporary lane restrictions and traffic management

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

measures would be implemented for one month to enable connection between the realigned road and the existing road.

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

Barkston Ash embankment satellite compound

2.3.85 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-503, D4 to E5).

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

Table 5: Demolitions required as a result of the works to be managed from the Barkston Ash embankment satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Two residential properties	Common Lane, between Barkston Ash and Church Fenton	Barkston Ash embankment
Commercial		
Commercial outbuildings	Common Lane, between Barkston Ash and Church Fenton	Barkston Ash embankment

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

- A162 London Road underbridge, which would take one year and six months to complete; and
- Saw Wells Lane underbridge, which would take one year to complete.

2.3.88 The compound would be used to manage the construction of the Barkston Ash embankment, which would take three years and six months to complete.

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

- temporary overnight/ weekend closure of the A162 London Road during construction, with diversions along the A63 Selby Road/A642 Aberford Road/B1217; and
- temporary overnight/weekend closure of Saw Wells Lane during construction.

2.3.90 The works to be managed from this compound would require permanent diversion of Barkston Ash Footpath 35.4/5/2 to the west of the route of the Proposed Scheme, 80m to the north of its current alignment, for 204m. The construction of the permanent diversion would be completed prior to the closure of the existing alignment.

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

- Bishop Dyke culvert, to convey surface water under the route of the Proposed

Scheme, which would take six months to complete;

- Barkston Moor culvert, to convey Tributary of Barkston Drain 1 under the route of the Proposed Scheme, which would take six months to complete; and
- Barkston Ash culvert, to convey Tributary of Barkston Drain 2 under the route of the Proposed Scheme, which would take six months to complete.

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

Church Fenton viaduct satellite compound

2.3.93 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-504, D4 to E4), for a period of five years and six months. On completion of civil engineering works, the compound would be used as a satellite compound for railway systems installations works for a period of one year and three months.

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

Table 6: Demolitions required as a result of the works to be managed from the Church Fenton viaduct satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Sandwath Lane, Church Fenton	Church Fenton Viaduct
Commercial		
Farm outbuilding	Farmland east of Sandwath Lake, Church Fenton	Church Fenton Viaduct
Building associated with fishery	Sandwath Lake, Sandwath Lane, Church Fenton	Church Fenton Viaduct

2.3.95 The compound would be used to manage the construction of the Church Fenton viaduct, which would take four years to complete.

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

- permanent realignment of Common Lane, 30m to the north of its existing alignment, which would take nine months to complete and would be constructed offline; and
- permanent realignment of Sandwath Lane, 630m to the west of its existing alignment, which would take six months to complete and would be constructed offline.

2.3.97 On completion of construction, temporary lane restrictions and traffic management measures would be implemented for one month to enable connection between the realigned and existing roads.

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

- Church Fenton Footpath 35.22/1/1 would be kept open on its existing alignment with short term closures during construction;
- Saxton-cum-Scarthingwell Bridleway 35.55/16/1 would be kept open on its existing alignment with short term closures during construction; and
- Saxton-cum-Scarthingwell Bridleway 35.55/14/2 would be kept open on its existing alignment with short term closures during construction.

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

2.3.100 Key railway systems works to be managed from a separate compound would include construction and installation of an auto-transformer station, located 500m west of Common Lane. The construction of the auto-transformer station foundations and building would take three months to complete. The installation of the auto-transformer station railway systems equipment would take one year to complete. Construction works for the auto-transformer station would be accessed from A162 London Road.

Church Fenton embankment east satellite compound

2.3.101 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-505, I7 to J7).

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

2.3.103 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 Busk Lane and via site haul routes (Volume 2: Map CT-05-505).

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

2.3.105 Key railway systems works to be managed from this compound would include the installation of switches and crossings to conventional rail network at the Ulleskelf junction.

Church Fenton embankment west satellite compound

2.3.106 This compound would be used to manage civil engineering works in the Garforth and Church Fenton area, as illustrated in Figure 5 (see Volume 2: Map CT-05-506, F5).

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

2.3.108 The compound would be used to manage the construction of the Church Fenton embankment, which would take two years and nine months to complete. Material for

embankments would be received from cuttings elsewhere along the Proposed Scheme.

2.3.109 This compound would be used to construct the Church Fenton viaduct, which would take four years to complete. This compound would also be constructed from the Church Fenton viaduct compound.

2.3.110 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 the B1223 New Road and via site haul routes (Volume 2: Map CT-05-506).

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

- temporary diversion of Church Fenton Footpath 35.22/6/1 to the east of the Proposed Scheme, to the south of its existing alignment. On completion of construction, the footpath would be permanently reinstated on its existing alignment;
- Ulleskelf footpath 35.70/3/1 will be kept open on its existing alignment, with short term closures during construction; and
- temporary diversion of Ulleskelf Footpath 35.70/1/1 to the west of the Proposed Scheme, to the west of its existing alignment. On completion of construction, the footpath would be permanently reinstated on its existing alignment.

2.3.112 The works to be managed from this compound would require works to watercourses:

- Ulleskelf Mires north inverted siphon, to carry Tributary of Dorts Dike 4 under the route of the Proposed Scheme, which would take six months to complete;
- permanent realignment of a section of an unnamed watercourse, which would take six months to complete; and
- Ulleskelf Mires South culvert, to convey Tributary of Dorts Dike 3 under the route of the Proposed Scheme, which would take six months to complete.

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

Sherburn railhead

2.3.114 This compound would be located alongside the route of the Proposed Scheme, between the A1(M) and the A162 and would be used to manage the movement of imported track ballast, excavated materials and railway installation materials, by rail, throughout the Proposed Scheme. It would also provide rail systems support to rail installation works and satellite construction compounds throughout the Proposed Scheme.

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

2.3.116 The compound would be capable of receiving and dispatching trains to/from the existing railway network. Rail deliveries into the railhead would be undertaken during day and night-time hours and at weekends, though unloading would be undertaken during standard working hours, insofar as reasonably practicable.

2.3.117 Key railway installation works managed directly from this construction compound would include:

- importation of track ballast material;
- transfer of excavated material from route-wide earthworks to point of use; and
- railway installation including track laying, overhead line equipment, communications equipment and traction power supply installation.

Oxton Lane Switch and Crossing compound

2.3.118 This compound would be used to manage rail systems installation works in the Garforth and Church Fenton area, as illustrated in Figure 6.

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

2.3.120 Key railway systems works to be managed from this compound would include track works which would take nine months to complete.

Construction waste and material resources

2.3.121 Excavated material (defined as excluding topsoil and subsoil) generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable, either with or without treatment.

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

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

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

Commissioning of the railway

2.3.125 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

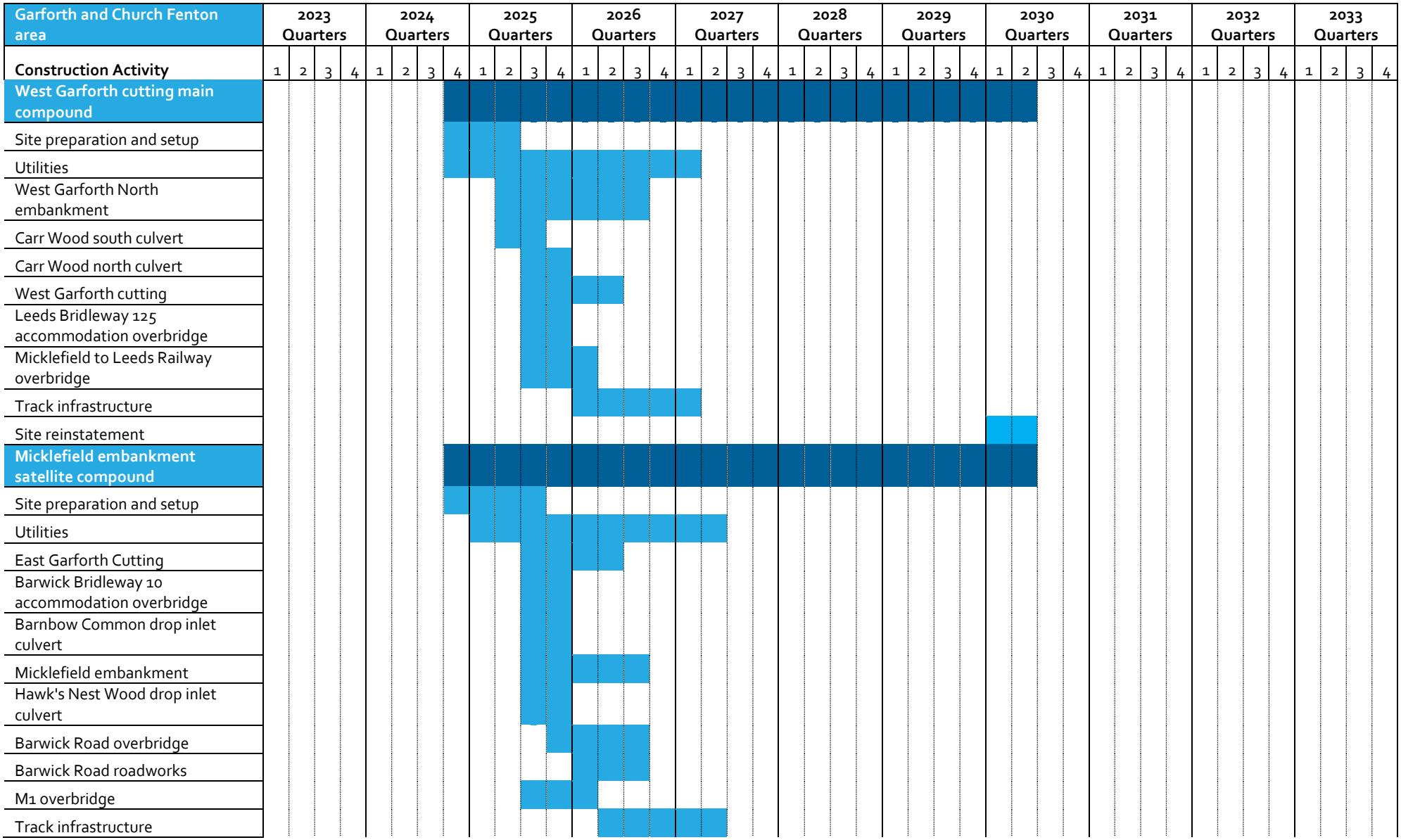
2.3.126 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

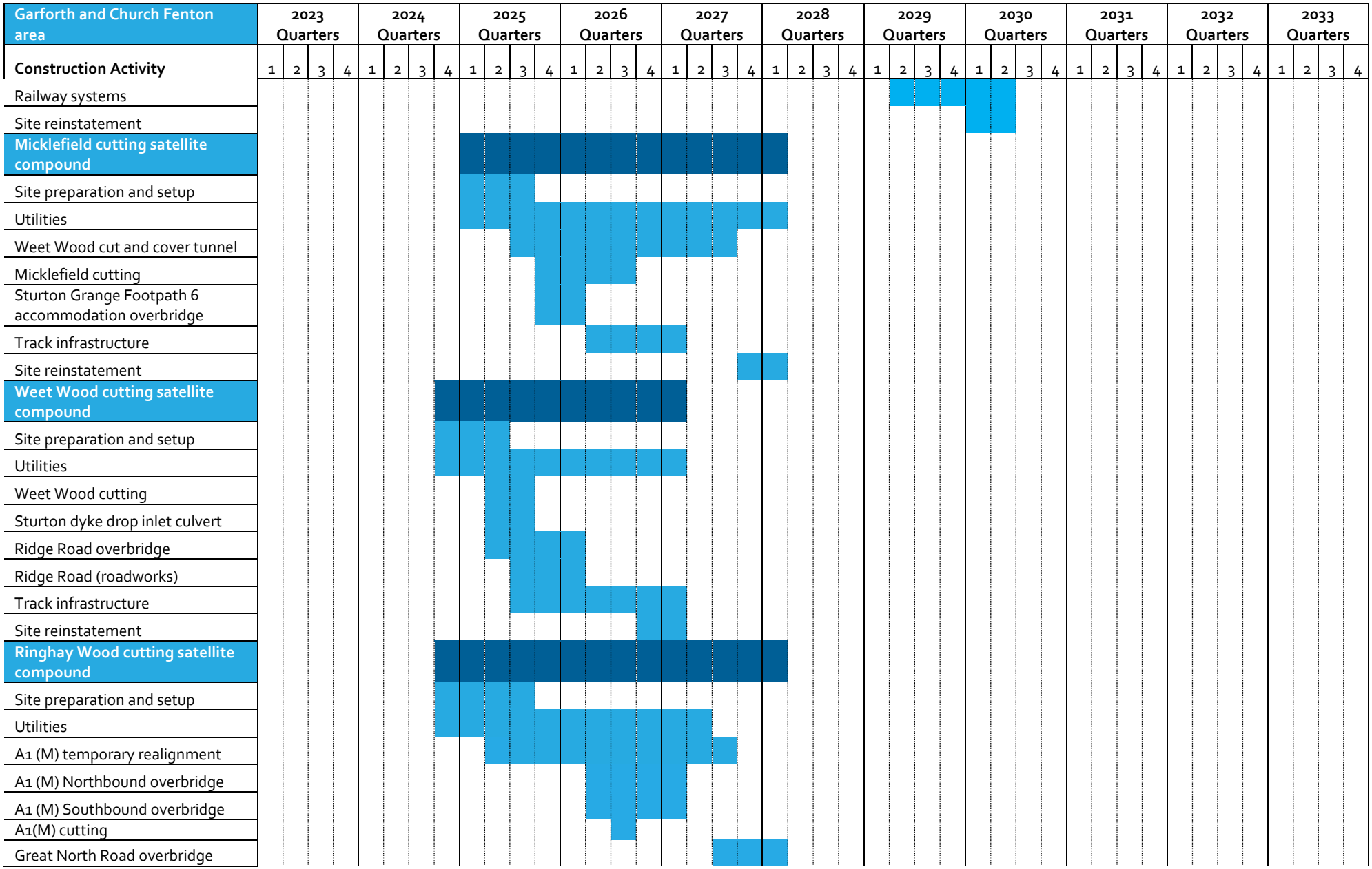
Monitoring during construction

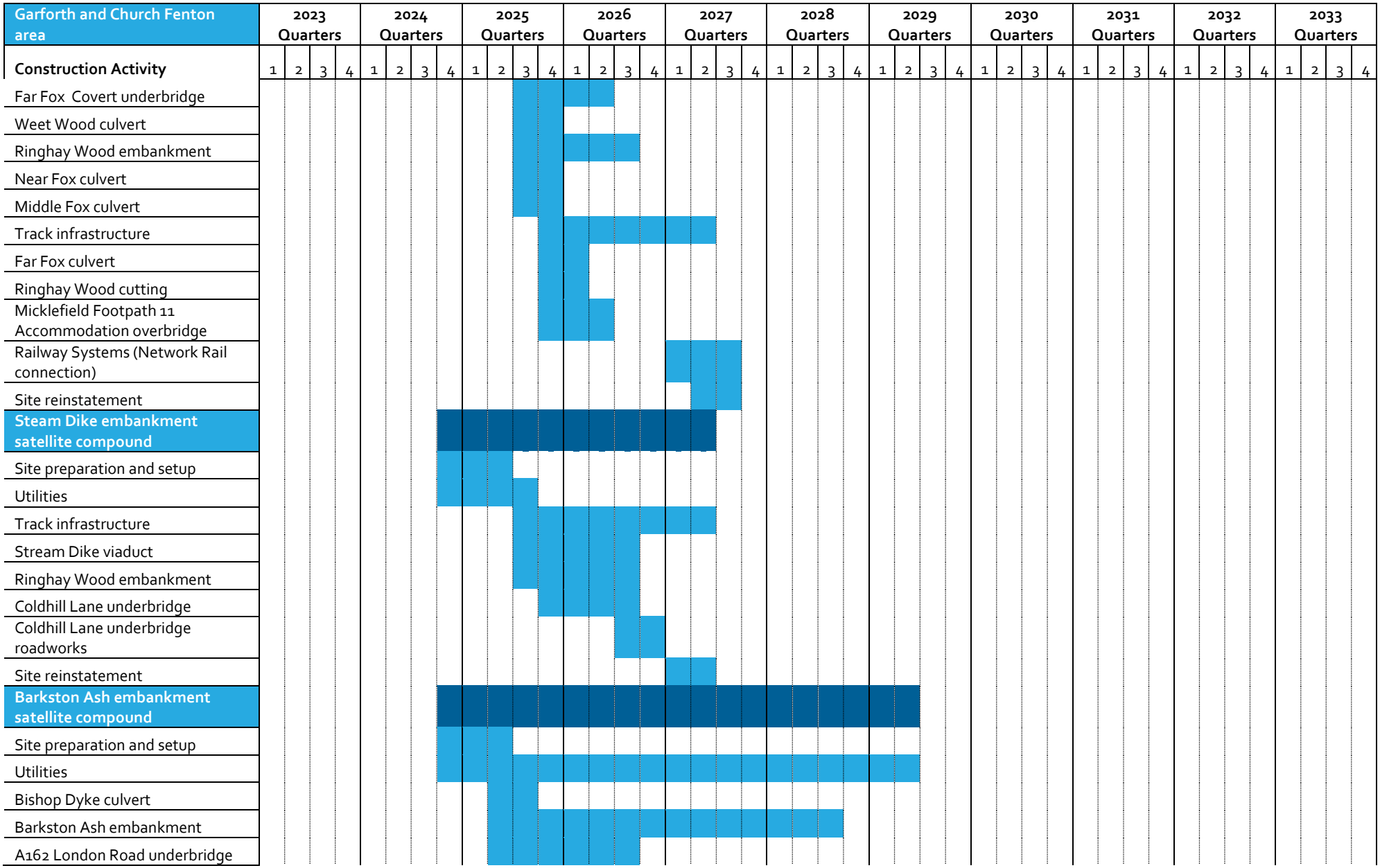
2.3.127 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated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

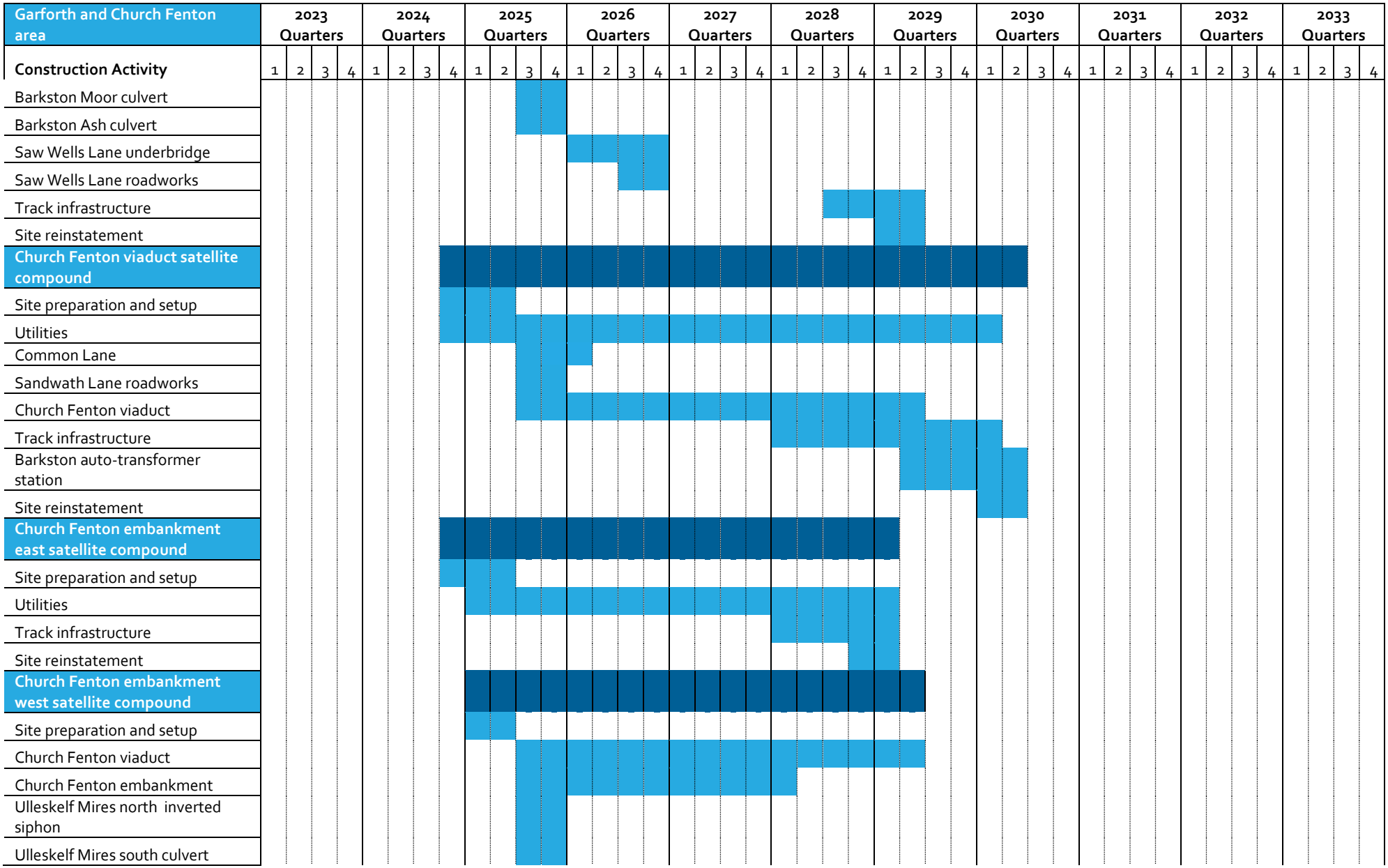
2.3.128 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on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

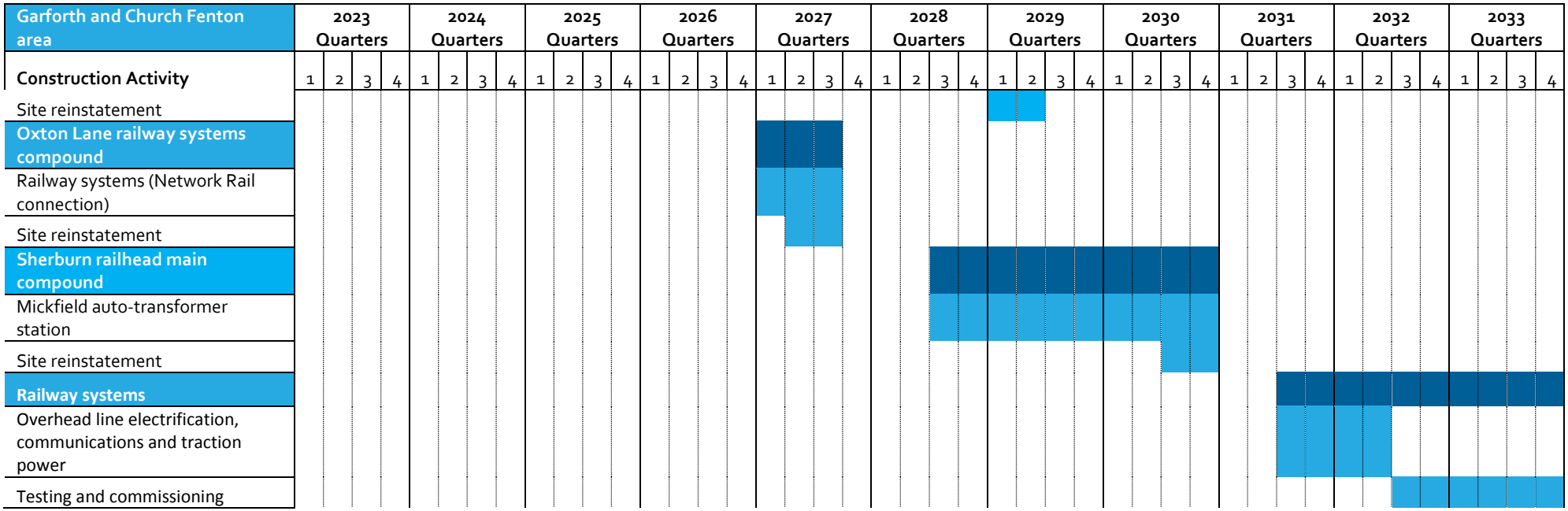
Figure 7: Indicative construction programme between 2023 and 2033




Garforth and Church Fenton area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
Railway systems
Site reinstatement
Micklefield cutting satellite compound
Site preparation and setup
Utilities
Weet Wood cut and cover tunnel
Micklefield cutting
Sturton Grange Footpath 6 accommodation overbridge
Track infrastructure
Site reinstatement
Weet Wood cutting satellite compound
Site preparation and setup
Utilities
Weet Wood cutting
Sturton dyke drop inlet culvert
Ridge Road overbridge
Ridge Road (roadworks)
Track infrastructure
Site reinstatement
Ringhay Wood cutting satellite compound
Site preparation and setup
Utilities
A1 (M) temporary realignment
A1 (M) Northbound overbridge
A1 (M) Southbound overbridge
A1(M) cutting
Great North Road overbridge


Garforth and Church Fenton area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
Far Fox Covert underbridge
Weet Wood culvert
Ringhay Wood embankment
Near Fox culvert
Middle Fox culvert
Track infrastructure
Far Fox culvert
Ringhay Wood cutting
Micklefield Footpath 11 Accommodation overbridge
Railway Systems (Network Rail connection)
Site reinstatement
Steam Dike embankment satellite compound
Site preparation and setup
Utilities
Track infrastructure
Stream Dike viaduct
Ringhay Wood embankment
Coldhill Lane underbridge
Coldhill Lane underbridge roadworks
Site reinstatement
Barkston Ash embankment satellite compound
Site preparation and setup
Utilities
Bishop Dyke culvert
Barkston Ash embankment
A162 London Road underbridge


Garforth and Church Fenton area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
Barkston Moor culvert
Barkston Ash culvert
Saw Wells Lane underbridge
Saw Wells Lane roadworks
Track infrastructure
Site reinstatement
Church Fenton viaduct satellite compound
Site preparation and setup
Utilities
Common Lane
Sandwath Lane roadworks
Church Fenton viaduct
Track infrastructure
Barkston auto-transformer station
Site reinstatement
Church Fenton embankment east satellite compound
Site preparation and setup
Utilities
Track infrastructure
Site reinstatement
Church Fenton embankment west satellite compound
Site preparation and setup
Church Fenton viaduct
Church Fenton embankment
Ulleskelf Mires north inverted siphon
Ulleskelf Mires south culvert


Garforth and Church Fenton 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
Oxton Lane railway systems compound
Railway systems (Network Rail connection)
Site reinstatement
Sherburn railhead main compound
Mickfield auto-transformer station
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 Garforth and Church Fenton 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 four trains per hour each way passing through the Garforth and Church Fenton area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

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

Maintenance

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

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

2.4.6 Provision for railway maintenance vehicles along the eastern leg of the route of the Proposed Scheme would be made at the Staveley 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

Great North Road and A1(M) northbound and southbound crossing (formerly Daniel Hartley's Wood cut and cover tunnel)

2.5.1 During the design development process since the announcement of the route in July 2017, consideration has been given to the route of the Proposed Scheme where it would cross the Great North Road and the A1(M) near Micklefield, Leeds. At this location, the A1(M) northbound and southbound carriageways diverge so that the A1(M) northbound carriageway can rise and cross over the M1. The route of the Proposed Scheme would need to pass under the A1(M) carriageways. Design options were considered for the Great North Road and the A1(M) northbound and southbound crossing. These options presented opportunities to simplify the construction method, create smaller structures, and reduce disruption to the existing road network.

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

- Option O: a cut and cover tunnel, which would consist of a reinforced concrete box tunnel structure with a central dividing wall. The total length of the tunnel would be 115m. Retaining walls would be provided at the ends of the tunnel structure. The roof slab, base slab and wall thicknesses would all be 1m. The vertical clearance provided from top of rail to soffit of the box would be 8m. The external dimensions of the box structure would be 17m in width and 11m in height;
- Option A: an overbridge across the Great North Road and a reinforced concrete box tunnel below the A1(M). The dimensions of the box tunnel structure would be the same as Option O. The dimensions of this overbridge would be 18m in length and 15m in width. A jacked box in open cut would be a possible construction method for the tunnel structure. The length of this jacked box would be 67m, which could be jacked from either one end or both ends. The Great North Road overbridge could be a single span concrete structure;
- Option B: three overbridges. This option would comprise three overbridges, one for each of the highway crossings, with a three-span arrangement and would comprise concrete beams and a reinforced concrete slab. Two of the overbridges would have main spans of 25m and side spans of 20m, and the third, a main span of 24m and side spans of 20m;
- Option C: three overbridges. This option would comprise three overbridges, one for each of the highway crossings, with a single span arrangement. Similar to Option B, Option C would consist of three overbridges, one for each of the highway crossings. Each bridge would have a single span arrangement and

would comprise concrete beams and a reinforced concrete slab. Similar to Option B, two of the overbridges would have main spans of 25m and side spans of 20m, and the third, a main span of 24m and side spans of 20m. The bridges in Option C are assumed to span over a retained cut. This retained cut would reduce the amount of permanent excavation that would be required to carry the route through the A1(M)/Great North Road corridor. It is assumed that a pile wall would be used to form the walls of the retained cut; and

- Option D: two, three span overbridges. This option would consist of two, three span overbridges; one overbridge for the Great North Road and one overbridge for both the A1(M) northbound and southbound carriageways. Similar to Option B, one of the overbridges would have main spans of 25m and side spans of 20m, and the second, a main span of 24m and side spans of 20m. Each bridge would comprise concrete beams and a reinforced concrete slab.

2.5.3 Table 7 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 7: Consideration of local alternatives for the Great North Road and A1(M) northbound and southbound crossing

Option	**Outcome of analysis**	**Further action/considerations**
Option O	Larger area of land required compared to the Proposed Scheme. Similar tree line and hedgerow loss compared to the Proposed Scheme. Similar potential for indirect impacts on Hook Moor Wood SSSI compared to the Proposed Scheme. Similar volume of excavated material from construction compared to the Proposed Scheme. More complex construction method and a resulting longer construction period compared to the Proposed Scheme. Greater disruption to local communities compared to the Proposed Scheme due to longer period of temporary diversions/traffic management on the Great North Road, the A1(M) northbound and the A1(M) southbound. Similar impacts on health and safety compared to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	This option will not be subject to further consideration
Option A	Larger area of land required compared to the Proposed Scheme. Similar tree line and hedgerow loss compared to the Proposed Scheme. Similar potential for indirect impacts on Hook Moor Wood SSSI compared to the Proposed Scheme. Similar volume of excavated material from construction compared to the Proposed Scheme. More complex construction method and a resulting longer construction period compared to the Proposed Scheme. Greater disruption to local communities compared to the Proposed Scheme due to longer period of temporary diversions/traffic	This option will not be subject to further consideration

Option	Outcome of analysis	Further action/considerations
	management on the Great North Road, the A1(M) northbound and the A1(M) southbound. Greater impacts on health and safety compared to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	
Option B	Similar land requirements compared to the Proposed Scheme. Similar tree line and hedgerow loss compared to the Proposed Scheme. Similar potential for indirect impacts on Hook Moor Wood SSSI compared to the Proposed Scheme. Similar volume of excavated material from construction compared to the Proposed Scheme. More complex construction method, which would mean longer construction period, compared to the Proposed Scheme. Greater disruption to local communities compared to the Proposed Scheme due to longer period of temporary diversions/traffic management on the Great North Road, the A1(M) northbound and the A1(M) southbound. Similar impacts on health and safety compared to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	This option will not be subject to further consideration
Option C (the Proposed Scheme)	Less land and excavation required compared to alternative options as each overbridge has a single span. Similar tree line and hedgerow loss compared to alternative options. Similar potential for indirect impacts on Hook Moor Wood SSSI compared to alternative options. A simplified construction method would be possible through the use of an embedded retaining wall. Importantly this means that the construction programme would be shortened and temporary diversions/traffic management on the Great North Road, the A1(M) northbound and the A1(M) southbound reduced. This in turn would reduce disruption to local communities. The overbridges would avoid the need for additional safety/evacuation systems and a drainage pump, which would be required for the tunnel options. Less disruption to local communities compared to alternative options due to shorter period of temporary diversions/traffic management on the Great North Road, the A1(M) northbound and the A1(M) southbound. Similar impacts on health and safety compared to alternative options. Lowest cost compared to alternative options.	This is the selected option taken forward into the Proposed Scheme
Option D	Similar land and excavation requirements compared to the Proposed Scheme.	This option will not be subject to further consideration

Option	Outcome of analysis	Further action/considerations
	Similar tree line and hedgerow loss compared to the Proposed Scheme. Similar potential for indirect impacts on Hook Moor Wood SSSI compared to the Proposed Scheme. More complex construction method, and longer construction period, compared to the Proposed Scheme. Greater disruption to local communities compared to the Proposed Scheme due to longer period of temporary diversions/traffic management on the Great North Road, the A1(M) northbound and the A1(M) southbound. Similar impacts on health and safety compared to the Proposed Scheme. Higher cost compared to the Proposed Scheme.	

2.5.4 Option C was taken forward into the Proposed Scheme. Overall, Option C (three overbridges with a single span arrangement) was the preferred option because compared with the other options, it would require less land, would be less complex and would cost less to construct. This in turn would allow a shorter construction period and less disruption to the local community. In addition, there would be a lower risk of major accidents during construction. Options B, C and D would potentially give rise to lower environmental impacts compared to Option O and Option A, due to less land requirements and less loss of habitat, however, Option C would broadly have the same environmental impacts as Options B and D.

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 Final 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 8.

Table 8: 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
Phase 2b consultation on the working draft ES and working draft EQIA	October – December 2018

Draft EIA SMR consultation

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

Consultation on the working draft ES and ongoing engagement

3.2.3 As set out in Volume 1, the working draft ES is being formally consulted upon. The consultation is taking place during October 2018 to December 2018. A parallel consultation on the working draft 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 Garforth and Church Fenton 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 the initial preferred route announcement November 2016.

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

- temporary and permanent land requirements during construction and operation;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;
- retention or realignment of public rights of way (PRoW) in the Selby District and Leeds District area, including cycleways and bridleways;
- temporary or permanent changes to road access, including Sandwath Lane and Common Lane in Church Fenton;
- concerns about traffic on the A162 London Road in Barkston Ash and the A63 south of Garforth during construction;

- impacts on access to local community educational/care/sporting/leisure/cultural facilities;
- impacts to local businesses;
- the potential visual impacts, including the visual impact of the viaduct at Church Fenton and Barkston Ash;
- the potential impact on ecology and biodiversity and opportunities for environmental mitigation, including Daniel Hartly's Wood, Hawk's Nest Wood and Parlington Hollins; and
- discussion of alternative engineering options in this area.

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 Garforth and Church Fenton 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 residents of Sandwath Lane and Common Lane, Church Fenton, Selby Rail Users Group, Alec Shelbrooke MP and Nigel Adams MP.

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 9 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 9: Engagement to date with community stakeholders

Stakeholder	Area of focus
Alec Shelbrooke MP	Engagement with MP for Elmet and Rothwell to provide information on the Proposed Scheme and discuss local concerns.
Nigel Adams MP	Engagement with MP for Selby and Ainsty to provide information on the Proposed Scheme and discuss local concerns, particularly the potential impact to Church Fenton.
Residents of Sandwath Lane and Common Lane Church Fenton	Engagement to provide information on the Proposed Scheme and discuss their concerns as potentially impacted parties.
Selby Rail Users Group	Engagement to provide information on the Proposed Scheme as an interested party.

Local authorities and parish councils

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

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

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 10.

Table 10: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
North Yorkshire County Council	General introductory and project update meetings, including briefings to Council leaders. Discussion on needs of LA, including approach to engagement with stakeholders.
	Meetings with technical leads to collate data and discuss key assessment topics including: community and equality issues; ecology; flood risk, drainage and water; historic environment; landscape and visual issues; land quality; road diversions and realignments; socio-economics; traffic and transport; utilities; and waste and material resources.
	Meetings with technical leads to discuss urban design and planning.
Selby District Council	General introductory and project update meetings, including briefings to Council leaders. Discussion on needs of LA, including approach to engagement with stakeholders.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality, community and equality issues; construction and logistics; flood risk, drainage and water; highways and bridges; historic environment; road diversions and realignments; sound, noise and vibration and traffic and transport.
	Meetings with technical leads to discuss urban design and planning.
Leeds City Council	General introductory and project update meetings, including briefings to Council leaders. Discussion on needs of LA, including approach to engagement with stakeholders
	Meetings with technical leads to collate data and discuss key assessment topics including: community and equality issues; construction and logistics; flood risk, drainage and water;

Stakeholder	Area of focus
	highways and bridges; road diversions and realignments and traffic and transport.
	Meetings with technical leads to discuss transport assessment scoping report and modelling, access to land owned by Leeds city council and urban design and planning
West Yorkshire Combined Authority	Meetings with technical leads to discuss transport assessment scoping report and modelling
Aberford & District Parish Council	Introductory meeting was offered to Aberford & District Parish Council to establish relationships based on producing the best design for their community. Aberford & District Council were happy not to meet with HS2 Ltd. HS2 Ltd agreed to update the parish council and will meet when appropriate.
Barkston Ash Parish Council	Introductory meeting to understand local concerns, to explain the hybrid Bill process and design process, and to initiate a schedule for any further meetings required to focus on environmental and engineering issues.
	The potential environmental issues associated with the Proposed Scheme and impacts to local roads, including the A162 London Road and Common Lane were discussed.
Church Fenton Parish Council	Introductory meeting to understand local concerns, to explain the hybrid Bill process and design process, and to initiate a schedule for any further meetings required to focus on environmental and engineering issues.
	A series of further meetings discussed alternative design options for the Proposed Scheme and construction and logistics plans around Church Fenton.
Garforth Neighbourhood Planning Forum	Introductory meeting to understand local concerns, to explain the hybrid Bill process and design process, and to initiate a schedule for any further meetings required to focus on environmental and engineering issues.
	The challenging geology in this area and the potential impacts to woodland in the Garforth Area were discussed.
Huddleston with Newthorpe Parish Council	Introductory meeting to establish relationships based on producing the best design for their community. HS2 Ltd agreed to update the parish council and will meet again, when appropriate.
Micklefield Parish Council	Introductory meeting to understand local concerns, to explain the hybrid Bill process and design process, and to initiate a schedule for any further meetings required to focus on environmental and engineering issues.
	The potential increase in noise to the area as a result of the Proposed Scheme, and the connectivity to Micklefield, with particular reference to Ridge Road were discussed.
Sherburn in Elmet Parish Council	Introductory meeting to understand local concerns, to explain the hybrid Bill process and design process, and to initiate a schedule for further meetings as required to focus on environmental and engineering issues. HS2 Ltd agreed to update the parish council and will meet when appropriate.
Ulleskelf Parish Council	Introductory meeting to understand local concerns, to explain the hybrid Bill process and design process, and to initiate a schedule for further meetings as required to focus on environmental and engineering issues. HS2 Ltd agreed to update the parish council and will meet when appropriate.
	The potential impact on line side properties of new HS2 services in combination with existing conventional rail, passenger and freight services, and the council's concern that Ulleskelf Station will be closed as a result of the Proposed Scheme were discussed. HS2 Ltd agreed to update the parish council and will meet when appropriate.

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)[29].

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:

- Ainsty Internal Drainage Board;
- Animal and Plant Health Agency;
- Biological Records Centres;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department for Environment, Food and Rural Affairs;
- English Heritage;
- Environment Agency;
- FERA Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Homes England;
- Inland Waterways Association;
- Leeds City Region Local Enterprise Partnership;
- National Farmers Union;
- Natural England;
- Network Rail;
- NHS Leeds North Clinical Commissioning Group;
- NHS Leeds South and East Clinical Commissioning Group;

[29] Supporting document: Draft Code of Construction Practice

- NHS Vale of York Clinical Commissioning Group;
- North Yorkshire and East Riding Local Enterprise Partnership;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Selby Internal Drainage Board;
- The Country Land and Business Association;
- The emergency services;
- The Equalities and Human Rights Commission;
- Woodland Trust;
- The Yorkshire Wildlife Trust;
- Utility companies relevant to this area;
- York, North Yorkshire and East Riding Local Enterprise Partnership;
- Yorkshire and Humber Health Authority; and
- Yorkshire Water Limited.

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, GeneSys, Instalcom, National Grid Transmission, Network Rail, Northern Gas Networks, Northern Power Grid and Yorkshire Water Limited to establish what infrastructure exists in the Garforth and Church Fenton area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Garforth and Church Fenton 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 has been 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 18 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 Garforth and Church Fenton area, information events were held at Holiday Inn Leeds - Garforth on 28 June 2018 and Kirk Fenton Parochial Primary School on 30 June 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 Banks Group Ltd, Leeds East Airport and Makins Soft Fruit Ltd.

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 Garforth and Church Fenton 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[30].

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: LA16 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)[31].

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)[32] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of

[30] 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
[31] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[32] Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land.*

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

4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts 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 has 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 Garforth and Church Fenton 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 Garforth and Church Fenton 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)[33]. Superficial deposits of alluvium, variably comprising clay, organic clay, silt, sand, peat and gravel, are associated with a shallow valley between Garforth and the M1, which contains a small watercourse connecting with the Cock Beck to the north-west and Dorts Dike to the west and south-west of Ulleskelf.

4.3.3 Superficial deposits of the Hemingbrough Glaciolacustrine Formation form an extensive sheet of laminated clays, silts and sands overlying the Roxby Formation, from Sherburn in Elmet to north of Church Fenton.

4.3.4 North of Church Fenton the superficial deposits are of the Breighton Sand Formation, which comprise slightly clayey sand or silty sand with medium quartz grains.

4.3.5 Between Coldhill Lane and London Road, Head deposits are associated with Stream Dike and comprise gravel, silt and clay. Two small patches of glacio-fluvial sand and gravel are also mapped.

4.3.6 Pockets of the Harrogate Till Formation are mapped from the north-east of Garforth to the west of Barkston Ash. The deposits comprise slightly sandy clay, locally with large sandstone blocks, of glacial origin.

4.3.7 The bedrock geology of the study area is predominantly of Permian-age, of the Zechstein Group (within which are distinct formations of dolostone, limestone and mudstone of the Cadeby, Brotherton and Roxby Formations).

4.3.8 The Cadeby Formation is mapped between the north of Garforth and north of Micklefield and comprises dolostone, a carbonate rock, with subordinate mudstone, siltstone or sandstone.

4.3.9 Limestone of the Brotherton Formation is mapped to the north-east of Micklefield, within which bands of calcareous mudstone, of the Edlington Formation, are generally associated with shallow gradients at higher altitudes.

4.3.10 To the south of Barkston Ash is limestone and calcareous mudstone of the Roxby Formation. The Roxby Formation includes reddish brown mudstone and siltstone with subordinate sandstone, and continues to be mapped to the northern end of the study area at Ulleskelf.

4.3.11 At Garforth, the bedrock is of Carboniferous-age, of the Pennine Coal Measures Group (of which the Pennine Middle and Lower Coal Measures Formations are components, mapped to the west and north of Garforth respectively). The Pennine Coal Measures Group includes interbedded grey mudstone, siltstone and pale grey sandstone. Coal seams are common. Within the Coal Measures are ridges of sandstone, including Thornhill Rock and Slack Bank Rock. The boundary between the Pennine Lower Coal Measures Formation and the Cadeby Formation to the east of Garforth is marked by a narrow seam of Yellow Sands Formation, consisting of medium and fine-grained yellow sand or sandstone.

[33] British Geological Survey (2018). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Topography and drainage

4.3.12 The main topographical features of the study area are a series of valleys in the west, and a broad and low-lying plain in the east over the mudstone between Barkston Ash and Ulleskelf.

4.3.13 From Garforth to Micklefield, the landform is typically gently undulating between around 90m above Ordnance Datum (AOD) and 65m AOD, with the highest land on an outcrop at Barrowby Hall. Shallow valleys are cut into the landform and contain The Beck and smaller watercourses which converge with Cock Beck and Sheep Dike beyond the study area. Gradients are shallower than 7 degrees, which is not limiting to agricultural land quality.

4.3.14 East of Micklefield, irregular valley sides fall from around 75m to 55m AOD to an unnamed watercourse within Weet Wood. North of Daniel Hartly's Wood and west of Coldhill Lane, the land slopes down from ridges at 55m AOD toward valleys containing a small unnamed watercourse and Stream Dike respectively. Gradients are shallow and not likely to exceed 7 degrees.

4.3.15 To the south-west of Barkston Ash, the east-facing valley side forms a uniform slope, falling from a terrace at 40m AOD to the north of the Copley Lane Quarry, to the broad plain at 10m AOD. The plain continues to the north of the study area and is traversed by a series of ditches and dikes, including the Bishop Dike and Dorts Dike, which eventually join the River Wharfe to the north of Ulleskelf and the River Ouse to the east.

4.3.16 The Environment Agency's Flood Map for Planning (rivers and sea)[34] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. Much of the low-lying land in the east of the study area benefits from flood defences, which offer protection against flooding from water released from a recognised flood storage area[35] to the west and north of Ulleskelf. Land at risk of flooding is otherwise confined to the channels of Stream Dike, in which the land is classed as Flood Zone 3[36], to the west and north-west of Church Fenton, and a small area at Ulleskelf Mires, in which the land is classed as Flood Zone 2. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.17 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[37] and their general distribution is shown on the National Soil Map[38]. Soils possessing similar characteristics are amalgamated into associations.

[34] Environment Agency (2018). Flood Map for Planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[35] Flood storage areas recognised by the Environment Agency generally lie within the floodplain, but are isolated by purpose-built walls or embankments
[36] 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.
[37] 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.
[38] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.

4.3.18 There are four known groups of soil associations in this study area. The presence of the two most prevalent groups has been confirmed in parts of the study area by published soil data.

4.3.19 The predominant group includes the Aberford, Rivington 1 and East Keswick 2 associations. Aberford soils cover a wide swathe of the study area from the east of Garforth to Barkston Ash and are characterised by calcareous clay loam topsoils over similar subsoils, overlying limestone at a moderate depth. The profiles are well drained, of Wetness Class[39] (WC) I.

4.3.20 The Rivington 1 association develops in outcrops of coal measures and is mapped to the west of Garforth. Profiles comprise well drained (WC I) sandy loam or sandy silt loam topsoil overlying sandstone or extremely stony sandy loam.

4.3.21 Soils of the East Keswick 2 association are mapped to the immediate east of Garforth, in a band aligned roughly north to south. The East Keswick 2 soils develop over variably sloping land, over Carboniferous shales interbedded with sandstones. Profiles can include fine- and coarse-loamy soils which are well drained, of WC I.

4.3.22 This group of soil associations has been identified in surveys undertaken to the west[40] and north[41] of Garforth, and at Micklefield[42]. Soils at Garforth include sandy loam or medium clay loam topsoils over loamy sand, sandy loam or medium clay loam subsoils, in some areas passing to sandstone. Profiles are generally well drained (WC I) or moderately well drained (WC II) where there is some evidence of intermittent waterlogging in the subsoil.

4.3.23 At Micklefield, medium clay loam or silty clay loam topsoils and subsoils overlie soft weathering limestone, which is present at variable depths. Profiles are of WC I.

4.3.24 The second most prevalent group of associations includes the Dale, Dunkeswick and Foggathorpe 2 associations. Dale soils are common to the west of Garforth. Dunkeswick soils are mapped to the north of Garforth. The Foggathorpe 2 association is mapped to the west and south-west of Church Fenton.

4.3.25 Profiles of this group are characterised by stoneless or slightly stony clay loam, clay or sandy clay loam topsoils overlying grey clayey subsoils. The subsoils are slowly permeable and the profiles are typically poorly drained, of WC IV. The presence of such profiles, with the inclusion of medium clay loam and heavy clay loam topsoils, are also confirmed by the publicly available survey records for land at Garforth[40, 41] and Micklefield[42].

4.3.26 The Sessay association is mapped to the south-west of Ulleskelf and develops in glaciofluvial drift. Profiles comprise clay loam throughout, or have sandy loam

[39] 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.
[40] ADAS (1992). Agricultural Land Classification, Barrowby Hall and Swillington Common Farms, Garforth, West Yorkshire – Proposed Golf Course Development, Job No 32/02
[41] ADAS (1992). Agricultural Land Classification, Parlington Estate, Garforth, Leeds – Proposed Inclusion in Local UDP, Project No 20/92.
[42] ADAS (1992). Agricultural Land Classification, Leeds UDP Topic 442, Micklefield Enlarged Settlement, West Yorkshire. Job No 21/92

subsoils. The profiles are inherently freely draining but are affected by fluctuating groundwater such that they may be of WC II or III.

4.3.27 The least extensive soil within the study area is of the Fladbury 3 association, which develops in alluvium and is found on floodplains. The Fladbury 3 association is mapped across a small area mid-way between Church Fenton and Ulleskelf. Profiles are clayey throughout and are waterlogged for long periods of the year, due to slowly permeable subsoils as well as high groundwater. Profiles are of WC IV.

Soil and land use interactions

Agricultural land quality

4.3.28 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.

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

4.3.30 Climate within this area does not in itself place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[43] limitations of the land.

4.3.31 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[44] for four points within the study area. The data show the area to have moderate rainfall and cool temperatures at the higher altitudes (65m to 85m AOD) and to be moderately dry with mild temperatures at lower altitudes (5m to 15m AOD). The number of Field Capacity Days[45] (FCDs), when the moisture deficit[46] is zero, ranges from 140 days per annum across most of the study area, to 161 days in the west. This is about 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.

4.3.32 Flood risk is likely to affect agricultural land quality in the valley of Stream Dike and across much of the low-lying plain between Church Fenton and Ulleskelf. Although some degree of protection is provided by flood defences to the north and west of Ulleskelf, land within the flood plain is limited to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk. Gradient is not likely to be limiting to agricultural land quality in this study area.

[43] 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
[44] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[45] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.
[46] 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.

4.3.33 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.

4.3.34 The predominant soil type of the area, comprising well drained, fine and coarse loamy textures of the Aberford, Rivington 1 and the East Keswick 2 associations are limited mostly by droughtiness, the severity of which is determined by the factors set out above.

4.3.35 The publicly available survey records for land to the west and north of Garforth40, 41 and at Micklefield42 confirm that deep and slightly stony profiles overlying sandstone or limestone bedrock at depths of around 70cm depth have a slight droughtiness limitation and are classified as Grade 2. The profiles are sufficiently deep to enable adequate water storage for crop uptake throughout most of the year.

4.3.36 To the north and west of Garforth, profiles comprising sandy loam topsoil over loamy sand subsoil, overlying sandstone at around 60cm depth, have a reduced capacity for water storage, such that the droughtiness limitation is to Subgrade 3a. At Micklefield, medium textured soils overlying limestone at 50cm depth are similarly limited by droughtiness to Subgrade 3a.

4.3.37 Where limestone bedrock is present at around 35cm depth at Micklefield, the droughtiness limitation is more severe, to Subgrade 3b.

4.3.38 The second most extensive soil group of the study area, comprising imperfectly or poorly drained fine loamy over clayey profiles of the Dale, Dunkeswick and Foggathorpe 2 associations, is most affected by wetness and workability. The profiles of this group identified at Garforth, and to a limited extent at Micklefield, are of WC III or IV depending on the depth to the slowly permeable layer.

4.3.39 Where the slowly permeable layer occurs at depths between 45cm and 70cm, the profiles are of WC III. Under the climatic conditions of the study area, profiles of WC III are limited by wetness and workability to Subgrade 3a where the topsoil textures are medium clay loam, or to Subgrade 3b where the topsoil is heavy clay loam.

4.3.40 In profiles of WC IV, the slowly permeable layer typically occurs within 35cm of the soil surface. Under the climatic conditions of the study area and with medium clay loam or heavy clay loam topsoils, profiles of WC IV are limited by wetness and workability to Subgrade 3b.

4.3.41 The least prevalent soils of the study area, of the Sessay and Fladbury 3 associations, are affected by fluctuating groundwater. Clay loam soils of the Sessay association are typically of WC II or III.

4.3.42 Sessay soils of WC II are limited by wetness to Grade 2 or Subgrade 3a where topsoil is medium clay loam or heavy clay loam respectively.

4.3.43 Sessay profiles of WC III are classified as Subgrade 3a where the topsoil is medium clay loam; and Subgrade 3b where the topsoil is heavy clay loam.

4.3.44 Profiles of the least extensive soil type of the study area, the Fladbury 3 association, which include clay profiles of WC IV, are limited by wetness and workability to Subgrade 3b.

4.3.45 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[47] shows that there is a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.

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

Other soil interactions

4.3.47 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[48] and the Government's White Paper, The Natural Choice: securing the value of nature[49], 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.

4.3.48 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.

4.3.49 The floodplains of Stream Dike, Bishop Dike and Dorts Dike, and the numerous ditches traversing the plain between Barkston Ash and Ulleskelf, occupy land where

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

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 a range of ecological habitats.

Land use

Land use description

4.3.50 Agricultural land use in this study area is predominantly arable cultivation, with land in pasture north of Garforth and in smaller pockets near Church Fenton used to graze cattle and sheep. Arable crops are grown in medium to large fields on the higher undulating land between Micklefield and Barkston Ash, with a narrow strip field pattern found on the lower, intensively drained land between Barkston Ash and Church Fenton. Medium to large arable fields again predominate south of Ulleskelf. The study area also includes equestrian and horticultural enterprises near Garforth.

4.3.51 Woodland is found predominantly east of the A1(M), and includes: Ringhay Wood and Daniel Hartly's Wood ancient woodlands, as well as Scott's Wood; Weet Wood; Middle Fox Covert; Coburn Hill Wood; Longroyd Wood; Near Fox Covert; and Far Fox Covert. Further south, near Barrowby Hall, are Carr Wood and Crawshaw Wood, and Hawk's Nest Wood north of Garforth. At the northern end of the study area is an unnamed wood south of Ulleskelf. Ringhay Wood, Daniel Hartly's Wood, Scott's Wood, Weet Wood, Coburn Hill Wood and Longroyd Wood are all managed commercially for timber extraction. In addition, there is a small willow plantation north of Church Fenton growing trees for wholesale.

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

4.3.53 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.

4.3.54 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 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 11.

Number, type and size of holdings

4.3.55 Table 11 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.

4.3.56 Table 11 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 11: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Barrowby Hall	Arable, beef cattle and sheep	140	None	None	Medium
Shippen House Farm	Beef cattle and sheep	178	None	None	Medium
White House Farm	Equestrian (commercial)	6	None	None	Medium
Throstlenest Farm	Arable and beef cattle	312	None	None	Medium
Land at Rose Cottage*	Rough grassland	2	Not known	None	Low
Leyfield Farm*	Arable and beef cattle	160	Not known	None	Medium
Sturton Grange Farm	Protected horticulture	51	Temperature controlled fruit storage	None	High
Ridge Road Farm	Arable, beef cattle and sheep	306	Anaerobic digestion plant, HGV park, commercial lets	None	Medium
Well House Farm	Arable and sheep	372	Agricultural contracting	None	Medium
Coldhill Farm	Arable	749	Wind farm	None	Medium
Huddleston Hall	Arable	386	None	None	Medium

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land east of Copley Lane Quarry*	Arable	9	Not known	None	Medium
Land west of A162 London Road*	Arable	11	Not known	None	Medium
Laurel Farm	Arable and beef cattle	150	None	None	Medium
Castle Hill Farm	Arable and beef cattle	171	None	ELS	Medium
Turpin Hall Farm*	Arable	25	Not known	None	Medium
Southlands	Arable	36	Agricultural contracting	None	Medium
Willow Farm	Grassland	19	Willow growing	None	Medium
Sherburn Lodge Farm	Arable and pigs	82	None	None	Medium
Sandwath Farm	Arable and sheep	21	None	None	Medium
Saxton Grange*	Arable	143	Not known	None	Medium
Land south of Patefield Wood*	Arable	33	Not known	None	Medium
Manor Farm	Arable	83	None	None	Medium
North Lodge Farm	Arable	380	None	None	Medium
North Milford Grange Farm	Arable, beef cattle and sheep	1,335	None	None	Medium
Intake Farm*	Arable and beef cattle	226	Not known	None	Medium
Home Farm (Grimston Park Estate)*	Arable and equestrian	190	Not known	ELS	Medium

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

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 In addition to design features that would be included in the Proposed Scheme to mitigate the impacts on farm holdings, there is a need to avoid or reduce environmental impacts to soils during construction. Soil resources from the areas required temporarily and permanently for the Proposed Scheme would be stripped and stored. This would enable agricultural land that is required temporarily for construction to be returned to agricultural use. It would also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they would be able to fulfil the identified function.

4.4.2 Compliance with the Code of Construction Practice (CoCP) 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[50] 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).

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:

- Leeds Bridleway 125 accommodation overbridge to mitigate severance of agricultural land at Barrowby Hall (CT-06-496);

[50] Supporting document: Draft Code of Construction Practice

- Sturton Grange Footpath 6 accommodation overbridge to mitigate severance of agricultural land at Hawk's Nest Wood (CT-06-497); and
- Micklefield Footpath 11 accommodation overbridge to mitigate severance of agricultural land at Cold Hill Farm (CT-06-499).

4.4.4 The effect of severance of agricultural land for Sherburn Lodge would also be reduced by the ability of agricultural machinery to pass under the Church Fenton 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, Dunkeswick, Foggathorpe 2 and Fladbury 3 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 construction of the Proposed Scheme is likely to require approximately 540ha of agricultural land, within the Garforth and Church Fenton area, of which approximately 350ha (65%) is likely to be classified as BMV land (Grades 2 and 3a). This is a high magnitude of impact on BMV land.

4.4.11 As BMV land in this local area is a receptor of low 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[51]. These principles would be followed throughout the construction period.

4.4.15 Clayey and seasonally waterlogged soils (including Dale, Dunkeswick, Foggathorpe 2 and Fladbury 3 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

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

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 12 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 12: Summary of temporary effects on holdings from construction

Holding name/Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Barrowby Hall Medium sensitivity	High	Medium	Major/moderate adverse
Shippen House Farm Medium sensitivity	Low	Negligible	Minor adverse
White House Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Throstlenest Farm Medium sensitivity	Low	High	Major/moderate adverse
Land at Rose Cottage Low sensitivity	High	Negligible	Moderate adverse
Leyfield Farm Medium sensitivity	Low	High	Major/moderate adverse
Sturton Grange Farm High sensitivity	High	Negligible	Major adverse

Holding name/Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Ridge Road Farm Medium sensitivity	Negligible	Medium	Moderate adverse
Well House Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Coldhill Farm Medium sensitivity	Medium	High	Major/moderate adverse
Huddleston Hall Medium sensitivity	Low	High	Major/moderate adverse
Land east of Copley Lane Quarry Medium sensitivity	High	High	Major/moderate adverse
Land west of A162 London Road* Medium sensitivity	High	Negligible	Major/moderate adverse
Laurel Farm Medium sensitivity	Low	High	Major/moderate adverse
Castle Hill Farm Medium sensitivity	Negligible	Negligible	Negligible
Turpin Hall Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Southlands Medium sensitivity	Medium	Negligible	Moderate adverse
Willow Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Sherburn Lodge Farm Medium sensitivity	Medium	High	Major/moderate adverse
Sandwath Farm Medium sensitivity	Medium	Low	Moderate adverse
Saxton Grange Medium sensitivity	Low	Negligible	Minor adverse
Land south of Patefield Wood* Medium sensitivity	High	Negligible	Major/moderate adverse
Manor Farm	High	Negligible	Major/moderate adverse

Holding name/Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Medium sensitivity			
North Lodge Farm Medium sensitivity	Low	Negligible	Minor adverse
North Milford Grange Farm Medium sensitivity	Negligible	Negligible	Negligible
Intake Farm Medium sensitivity	Low	Negligible	Minor adverse
Home Farm (Grimston Park Estate) Medium sensitivity	Medium	High	Major/moderate adverse

4.4.21 Overall, the construction of the Proposed Scheme could potentially affect 27 holdings in the Garforth and Church Fenton area temporarily. On the basis of information currently available, 21 holdings could experience moderate or major/moderate adverse temporary effects from construction, which would be significant for each holding.

4.4.22 One farm (Sturton Grange Farm) is currently anticipated to experience major adverse temporary effects from construction. This is a high sensitivity horticultural holding, which would have a high proportion of the holding required temporarily during construction.

4.4.23 Fifteen holdings are currently anticipated to experience major/moderate adverse temporary effects. The majority of these are medium sensitivity arable or mixed arable and livestock holdings experiencing a high proportion of the holding required, or high severance impacts.

4.4.24 A further six holdings would experience moderate adverse temporary effects. Again, these are mainly arable or mixed holdings, but with a lower magnitude of impact. A high proportion of the low sensitivity small holding at land at Rose Cottage would be required.

4.4.25 Although financial compensation will 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

4.4.26 Interpretation of publicly available data shows that construction of the Proposed Scheme, is likely to require approximately 190ha of agricultural land within the Garforth and Church Fenton area, of which approximately 110ha (58%) are likely to be classified as BMV land (Grades 2 and 3a). This is a medium magnitude of impact on BMV land.

4.4.27 As BMV land in this local area is a receptor of low sensitivity, it is currently anticipated that construction of the Proposed Scheme is likely to have a minor adverse effect on BMV land, which would be unlikely to produce a significant effect.

Impacts on forestry land

4.4.28 It is currently anticipated that an area of 4ha of commercial forestry land at Scott's Wood and Weet Wood would be required for construction of the Proposed Scheme. Both of these woodlands are managed commercially, with the impacts on these resources primarily relating to reduced timber revenues. In addition, a further 0.5ha of willow plantation at Willow Farm would be required. 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

4.4.29 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 13 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.

4.4.30 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 13: 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
Barrowby Hall Medium sensitivity	Medium	Low	High	Major/moderate adverse
Shippen House Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
White House Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Throstlenest Farm Medium sensitivity	Negligible	Low	Negligible	Minor adverse
Land at Rose Cottage Low sensitivity	High	Negligible	Negligible	Moderate adverse
Leyfield Farm Medium sensitivity	Low	Low	Negligible	Minor adverse
Sturton Grange Farm High sensitivity	Low	Negligible	High	Major adverse

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential impact on farm infrastructure**	**Potential scale of effect**
Ridge Road Farm Medium sensitivity	Negligible	Medium	High	Major/moderate adverse
Well House Farm Medium sensitivity	Negligible	Negligible	High	Major/moderate adverse
Coldhill Farm Medium sensitivity	Low	Low	Medium	Moderate adverse
Huddleston Hall Medium sensitivity	Negligible	High	Negligible	Major/moderate adverse
Land east of Copley Lane Quarry Medium sensitivity	High	High	Negligible	Major/moderate adverse
Land west of A162 London Road* Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Laurel Farm Medium sensitivity	Low	Low	Negligible	Minor adverse
Castle Hill Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Turpin Hall Farm Medium sensitivity	Medium	Negligible	Negligible	Moderate adverse
Southlands Medium sensitivity	Medium	Low	High	Major/moderate adverse
Willow Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Sherburn Lodge Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Sandwath Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Saxton Grange Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land south of Patefield Wood* Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Manor Farm	Low	Negligible	Negligible	Minor adverse

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Medium sensitivity				
North Lodge Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
North Milford Grange Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Intake Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Home Farm (Grimston Park Estate) Medium sensitivity	Negligible	Negligible	Negligible	Negligible

4.4.31 Overall, the construction of the Proposed Scheme could potentially affect 27 holdings in the Garforth and Church Fenton area permanently. On the basis of information currently available, 12 holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.

4.4.32 The high sensitivity horticultural unit at Sturton Grange Farm is currently anticipated to experience a major adverse permanent effect from construction. Although the permanent impacts associated with both the proportion of the holding required and severance would be negligible, construction of the Proposed Scheme would require the demolition of an area of polytunnels and associated horticultural infrastructure.

4.4.33 Seven medium sensitivity farms are anticipated to experience major/moderate adverse permanent effects. Four holdings would experience major/moderate adverse permanent effects, due to the demolition of farm buildings (Barrowby Hall, Ridge Road Farm, Well House Farm and Southlands. Four holdings are anticipated to experience major/moderate adverse permanent effects, largely due to the proportion of land required for construction of the Proposed Scheme and severance impacts.

4.4.34 A further three holdings would experience moderate adverse temporary effects. These are either low sensitivity small-holdings, which would experience a high proportion of land required for construction of the Proposed Scheme, or moderate sensitivity commercial holdings with medium impacts associated with the proportion of land required and severance impacts.

4.4.35 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

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

4.4.37 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.

4.4.38 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

4.4.39 Although the extent of land required permanently by ALC grade is not yet known in the Garforth and Church Fenton area; current indications based on publicly available information are that the effect on BMV agricultural land would be moderate adverse temporarily during construction, which would be significant, and minor adverse permanently from construction, which would be unlikely to produce a significant effect. The amount of land required by ALC grade will be assessed and reported in the formal ES.

4.4.40 Of the 27 farm holdings identified, 21 are anticipated to experience moderate or major/moderate adverse temporary effects during construction; with 12 anticipated to experience moderate, major/moderate or major adverse permanent effects of construction, which would be significant for each holding.

4.4.41 Effects on forestry land and soils to be disturbed will 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 Farm buildings at Barrowby Hall, White House Farm and Sandwath Farm lie within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

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

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

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Garforth and Church Fenton 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 Garforth and Church Fenton area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[52] (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 Leeds City Council (LCC), North Yorkshire County Council (NYCC) and Selby District Council (SDC) 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: LA16 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)[53].

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[54]:

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

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

[52] 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.
[53] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[54] 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.

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 Garforth and Church Fenton area are emissions from road vehicles and agricultural activities. The main roads within the area are the M1, the A1(M) and other local roads: the A63 Selby Road; the A656 Lock Lane; the A162 London Road; the B1217 Aberford Road; the B1223 Church Fenton Lane; the B1223 Raw Lane/New Road; Barwick Road; Ridge Road; Great North Road; Coldhill Lane/Mile Hill; Saw Wells Lane; Common Lane/ Common Road; Sandwath Lane; and Mires Lane.

5.3.2 There are two industrial installations (regulated by the Environment Agency) with permits for emissions to air relevant to the Garforth and Church Fenton area; namely Ridge Road Farm and Copley Lane landfill site. 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)[55], 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 Garforth and Church Fenton area.

Local monitoring data

5.3.4 There are currently two local authority diffusion tube sites located within the Garforth and Church Fenton area for monitoring NO_2 concentrations. These are both located on the A63 Selby Road in Garforth. Measured concentrations in 2016 at both sites exceeded the air quality standard[56].

Air quality management areas

5.3.5 There are no air quality management areas (AQMA) within the Garforth and Church Fenton area.

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

Receptors

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

5.3.7 Most of the receptors which may be affected by the Proposed Scheme are in residential areas including Garforth, Sherburn in Elmet, Barkston Ash and Church Fenton. Other receptors include various schools, nurseries and commercial premises.

5.3.8 There are two statutory designated ecological sites identified within the Garforth and Church Fenton area, namely Hook Moor Site of Special Scientific Interest (SSSI) and Kirkby Wharfe SSSI. Other non-statutory sensitive ecological sites identified close to the Proposed Scheme include Hawk's Nest Wood Local Wildlife Site (LWS), Coburn Hill Wood LWS and Daniel Hartly's Wood Ancient Woodland Inventory Site. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP)[57]. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

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

[57] Supporting documents: Draft Code of Construction Practice

- 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[58] have been assessed for their effect on dust soiling, human health[59] and ecological sites. There are residential and ecological receptors located within the Garforth and Church Fenton area.

5.4.6 It is anticipated that, prior to mitigation measures being applied, there would be low risk of dust effects and negligible risk of human health effects from demolition. For earthworks, there would be a medium to high risk of dust effects and a low risk of human health effects. For construction, there would be a medium risk of dust effects and a low risk of human health effects. For trackout, there would be a medium risk of dust effects and a low to medium risk of human health effects. There would also be a low risk of ecological effects from all dust generating activities.

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

Construction traffic effects

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

5.4.9 The M1, the A1(M), the A642 Aberford Road for short-distance (approximately 300m) south of the M1, the A656 Lock Lane between the M1 and Ridge Road, the A63 Great North Road between the A1(M) and the A162 London Road, the A162 London Road, B1217 Aberford Road, the B1223 Raw Lane/New Road, the B1222 Bishopdyke Road between the A162 London Road and Fenton Lane and Ridge Road would likely

[58] 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.
[59] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on the A1(M), the A162 London Road, the A642 Aberford Road, the A656 Lock Lane, the A63 Great North Road, and Saw Wells Lane. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

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

Permanent effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

Operational traffic effects

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

6.1.2 The assessment draws on information gathered from engagement with users and operators of community facilities including North Yorkshire County Council (NYCC), Leeds City Council (LCC), Selby District Council (SDC) and Church Fenton Parish Council. 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: LA16 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)[60].

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

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

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

6.2.6 The assessment in the working draft ES is based on the design information, including demolitions as set out in Section 2 available at the time of 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 the 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 Garforth and Church Fenton area would be approximately 16.2km in length and lie within the LCC, SDC and NYCC areas. It would extend from north of Garforth to near the existing railway line at Ulleskelf, passing close to the settlements of Austhorpe, Garforth, Micklefield, Barkston Ash, Sherburn in Elmet and Church Fenton, and Ulleskelf in the north.

6.3.2 The Garforth and Church Fenton area is predominantly rural in nature, made up of a number of settlements. The main concentrations of community facilities are located in Garforth and Sherburn in Elmet, which are partially within the study area. Micklefield, Barkston Ash, Church Fenton and Ulleskelf are villages, which are residential in nature.

6.3.3 The Garforth and Church Fenton area is crossed by a promoted PRoW: Leeds Country Way (62-mile footpath around Leeds).

Garforth and Austhorpe

6.3.4 This area covers the town of Garforth and the civil parish of Austhorpe.

6.3.5 The town of Garforth is located approximately 7km east of Leeds City Centre and south of the M1; the village comprises approximately 5,000 residential properties, the nearest of which would be adjacent to the route of the Proposed Scheme. Within the

study area, notable community facilities include Garforth Stables and Riding School, Barrowby Lane Stables, Garforth Golf Club, Amaranth Football and Cricket Club, Garforth Football Club, Meadowbrook Manor nursing home, Hawk's Nest Wood and Parlington Hollins (an area of publically accessible woodland just north of the main settlement). Other community facilities within the study area include allotments, schools (St. Benedict's Catholic Primary School and East Garforth Infant and Primary School), churches (Dayspring Church and Evangelical Church) and GP surgeries.

6.3.6 The parish of Austhorpe is located approximately 5km east of Leeds City Centre, comprising approximately 1,500 residential properties, the nearest of which would be located approximately 550m west of the route of the Proposed Scheme. Within the study area, community facilities include Colton Mill Medical Centre, Busy Bees nursery at Colton Mill, and Thorpe Park Clinic.

Micklefield

6.3.7 The village of Micklefield is located approximately 2km east of Garforth and comprises approximately 700 residential properties, the nearest of which would be located approximately 600m south of the route of the Proposed Scheme. The village is split into two clusters, linked by Great North Road, made up predominantly of residential dwellings. Within the study area, community facilities include St Mary the Virgin's Church, Micklefield Youth and Adult Centre and Ringhay Wood, which is a publically accessible area of ancient woodland. Weet Wood, Scott's Wood and Coburn Hill Wood are publically accessible areas of woodland adjacent to Ringhay Wood.

Sherburn in Elmet

6.3.8 The village of Sherburn in Elmet is located approximately 4km east of Micklefield and the A1(M) and comprises approximately 2,800 residential properties. The nearest residential properties would be approximately 250m south of the route of the Proposed Scheme. Whilst the main settlement is located outside of the study area, there is linear residential development along Finkle Hill, London Road and Coldhill Lane, which lie within the study area.

Barkston Ash, Church Fenton and surrounds

6.3.9 The villages of Barkston Ash, Church Fenton and surrounds comprise approximately 750 residential properties.

6.3.10 The village of Barkston Ash is located approximately 1.5km north of Sherburn in Elmet. The nearest residential properties would be located approximately 250m north of the route of the Proposed Scheme. Within the study area, community facilities include Barkston Ash Primary School, Barkston Ash Holy Trinity Church, Rainbow Nursery, Barchester Highfield Care Home, Barkston Ash Village Hall, two public houses (Ash Tree Inn and Boot and Shoe), Scarthingwell Park and Scarthingwell Golf Course.

6.3.11 The village of Church Fenton is located approximately 1.3km north-east of Barkston Ash. Some residential properties would be on the route of the Proposed Scheme. Within the study area, community facilities include Church Fenton Bowling Club, Church Fenton Methodist Church, St. Mary's Church, Kirk Fenton Parochial Primary School, Jigsaw Childcare Limited, Sunar Bangla restaurant, Church Fenton

Community Shop, Church Fenton Village Hall, Church Fenton Bowling Club, and the White Horse Public House. Sandwath Lake is also located within the study area, and is used recreationally for fishing by members of the Leeds and District Amalgamated Society of Anglers.

Ulleskelf

6.3.12 The village of Ulleskelf is located within the study area, approximately 2.5km north of Church Fenton; bordered by the River Wharfe to the north. The village comprises approximately 300 residential properties. The Proposed Scheme would join the existing York to Church Fenton railway line which bisects the village. The nearest residential properties would be located adjacent to the route of the Proposed Scheme. The village contains a number of community facilities including Ulleskelf Post Office, Ulleskelf Methodist Church, The Ulleskelf Arms public house, and Ulleskelf Village Hall.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[61] 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 reasonably practicable, which may affect community resources during construction (Section 16);
- specific measures in relation to air quality and noise will also serve to reduce impacts on 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).

[61] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.2 As part of the construction of the West Garforth cutting, it would be necessary to carry out works that falls within the boundary of one residential property on Barrowby Lane, Garforth. An area of garden space would be temporarily lost for approximately four months. This would not impact on the ability of the residents to use their dwelling, with access maintained throughout construction. This would result in a minor adverse effect, which would not be significant.

6.4.3 As part of the construction of Barwick Road overbridge, it would be necessary to carry out works that fall within the boundaries of one residential property on Barwick Road. An area of garden space would be temporarily lost from the property for approximately seven months. This would not impact on the ability of the residents to use their dwelling, with access maintained throughout construction. This would result in a minor adverse effect, which would not be significant.

6.4.4 As part of the construction of Weet Wood cutting and Ridge Road overbridge, it would be necessary to carry out works which falls within the boundary of a residential property on Ridge Road. An area of garden space would be temporarily lost for approximately eight months. This would not impact on the ability of the residents to use their dwelling, with access maintained throughout construction. This would result in a minor adverse effect, which would not be significant.

6.4.5 As part of the construction of Common Lane realignment, it would be necessary to carry out works that fall within the boundary of two residential properties on Common Lane. An area of outside garden space at these residential properties would be temporarily lost for a period of approximately twelve months. This would not impact on the ability of the residents to use their dwelling, with access maintained throughout construction. This would result in a minor adverse effect, which would not be significant.

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 Church Fenton viaduct would temporarily require Sandwath Lake, Church Fenton, for approximately three years and two months. Access would be maintained. However, during construction, this recreational facility would be unusable for its intended purpose of fishing. This would result in a major adverse effect, which would be significant.

Open space and PRoW

6.4.8 The construction of Micklefield cutting would temporarily require part of the publicly accessible land from Hawk's Nest Wood and the surrounding publicly accessible countryside. Approximately 30% of Hawk's Nest Wood and surrounding countryside would be temporarily required during construction for a period of approximately nine

months. The remainder of the open space would be unaffected and access would be maintained during construction. The woodland and surrounding countryside is regularly used, however is not well maintained. Parlington Hollins is an area of publicly accessible woodland approximately 500m north of Hawk's Nest Wood and provides a comparable and accessible alternative within the area. The temporary loss of approximately 30% of Hawk's Nest Wood and surrounding countryside would result in a moderate adverse effect, which would be significant.

6.4.9 Part of Weet Wood at Micklefield is located within the land required for the construction of Ringhay Wood embankment. Approximately 75% of Weet Wood would be inaccessible for a period of approximately one year and nine months. The area of open space is regularly used, and the adjacent Scott's Wood and Coburn Hill Wood provide comparable and accessible alternatives within the area. Weet Wood is also well maintained with some footpaths, benches and signage, and is likely to be a moderately valued resource in the local community. The temporary loss of approximately 75% of the open space would result in a major adverse effect, which would be significant.

Permanent effects

Residential properties

6.4.10 The construction of the Barwick Road realignment would require the demolition of a residential property on Barwick Road, Garforth. This residential property would be permanently lost.

6.4.11 The construction of the Barwick Road realignment would require part of the garden space from two residential properties on Barwick Road, Garforth. The permanent loss of garden space would not impact on the ability of residents to use their dwelling. This is not considered to have a significant community effect.

6.4.12 The construction of the Weet Wood cutting would require the demolition of a residential property on Ridge Road, Micklefield. This residential property would be permanently lost.

6.4.13 The construction of the Barkston Ash embankment would require the demolition of two residential properties on Common Lane, Church Fenton. These residential properties would be permanently lost.

6.4.14 The construction of the Church Fenton viaduct would require the demolition of one residential property and associated garage on Sandwath Lane, Church Fenton. This residential property would be permanently lost.

Recreational facilities

6.4.15 The construction of the East Garforth cutting would permanently require part of the land from Garforth Stables. The likely effects will be reported in the formal ES.

Open space and PRoW

6.4.16 The construction of the Micklefield cutting would permanently require approximately 15% of land from Hawk's Nest Wood and surrounding countryside. Parlington Hollins is an area of publicly accessible woodland approximately 500m north of Hawk's Nest

Wood and surrounding countryside and provides a comparable and accessible alternative within the area. The permanent loss of approximately 15% of Hawk's Nest Wood and surrounding countryside would result in a moderate adverse effect, which would be significant.

6.4.17 As part of the construction of the Ringhay Wood embankment, approximately 25% of land from Weet Wood would be permanently lost. There are adjacent comparable alternatives (Scott's Wood and Coburnhill Wood). Therefore the permanent loss of approximately 25% of Weet Wood would result in a moderate adverse effect, which would be significant.

Other mitigation measures

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

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

Summary of likely residual significant effects

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

- Hawk's Nest Wood in Garforth;
- Weet Wood in Micklefield; and
- Sandwath Lake in Church Fenton.

6.4.21 Land required for the construction of the Proposed Scheme is likely to result in permanent residual significant adverse effects:

- loss of publicly accessible land from Hawk's Nest Wood in Garforth; and
- loss of publicly accessible land from Weet Wood in Micklefield.

Cumulative effects

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

6.4.23 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 construction of the Proposed Scheme, which would result in cumulative community 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 Garforth and Church Fenton 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, Forestry Commission, Yorkshire Wildlife Trust and Leeds City Council (LCC) 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: LA16 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[62].

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 Final ES.

7.3 Environmental baseline

Existing baseline

Introduction

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

7.3.2 Land required for the construction of, and adjacent to, the Proposed Scheme in the Garforth and Church Fenton area consists mainly of agricultural land, woodland,

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

floodplain, villages and farmsteads. The route of the Proposed Scheme in this area would pass through undulating agricultural terrain, woodlands and floodplain grazing marsh along the banks of the River Wharfe (north of Ulleskelf). It would run parallel to, and frequently immediately adjacent to, the M1 between Garforth and north of Micklefield. The A1(M) would be crossed by the route of the Proposed Scheme north of Micklefield. The existing Leeds to Selby railway line would be crossed by the route of the Proposed Scheme near Nanny Goat Lane, and this line then runs parallel and close to the route of the Proposed Scheme between Coldhill Lane and Church Fenton.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA16 Map Book.

Designated sites

7.3.4 There is one site of international importance that is relevant to the assessment of the Proposed Scheme in the Garforth and Church Fenton area. Humber Estuary Ramsar, Special Area of Conservation (SAC) and Special Protection Are (SPA) is a multi-designated site located 25km east of the Proposed Scheme from the Garforth and Church Fenton area.

7.3.5 The Humber Estuary Ramsar, SAC and SPA cover an area of, respectively, 37,988ha, 36,657ha and 37,630ha. The Humber 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 Garforth and Church Fenton area is within the catchment of this site, connected by the River Wharfe, a tributary of the River Ouse.

7.3.6 There are five nationally important Sites of Scientific Interest (SSSIs) that are relevant to the assessment in the Garforth and Church Fenton area. For each of these sites, the route of the Proposed Scheme would be within the Impact Risk Zones[63] relevant to railway infrastructure as identified by Natural England. They are:

- 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 25km east of the Proposed Scheme within the Garforth and Church Fenton area and within the Impact Risk Zone for this SSSI relevant to railway infrastructure as identified by Natural England[64];
- Bolton Percy Ings SSSI, covering an area of 7.1ha, is designated because it comprises two unimproved alluvial flood meadows important for their neutral grassland plant community. This SSSI is located adjacent to the River Wharfe in the Vale of York, and is 1.2km south-east of the land required for the Proposed Scheme;

[63] 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.
[64] 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.

- Kirkby Wharfe SSSI, covering an area of 21.7ha, is designated because it is one of the few remaining sedge and rush dominated marshland communities in the Vale of York. This SSSI is located within an area of floodplain in the valley of Dorts Dike, adjacent to the land required for the Proposed Scheme;
- Sherburn Willows SSSI, covering an area of 5.3ha, is designated primarily for its magnesium limestone grassland and is situated on south-westerly facing slopes. The SSSI includes a wetland complex supporting water birds including mallard, widgeon, teal, water rail, snipe, reed bunting and grasshopper warbler, as well as breeding grounds for reed warbler and sedge warbler. This SSSI is located south of the Coldhill Lane and south-west of Sherburn in Elmet, 1.3km south of the land required for the Proposed Scheme; and
- Hook Moor SSSI, covering an area of 1.7ha, is designated for being one of the top two sites in Britain containing an unusual abundance of thistle broomrape. This SSSI is located adjacent to the A1(M), north of Micklefield, and would be located 200m north-east of the land required for the Proposed Scheme and adjacent to the B1217 that would be used for construction traffic.

7.3.7 There are three Local Wildlife Sites (LWS) of potential relevance to the assessment in the Garforth and Church Fenton area, each of which is of county/ metropolitan value. These are;

- Hawk's Nest Wood LWS, covering an area of 28.3ha, is designated for containing a range of semi-natural habitats including woodland, grassland and ponds, which support good populations of great crested newt, common frog, smooth newt and palmate newt. This LWS is located within the land required for the Proposed Scheme, adjacent to the M1;
- Hartly Wood/Castle Hills LWS, covering an area of 29.3ha, is designated for being of ancient origin with ancient woodland indicator species present and shrub and herb layer being indicative of calcareous soils. The site supports a number of species that are rare or uncommon in West Yorkshire. This LWS is located 100m south of the land required for the Proposed Scheme, to the east of the A1(M) at Micklefield; and
- Coburn Hill Wood LWS, covering an area of 21.9ha, is a woodland designated for breeding amphibians, supporting good populations of great crested newts, common frog, common toad, smooth newt and palmate newt. This LWS is located within the land required for the Proposed Scheme, to the east of the M1-A1(M) intersection.

7.3.8 There are two Sites of Importance for Nature Conservation (SINC) of potential relevance to the assessment in the Garforth and Church Fenton 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. They are:

- Haigh's Grass SINC, covering an area of 4.8ha, is predominately grassland with areas of woodland, scrub and mature hedge. It is located within the land required for the Proposed Scheme, south of Ulleskelf; and
- Patefield Wood SINC, covering an area of 25.4ha, is an ancient and semi-natural woodland (ASNW) comprising both ancient woodland and Plantation on Ancient Woodland Sites (PAWS). It is located partially within the land required for the Proposed Scheme east of Church Fenton.

7.3.9 There are four Ancient Woodland Inventory Sites (AWIS) of potential relevance to the assessment in the Garforth and Church Fenton area, each of which is of county/metropolitan value. They are:

- Carr Wood AWIS. This PAWS is located 150m west of the land required for the Proposed Scheme, east of Church Fenton;
- Patefield Wood AWIS, covering an area of 25.4ha, comprises both ancient woodland and PAWS. The boundary of the AWIS is the same as Patefield Wood SINC. It is located partially within the land required for the Proposed Scheme, east of Church Fenton;
- Ringhay Wood AWIS covers an area of 33ha. This PAWS is located 150m north of the land required for the Proposed Scheme, east of M1-A1(M) intersection; and
- Daniel Hartly's Wood AWIS, covers an area of 19.5ha. This PAWS is located 50m south of the land required for the Proposed Scheme, east of A1(M) and Micklefield.

7.3.10 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

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

Woodland

7.3.12 In addition to the aforementioned woodlands, there are 15 other areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[65], and local Biodiversity Action Plans (LBAP)[66] habitats), which would be within, or partly within, the land that would be required for the Proposed Scheme. These are woodland areas are located as follows;

- Barrowby Hall;
- near West Garforth;

[65] Section 41 (41) of the Natural Environment and Rural Communities Act 2006
[66] Leeds and Selby Biodiversity Action Plans (BAP).

- land associated with the M1;
- Micklefield;
- Sherburn in Elmet;
- Church Fenton; and
- Ulleskelf.

7.3.13 On a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to district/ borough value.

Grassland

7.3.14 Grasslands outside designated sites occur within the land that would be required for the Proposed Scheme. This includes the floodplain grazing marsh on the River Wharfe floodplain near Ulleskelf, which may qualify as a habitat of principal importance and LBAP habitat. On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands) these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.15 Many of the hedgerows within the land required for the Proposed Scheme are likely to qualify as a habitat of principal importance and a LBAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[67]. In addition, they could also provide commuting corridors for wildlife and nesting 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

7.3.16 The River Wharfe, its tributaries, Sturton Dyke, Stream Dike, Upper Fox Drain and several smaller watercourses would be crossed by the route of the Proposed Scheme. The River Wharfe and Sturton Dyke may qualify as habitats of principal importance and LBAP habitats. On a precautionary basis, pending the findings of field surveys, these watercourses are considered to be of up to county/ metropolitan value. There is also a spring at Carr Wood at Barrowby Hall that feeds a downstream pond. On a precautionary basis, pending the findings of field surveys, the watercourse has been assumed to be of up to county/ metropolitan value. The smaller watercourses are considered to be of up to district/ borough value.

Water bodies

7.3.17 There are 16 ponds that would be located within, or partly within, the land required for the Proposed Scheme. Some may qualify as habitats of principal importance, or LBAP habitats (e.g. if they support fauna species of high conservation importance such as great crested newts). There is a further pond outside of the land which would be required for the Proposed Scheme that is fed by the spring that rises at Carr Wood at

[67] '*Statutory Instrument 1997 No. 1160' Hedgerows* Regulations 1997

Barrowby Hall. 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

7.3.18 Pending the results of the field surveys, it is possible that ancient and veteran trees may be present within the land required for the Proposed Scheme in the Garforth and Church Fenton area. On a precautionary basis, ancient and veteran trees are considered to be of up to county/metropolitan value.

Protected and notable species

7.3.19 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 14.

Table 14*:* Species potentially relevant to the assessment within the Garforth and Church Fenton area

Resource/feature	Value	Rationale
Bats	Up to Regional	Records from the North and East Yorkshire Ecological Data Centre (NEYEDC) and West Yorkshire Joint Services (WYJS) indicate roost records at Barrowby Hall, which would be adjacent to the land required for the Proposed Scheme. There are further records within 2km of land that would be required for the Proposed Scheme mainly centred on villages and towns at Garforth, Sherburn in Elmet and Church Fenton. There is suitable habitat for both roosting and foraging bats along the route of the Proposed Scheme. This includes woodland, hedgerows, grassland and arable fields that occur along the existing Leeds to Selby and the York to Church Fenton lines and within the surrounding area. Along with blocks of habitat particularly associated with the cluster of woodland east of Micklefield and north of Garforth. Trees and buildings have been identified with potential to support roosting bat species at several locations within 100m of the land required for the Proposed Scheme. Records confirm there are at least five species of bat throughout the area: noctule, soprano pipistrelle, common pipistrelle, Natterer's bat and brown long-eared bat.
Otter	Up to county/metropolitan	Habitat suitable for this species is present along watercourses and drainage ditches, and there are records of their presence to the north of the River Wharfe and in Ulleskelf. These include two records within 150m of land that would be required for the Proposed Scheme.
Water vole	Up to county/metropolitan	Habitat suitable for water vole is present along watercourses and drainage ditches, and there are records of their presence along the River Wharfe and within Sherburn Willows SSSI. The closest record is 350m from the land that would be required for the Proposed Scheme.
Great crested newt	County/metropolitan	Ongoing surveys confirmed the presence of great crested newts in ponds north of Garforth and north of Church Fenton within the land required for the Proposed Scheme. Records from the West Yorkshire Joint Services (WYJS) and the North and East Yorkshire Ecological Data Centre (NEYEDC) confirm there are records of great crested newt from two areas within the land that would be required for the Proposed Scheme: Hawk's Nest Wood and Coburn Hill Wood. Records from the WYJS and the NEYEDC confirm there are three further sites within the land required for the Proposed Scheme.

Resource/feature	Value	Rationale
Birds	County/metropolitan	Ongoing surveys recorded Red kites, a schedule 1 species, nesting in the Garforth, Church Fenton and Micklefield areas. NEYEDC records confirm barn owl presence north of Ulleskelf and within the area of Church Fenton. There are also records of kingfisher in the area between Church Fenton and Ulleskelf and quail at the wind farm north of Micklefield. The farmland and woodland is suitable for breeding and wintering birds. Species associated with these habitats include lapwing, barn owl, red kite and yellowhammer which breed in low numbers in farmland habitats, and a range of typical common woodland breeding and wintering birds.
White-clawed crayfish	Up to county/metropolitan	There is one record of white-clawed crayfish present in the River Wharfe within 1.5km of the land required for the Proposed Scheme. There is suitable habitat for this species on tributaries of the River Wharfe within the land required for the Proposed Scheme.
Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates including species of principal importance is likely to be present in watercourses including the River Wharfe and Sturton Dyke, smaller watercourses, and in water bodies.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates including species of principal importance is likely to be present in the areas of woodland east of Micklefield and floodplain grazing at Ulleskelf.
Fish	Up to District/borough	There are records in the River Wharfe tributaries and Cock Beck for European bullhead and lamprey (both listed on Annex II of the EC Habitats Directive) and European eel and brown trout.
Reptiles	Up to district/borough	Suitable habitat is likely to be present for reptiles, including grass snake, slow worm and common lizard near the River Wharfe, Hawk's Nest Wood and existing railway embankments. There are no records of reptiles within 2km of 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 LA16 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigation of the losses of habitat and effects on species:

- construction of viaducts over Stream Dike and Church Fenton would avoid direct effects to these watercourses, water bodies and terrestrial habitats and allow free passage for wildlife beneath them including along the watercourses and their banks;
- creation of woodland habitat and landscape planting would help replace the losses of woodland (e.g. priority habitat around Barrowby Hall, Barwick Road, Coburn Hill Wood LWS, west of Sandwath Lane and the existing railway), and to enhance connectivity between remaining woodlands;
- provision of new species-rich hedgerow habitat, using appropriate native species, to help contribute towards reducing the loss of hedgerows, and re-

connecting the ecological network in the surrounding areas, including along the margins of the Proposed Scheme, and in areas such as south of Barrowby Hall, at Sandwath Lane and south of Ulleskelf; and

- provision of new grassland habitat, including some species rich grasslands to compensate for losses at the River Wharf near Ulleskelf.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[68,69], which includes translocation of protected species where appropriate.

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

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

Assessment of impacts and effects

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

Designated sites

7.4.5 The land required for construction of the Proposed Scheme is connected to the Humber Estuary Ramsar, SAC and SPA by the River Wharfe, a tributary of the River Ouse. This site is geographically distant, being located 25km to the east of the land

[68] 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.
[69] Supporting document: Draft Code of Construction Practice

required for 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.

7.4.6 The land required for construction of 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 Wharfe, there would be no significant effects.

7.4.7 There would be no direct effects on Bolton Percy Ings SSSI. Due to the distance of the SSSI from the Proposed Scheme (1.2km), the indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP.

7.4.8 There would be no direct effects on Kirkby Wharfe SSSI. Indirect hydrological effects arising from construction of the Church Fenton viaduct will be controlled by the draft CoCP. However, the site is adjacent to the land that would be required for the Proposed Scheme and there are potential impacts during construction resulting from installation of a satellite construction compound and a temporary material stockpile south-west of Ulleskelf village, adjacent to Bowlam Bridge. On a precautionary basis, in the absence of detailed mitigation, this would result in the temporary adverse effect that is significant at the national level.

7.4.9 There would be no direct effects on Sherburn Willows SSSI. The site is 1.3km from the land that would be required for the Proposed Scheme. It is anticipated that indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP.

7.4.10 There would be no direct effects on Hook Moor SSSI. Construction traffic on the existing B1217 Aberford Road would pass through the SSSI. However, it is anticipated that indirect effects would not be significant as the Proposed Scheme and the SSSI are not hydrologically connected and other indirect impacts would be controlled through the implementation of measures in the draft CoCP.

7.4.11 The Barwick Road to Ash Lane section of the Proposed Scheme would result in the permanent loss of 6.6ha (23%) of Hawk's Nest Wood LWS, which is designated for its population of amphibians including great crested newts. Potential impacts include reduction in available habitat and species using it, removal of existing ponds, loss of adjacent terrestrial habitat and fragmentation of existing populations. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/ metropolitan level.

7.4.12 The proposed A1(M) cutting to Stream Dike viaduct section of the Proposed Scheme would result in the permanent loss of 3.9ha (18%) of Coburn Hill Wood LWS, which is designated for its population of amphibians including great crested newts. Potential impacts include reduction in available habitat and species using it and deterioration in water quality of ponds and ditches from construction activity. Habitat loss would

result in a permanent adverse effect on site integrity that would be significant at the county/ metropolitan level.

7.4.13 The proposed Church Fenton Embankment would result in the permanent loss of 0.4ha (8%) of Haigh's Grass SINC. Potential impacts include reduction in available habitat and species using it. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/ metropolitan level.

7.4.14 Construction of the Proposed Scheme would result in the permanent loss of 200m² (0.1%) of ancient woodland within the Patefield Wood SINC/AWIS. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

Habitats

Woodland

7.4.15 The Proposed Scheme would result in the loss of 12.5ha of deciduous woodland outside designated sites in the Garforth and Church Fenton area. Given the extent of the woodland loss, the permanent loss of these woodlands would result in an effect that would be significant at up to the district/ borough level. Woodland creation would reduce the effect to a level that is not significant, unless the ongoing review identifies the presence of additional ancient woodland.

Grassland

7.4.16 The Proposed Scheme would result in the loss of non-designated grassland sites, including 0.1ha of floodplain grazing marsh adjacent to the River Wharfe at Ulleskelf. In the absence of field survey information, it has been assumed that none of the grassland lost would be unimproved, and hence the loss would be significant at up to the district/borough level.

Hedgerows

7.4.17 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

7.4.18 The Proposed Scheme would cross Stream Dike and Upper Fox Drain and two tributaries of Dorts Dike 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, the Proposed Scheme would result in the loss of sections of other smaller watercourses and severance of river corridors due to culverts, which would result in a permanent effect that would be significant at up to the district/ borough level.

Water bodies

7.4.19 Seventeen ponds would be lost as a result of the Proposed Scheme, including one spring dependant pond outside the land required for 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.

Ancient and veteran trees

7.4.20 It is assumed that veteran trees within the land required for the Proposed Scheme in the Garforth and Church Fenton 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

7.4.21 The permanent removal of vegetation may have impacts on bats. Habitat loss as a result of the Proposed Scheme 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 five bat species within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP. On a precautionary basis, in the absence of full 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.

Otters

7.4.22 Otters have been recorded along the River Wharfe within 150m of the land required for the Proposed Scheme. Indirect effects from construction activities may result in disturbance to these species during the construction period, and prevent them from moving along the watercourse. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. Habitat loss would result at several smaller watercourses that would be crossed by the Proposed Scheme. On a precautionary basis, in the absence of further survey information, impacts to otters would result in an adverse effect on the conservation status of these species that would be significant up to the county/ metropolitan level.

Water voles

7.4.23 Water voles have been recorded along the River Wharfe within 350m of the land required for the Proposed Scheme. Indirect effects from construction activities may result in disturbance to this species during the construction period, preventing them from moving along the corridor. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. Habitat loss would result to several smaller watercourses that would be crossed by the Proposed Scheme. On a precautionary basis, in the absence of further survey information, impacts to water voles would result in an adverse effect on the conservation status of these species that would be significant up to the county/ metropolitan level.

Great crested newt

7.4.24 On a precautionary basis, it has been assumed that all 16 ponds and surrounding terrestrial habitat within the land required for the Proposed Scheme and the spring fed pond outside 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 newts are present, two new ponds will be created for every one lost to the works, and this would contribute towards reducing the effects to not significant. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would require further development. In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/ metropolitan level.

Birds

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

White-clawed crayfish

7.4.26 White-clawed crayfish have been recorded along the River Wharfe within 1.5km of the land required for the Proposed Scheme. Indirect effects from construction activities may result in disturbance to these species during the construction period, and prevent them from moving along the river. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. Habitat loss would result at several smaller watercourses which would be crossed by the route of the Proposed Scheme. On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant up to the county/ metropolitan level.

Aquatic invertebrates

7.4.27 The Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates particularly around the River Wharfe, along Sturton Dyke and some of the smaller watercourses (including species of principle importance). On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/ borough level.

Terrestrial invertebrates

7.4.28 The Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates, particularly in the areas of woodland east of Micklefield and floodplain grazing at Ulleskelf (including species of principle 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

7.4.29 There are records of fish from the main watercourses including species such as European bullhead and lamprey (both listed on Annex II of the EC Habitats Directive), eel and brown trout. Although the route of the Proposed Scheme would pass over some watercourses on viaduct and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP; other smaller watercourses would still be affected and may require assessment under the Water Framework Directive (WFD)[70]. On a precautionary basis, in the absence of survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Reptiles

7.4.30 There are no records of common reptiles within 2km of the route of the Proposed Scheme. However suitable habitat is likely to be present for reptiles, including grass snake near the Hawk's Nest Wood and Coburn Hill Wood and common lizard and slow worm in suitable grassland and scrub habitats. On a precautionary basis in the absence of further survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/ borough level.

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

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

Other mitigation measures

7.4.33 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:

- ancient woodland is an irreplaceable resource and this loss is considered to be a permanent adverse residual effect, which is significant at a national level. The loss of ancient woodland would be partly mitigated 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

[70] EU Water Framework Directive. Available online at: http://ec.europa.eu/environemt/water/water-framework/index_en.html

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;

- Provision of additional broadleaved woodland to replace those lost, and/or enhancement of remaining woodlands; provision of additional hedgerows which would contribute towards replacing the losses and maintain the connectivity of the network; options to create new species rich grasslands (including translocation where appropriate) to contribute towards replacing grassland losses and to mitigate losses of floodplain grazing marsh;
- the spring at Carr Wood, Barrowby Hall will be re-established nearby in a manner that ensures any adverse impacts on the downstream pond are mitigated;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction; design of watercourse culverts and underpasses to allow the free passage of wildlife;
- considering the need for inclusion of structures to reduce severance effects on bats;
- provision of alternative roosting habitat for bats;
- 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; and
- provision of ponds on a 1:1 basis where existing ponds that do not support great crested newts are lost.

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

Summary of likely residual significant effects

7.4.35 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 15.

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

Resource/feature	**Residual effect**	**Level at which the effect would be significant**
Kirkby Wharfe SSSI	In the absence of detailed mitigation, temporary adverse effects on site integrity and habitat suitability due to indirect impacts.	Up to national
Hawk's Nest Wood LWS	Permanent adverse effect on site integrity due to loss of 6.6ha (23%) of woodland, grassland and existing ponds.	Up to county/metropolitan.
Coburn Hill Wood LWS	Permanent adverse effect on site integrity due to loss of 3.9ha (18%) of woodland and existing ponds.	Up to county/metropolitan.
Haigh's Grass SINC	Permanent adverse effect on site integrity due to loss of 0.4ha (8%) of existing grassland.	Up to county/metropolitan.
Patefield Wood SINC/AWIS	Permanent adverse effect on site integrity due to loss of 200m² (0.1%) of ancient woodland.	Up to county/metropolitan.
Woodland	Potential adverse effect on unidentified ancient woodland.	Up to county/metropolitan.
Grassland	Loss of 0.1ha of floodplain grazing marsh.	Up to district/borough
Hedgerows	Permanent loss of hedgerows.	Up to district/borough.
Watercourses	Loss of sections of smaller watercourses and severance of river corridors due to culverts, which would result in a permanent effect that would be significant at up to the district/ borough level.	Up to district/borough.
Water bodies	Loss of seventeen ponds.	Up to county/metropolitan.
Ancient and veteran trees	Permanent loss of individual trees.	County/metropolitan.
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional.
Otter	In the absence of detailed desk study records or further field survey data, it is currently anticipated that otter may be present on all watercourses along the route; therefore, there is potential for permanent adverse effects on suitable habitat for this species to occur.	Up to county/metropolitan
Water vole	In the absence of detailed desk study records or further field survey data, it is currently anticipated that water vole may be present on all watercourses along the route. Therefore, there is potential for permanent adverse effects on suitable habitat.	Up to county/metropolitan
Great crested newts	Loss of 17 ponds and surrounding terrestrial habitat, assumed in the absence of further survey data, to support great crested newts.	Up to county/metropolitan.

Resource/feature	Residual effect	Level at which the effect would be significant
Birds	Loss of nesting and foraging habitat for a range of breeding and wintering birds, including Schedule 1 species such as barn owl and red kite.	Up to county/metropolitan.
White-clawed crayfish	In the absence of detailed desk study records or further field survey data, it is currently anticipated that white-clawed crayfish m6ay be present in the River Wharfe. Therefore, there is potential for permanent adverse effects on suitable habitat for this species.	Up to county/metropolitan.
Fish	Loss of suitable habitat for fish listed on Annex II of the EC Habitats Directive.	Up to district/borough.
Aquatic invertebrate	Loss of suitable habitat for aquatic and terrestrial invertebrates.	Up to district/borough.
Terrestrial invertebrate	Loss of suitable habitat for aquatic and terrestrial invertebrates.	Up to district/borough.
Reptiles	Loss of suitable habitat for common species of reptiles.	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 full 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, particularly near Church Fenton and the River Wharfe, where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/ metropolitan level. 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 Final ES.

Other mitigation measures

7.5.5 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan[71] 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 of 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 16.

Table 16: 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 Garforth and Church Fenton area.

[71] Currently in development for Phase 1 of HS2

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Garforth and Church Fenton 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 the health issues in the Garforth and Church Fenton 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 Garforth and Church Fenton 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: LA16 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)[72].

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.

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

8.2.4 The health determinants of relevance within the Garforth and Church Fenton 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 sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

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

8.3 Environmental baseline

Existing baseline

Description of communities in the Garforth and Church Fenton area

8.3.1 The Garforth and Church Fenton area is characterised by villages and individual properties 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 route 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.

Garforth, Micklefield and surrounds

8.3.3 Garforth and Micklefield are villages located to the south of the route of the Proposed Scheme, comprising approximately 5,000 and 700 residential properties respectively. The nearest residential properties within Garforth would be adjacent to the route, while the nearest residential properties in Micklefield would be located approximately 600m from the route.

8.3.4 Community facilities within these settlements are primarily located within Garforth, the larger of the two villages, with Micklefield largely given over to residential properties. Available facilities include nursing homes, allotments, GP surgeries, primary schools and churches. In addition, Garforth Stables and Riding School, Garforth Golf Club, Amaranth Football and Cricket Club, Garforth Town Football Club, Parlington Hollins (an area of woodland), Ringhay Wood, Weet Wood, Scott's Wood and Coburn Hill Wood provide recreation opportunities for the local community.

Sherburn in Elmet, Barkston Ash and surrounds

8.3.5 The villages of Sherburn in Elmet and Barkston Ash are located to the south and north of the route of the Proposed Scheme, respectively. Sherburn in Elmet comprises approximately 2,800 residential properties, while Barkston Ash comprises approximately 200 residential properties. The nearest residential properties in both settlements would be approximately 250m from the route.

8.3.6 Community facilities within these settlements include a children's nursery, public houses, a primary school, a church and a nursing home. In addition, Scarthingwell Park and Scarthingwell Golf Course provide recreation opportunities for the local community.

Church Fenton, Ulleskelf and surrounds

8.3.7 The village of Church Fenton is located to the east of the route of the Proposed Scheme, comprising approximately 550 residential properties, the nearest of which would be on the route. Community facilities include a bowling club, churches, a children's nursery and a primary school. Sandwath Lake provides recreational opportunities for anglers within the local community.

8.3.8 The village of Ulleskelf comprises approximately 300 residential properties, connected to Church Fenton by Church Fenton Road, and bordered by the River Wharfe to the north. The route of the Proposed Scheme would run through the village along the existing railway line, and the nearest residential properties would be adjacent to the route. Community resources include a church, a village hall and a post office.

Demographic and health profile of the Garforth and Church Fenton area

8.3.9 The local communities in the Garforth and Church Fenton area have a relatively low population density, commensurate with the rural nature of the area.

8.3.10 Data provided by the Office for National Statistics[73] for the local authority areas of Selby District Council (SDC) and Leeds City Council (LCC), shows that this population has a broadly similar health status compared with the national (England) averages.

8.3.11 The population has similar levels of deprivation to the national average, with regard to the combined indices of multiple deprivation[74], and the health domain (a sub-set of the indices of multiple deprivation).

8.3.12 The available data provide information down to local authority level and enables a demographic and health profile to be made of the population within the Garforth and Church Fenton area. The description of the whole population, and the populations within local authority, 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.

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)[75], which provides a general basis for route-wide construction environmental management. Contractors would also be required to

[73] 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.
[74] 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
[75] Supporting document: Draft Code of Construction Practice

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 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 Garforth and Church Fenton area, taking account of mitigation measures contained in the CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme would have temporary and permanent 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 Traffic and transport impacts in the Garforth and Church Fenton 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.

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

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

8.4.17 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

8.4.18 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.

8.4.19 The Garforth and Church Fenton area is predominantly rural in character. Typically, there is a reliance on a limited range of 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

8.4.20 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 amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.

8.4.21 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.

8.4.22 There would be direct impacts on access to green space, recreation and physical activity where approximately 75% of Weet Wood would be inaccessible for a period of approximately one year and nine months due to the construction of Ringhay Wood embankment and associated landscape earthworks. Following construction, a total of 25% land within Weet Wood would be permanently lost.

8.4.23 As reported in Section 14, Traffic and transport, the route of the Proposed Scheme would intersect a number of PRoW in the Garforth and Church Fenton area. The effects on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be assessed in the formal ES.

8.4.24 Construction traffic would mainly use the 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

8.4.25 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.'[76]

8.4.26 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A decrease in social capital has the potential to reduce the beneficial 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.

8.4.27 The settlements along the route support small, well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including main compounds and satellite compounds in the vicinity of the settlements of Garforth, Micklefield, Barkston Ash, Church Fenton and Ulleskelf. The duration of the works at each site would range from approximately two years and six months to five years and six months. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds and workers using facilities such as shops, restaurants and public houses within settlements.

8.4.28 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.

[76] Office for National Statistics- Measuring Social Capital. Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

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

8.4.30 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.

8.4.31 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.

8.4.32 In the Garforth and Church Fenton 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.

8.4.33 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

8.4.34 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.

8.4.35 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.

8.4.36 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 Garforth and Church Fenton area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would not be likely to cause any significant impacts at residential and non-residential receptors, 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 Garforth and Church Fenton 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, Leeds City Council (LCC), North Yorkshire County Council (NYCC) and West Yorkshire Archaeology Advisory Service (WYAAS). 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: LA16 Map Book. Only designated heritage assets within the Garforth and Church Fenton 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 (numbers prefixed WYHER and MNY). 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)[77], including the method for determining the value of a heritage asset and magnitude of impact (Tables 19 and 20 respectively, in the SMR).

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

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

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

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

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

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

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

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

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. However, 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:

- cropmarks[78] of ditches visible on aerial photography at Austhorpe (WYHER 6330);
- Barkston Road bridge, single-span underbridge built 1865-69 by the North Eastern Railway (MNY38116);
- bridge CFM/4, a late 19th century underbridge on the North Eastern Railway Church Fenton Line on Saw Mill Lane (MNY38115);
- 14th century canalised stream possibly built to drain the fens around Barkston Ash, and later used to transport stone (MNY10351); and
- possible line of Roman road 28b in two sections (WYHER 3097, WYHER 3098).

[78] A cropmark is a variation in soil or variation in crop growth visible from the air or from higher ground which indicate the presence of below-ground remains such as ditches or stone walls. Cropmarks can also occur as a result of natural or geological features.

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

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

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

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be 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 Historic Environment Record;
- North Yorkshire Historic Environment Record;
- conservation area appraisals; and
- historic mapping 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:

- Barrowby Hall with front steps and flanking screen walls and gate piers (NHLE 1200237), a Grade II listed building of moderate value. This asset also includes structures which are curtilage listed. These include the stables and the walls of the former kitchen garden. Barrowby Hall, the front steps and flanking wall are not located within the lands required for the Proposed Scheme. The curtilage

listed stables and walls of the former kitchen garden are located within the land required for the Proposed Scheme; and

- Milepost at SE421344 (NHLE 1313208) is a Grade II listed building on Aberford Road in Sturton Grange, of moderate value.

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within 2km of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:

- 16 scheduled monuments of high value: Shrunken medieval village of Colton (NHLE 1005777); Length of Grim's Ditch extending 1.4km from a point 70m south of Cotton Road East to the south east corner of Avenue Wood (NHLE 1018793); Length of Grim's Ditch from Cotton Road East to the A63, Colton Common (NHLE 1018794); Length of Grim's Ditch immediately east of Barrowby Road (NHLE 1018795); Length of Grim's Ditch 260m west of Brown Moor Farm (NHLE 1020350); Former World War I National Filling Factory, Barnbow (NHLE 1415057); Iron Age and Romano-British Settlement south of Hungerhills Plantation, Parlington (NHLE 1433523); Length of linear earthworks known as Becca Banks and The Ridge, part of the Aberford Dyke system, between Aberford and a quarry 590m north of Ass Bridge (NHLE 1016951); Length of linear earthwork, part of the Aberford Dyke system, at Green Hill between Aberford and the Aberford By-pass (NHLE 1016952); Linear earthworks known as Woodhouse Moor Rein and South Dyke, part of the Aberford Dyke (NHLE 1016954); Castle Hill prehistoric settlement, field system and medieval wood banks (NHLE 1019403); Site of 'King Athelstan's palace', immediately north of the church (NHLE 1017486); Saxton Castle: a motte and bailey castle with a later medieval manor house and field system including a trackway and fishpond (NHLE 1008226); World War II airfield defences at RAF Church Fenton (NHLE 1021191); Roman villa (NHLE 1004061) and Tithe barn (NHLE 1004905);
- five Grade I listed buildings of high value: Temple Newsam House (NHLE 1255943); Church of St Mary (in Colton, NHLE 1375130); Church of All Saints (in Sherburn in Elmet, NHLE 1148444); Church of St Mary the Virgin (in Church Fenton, NHLE 1148436) and Church of All Saints (in Bolton Percy, NHLE 1296630);
- 12 Grade II* listed buildings of high value: Stables at Temple Newsam (NHLE 1255954); Little Temple (NHLE 1255949); Austhorpe Hall (NHLE 1256314); Triumphal Arch, Parlington (NHLE 1135624); Gascoigne Almshouse and attached Wardens Cottage (NHLE 1300616); Lotherton Chapel (NHLE 1200687); Chapel to Huddleston Hall now Barn approximately 4 metres to west of house (NHLE 1167970); Huddleston Hall (NHLE 1167923); Stables to Huddleston Hall approximately one metre to south east of house (NHLE 1167953); Church of St John the Baptist (in Kirkby Wharfe, NHLE 1148423); Grimston Park (NHLE 1168029) and Gatehouse (NHLE 1148416);

- 149 Grade II listed buildings of moderate value. The majority of these are located in the three conservation areas of Bolton Percy, Saxton and Aberford, or in the villages of the Garforth and Church Fenton. The buildings are a mixture of domestic structures of varied scale, from terraces to isolated, detached farmhouses, smaller scale halls and mansions, and features and ornamentations associated with listed buildings of higher grades such as flanking walls, garden structures and gate piers. The Grade II listed buildings also comprise structures associated with transport, for example bridges and milestones, and agricultural buildings such as barns;
- three conservation areas of moderate value: Aberford Conservation Area, Saxton Conservation Area and Bolton Percy Conservation Area;
- two Grade II registered parks and gardens: Temple Newsam (NHLE 1001356) and Lotherton Hall (NHLE 1001223). Grade II registered parks and gardens are considered to be of a moderate value; and
- Battle of Towton 1461 (NHLE 1000040), a registered battlefield of high value.

Non-designated assets

9.3.5 One non-designated heritage asset of high value, Friends' Burial Ground (MNY10809), is located partially or wholly within the land required for the Proposed Scheme.

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

- park and gardens at Barrowby Hall (WYHER 6871);
- cropmarks[79] of ditches visible on aerial photographs at Austhorpe (WYHER 6330);
- stables at Barrowby Hall (WYHER 8547);
- cropmarks of possible Iron Age enclosures, visible on aerial photographs to the east of Barrowby Hall (WYHER 4971);
- cropmarks of a possible Roman-British field system visible on aerial photographs (WYHER 15981);
- cropmarks of Iron Age enclosures visible on aerial photographs, partially excavated and dated (WYHER 1035);
- cropmarks of a possible Iron Age or Roman enclosure visible on aerial photographs (WYHER 1179);
- cropmarks of a possible Iron Age or Roman double ditched enclosure and field system visible on aerial photographs (WYHER 1057);

[79] A cropmark is a variation in soil or variation in crop growth visible from the air or from higher ground which indicate the presence of below-ground remains such as ditches or stone walls. Cropmarks can also occur as a result of natural or geological features.

- cropmarks of a possible Iron Age or Roman field system and enclosure, visible on aerial photographs west of Dawson's Wood (WYHER 1058);
- cropmarks of a possible Iron Age or Roman field system visible on aerial photographs (WYHER 5174);
- cropmark of possible enclosure associated with a trackway, visible on aerial photographs (MNY10158);
- cropmark of an enclosed field system, visible on aerial photographs, (MNY10814);
- cropmark of a field system comprising two parallel trackways with attached enclosures, visible on aerial photographs at Kirkby Wharfe (MNY10838);
- Barkston Road bridge, single-span underbridge built 1865-69 by the North Eastern Railway (MNY38116); and
- bridge CFM/4, a late 19th century underbridge on the North Eastern Railway Church Fenton Line on Saw Mill Lane (MNY38115).

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

- possible line of Roman road 28b in two sections (WYHER 3097; WYHER 3098);
- site of an early 20th century brick and tile works with associated quarry at Church Fenton (MNY10847); 14th century canalised stream possibly built to drain the fens around Barkston Ash, and later used to transport stone (MNY10351);
- cropmark of a linear ditch visible on aerial photography (WYHER 1093);
- cropmark of a trackway visible on aerial photographs (MNY10157);
- site of a possible enclosure identified from aerial photograph (MNY10163);
- cropmark of a possible structure identified from aerial photographs (MNY10864);
- cropmark of a possible sub-rectangular enclosure, visible on aerial photographs to the east of Bowlam Bridge (MNY17116); and
- cropmark of a possible field system visible on aerial photographs to the north-east of Bowlam Bridge (MNY17125).

9.3.8 Non-designated heritage assets located partially or wholly within the 500m study area include:

- two assets of moderate value indicative of prehistoric activity and comprising cropmarks of a possible barrow and a possible ring ditch[80];
- 23 assets of moderate value comprising cropmarks identified from aerial photographs and interpreted by the National Mapping Programme (NMP) as indicative of Iron Age or Roman activity in the form of field systems, enclosures, ditches and trackways;
- four assets of moderate value associated with coal mining and providing evidence for pits and colliery machinery;
- nine assets of low value indicating medieval agricultural activity in the form of ridge and furrow and headlands[81], and 18 assets of low value indicating medieval settlement and other forms of medieval activity, including two holy wells;
- 15 assets of low value providing evidence of post-medieval and modern settlement, industry (such as lime kilns, saw pits and windmills);
- eight assets of low value associated with the World War II airfield at Church Fenton and other World War II activity;
- Barrowby Carr Cottage, a building of low value identified from historic mapping; and
- a large number of assets which have not been assigned a period, date or origin. These are primarily cropmarks identified from aerial photographs but which are not distinct enough to assign to a specific period. They are assets of low value comprising enclosures, field systems, ring ditches and trackways.

Historic environment overview

9.3.9 The underlying solid geology of the Garforth and Church Fenton area varies[82]. At Garforth it comprises mudstone, sandstone and siltstone associated with the Pennine Lower Coal Measures. East of Garforth and along the M1 corridor, it changes to Cadeby Formation and then limestone associated with the Brotherton Formation and Magnesian Limestone. Giving rise to well drained and light soils that are easily ploughed, Magnesian Limestone geology was both particularly favoured by Iron Age and Romano-British communities for settlement and agriculture and is very conducive to the formation of cropmarks, which are the principle form of evidence for such activities within the study area. Church Fenton is underlain by chalky mudstone from the Roxby Formation, and at Ulleskelf the solid geology comprises sandstone associated with the Sherwood Sandstone Group.

[80] A barrow is an artificial mound of earth, turf or stone usually constructed to conceal or contain burials. A ring ditch is a circular, or near circular ditch with numerous possible functions. They may be the ploughed out remains of round barrows, round houses or modern features such as gun emplacements.
[81] A headland is an unploughed strip of land left at the end of a field, often associated with ridge and furrow ploughing
[82] British Geological Survey, 2018, Geology of Britain Viewer, online at http://mapapps.bgs.ac.uk/geologyofbritain/home.html

9.3.10 The superficial geology of the Garforth and Church Fenton area varies. Areas of Harrogate Till Formation of sands, gravels and clay are recorded to the north-east of Garforth, with small outcrops of Harrogate Till and deposits of sands and gravels, and peat deposits to the south-west of Barkston Ash. From Barkston Ash to Ulleskelf, where the topography becomes extremely flat, there is a large swathe of superficial geology formed of Hemingbrough Glaciolacustrine Formation clays and silts which are indicative of very wet, possible lake conditions in the Ice Age.

9.3.11 The first indication of human activity in the Garforth and Church Fenton area dates to the Palaeolithic period, with settlement and other activity recorded at Towton and Ulleskelf. Activity during the Mesolithic, Neolithic and Bronze Age periods is demonstrated by finds including Mesolithic flint implements (scrapers and blades) and a stone axe at Aberford, a Neolithic polished axe near Saxton and a Neolithic arrowhead within the grounds of Lotherton Hall. Late Neolithic worked flints and Late Bronze Age/Early Iron Age pottery have been found at Garforth, and other flint artefacts have been recovered from east of the A1, and west of Weet Wood. These findspots are recorded as non-designated assets within the WYHER. Cropmarks of possible barrow and ring ditch, features visible on aerial photographs, have been recorded. In addition to settlement and domestic activity, there is evidence within the area of prehistoric ceremonial activity in the form of barrows, again visible on aerial photographs.

9.3.12 The Garforth and Church Fenton area contains a considerable number of features (enclosures, associated trackways, ditches, pits and field systems) which provide evidence that the area was extensively settled and utilised during the Iron Age and Roman periods. The area includes a series of later Iron Age earthworks associated with the valley of the Cock Beck and located either side of the village of Aberford. These are known as the Aberford Dykes[83]. They are thought to have been created as defensive structures[84], but given their extent would have made trespassing easy this seems an unlikely function. The earthworks cover a wide area and are split into a number of scheduled sections (NHLE 1016952, NHLE 1016951 and NHLE 1016954).

9.3.13 Castle Hills prehistoric settlement, field system and medieval wood banks, a scheduled monument (NHLE 1019403), comprises an Iron Age settlement and associated field system and hollow way which survive as earthworks within an area of ancient woodland[85]. Another Iron Age and Romano-British settlement within the Garforth and Church Fenton area is situated at Parlington (Iron Age and Romano-British Settlement south of Hungerhills Plantation, Parlington, NHLE 1433523). This is a rare example within the Yorkshire region of a large, densely occupied settlement comprising numerous farmsteads with surrounding enclosures and evidence of multiple phases of occupation[86]. In addition to these scheduled examples, the area

[83] A dyke is a defensive boundary or earthwork.
[84] Weldrake, D, 2011, *Aberford Dykes: A tourist's guide to interesting archaeological sites in West Yorkshire*, West Yorkshire Archaeology Advisory Service Guide, online at http://www.wyjs.org.uk/media/1362/aberford-dykes.pdf
[85] Historic England, 2018, National Heritage List Record for Asset: Castle Hills prehistoric settlement, field system and medieval wood banks (NHLE 1019403), online at https://historicengland.org.uk/listing/the-list/list-entry/1019403
[86] Historic England, 2018, National Heritage List Record for Asset: Iron Age and Romano-British Settlement south of Hungerhills Plantation, Parlington (NHLE 1433523), online at https://historicengland.org.uk/listing/the-list/list-entry/1433523

contains a large number of cropmarks indicating an extensive network of fields and enclosures dating to the Iron Age and Roman periods, with concentrations to the south of Parlington and to the east of the A1, west of Weet Wood. This evidence is concentrated to the west of the Garforth and Church Fenton area, with fewer examples of Iron Age and Roman activity around Barkston Ash, Church Fenton and Ulleskelf. This is likely to be the result of topography, with the area north-east of Barkston Ash dropping down from the rolling topography of the landscape east of Garforth and north of Micklefield to a flat, fenland-type, drained landscape stretching all the way to Ulleskelf. This flat, marshy landscape would have been less favourable for settlement, with activity being restricted to the drier seasons.

9.3.14 A number of Roman sites are recorded within the Garforth and Church Fenton area, including one in Garforth and a Roman villa to the north-west of Ulleskelf at Kirkby Wharfe, north of the River Wharfe. There may also be evidence of river crossings dating to this period. There is also good evidence of a network of Roman roads across the region, some of which survive in modern form (WYHER 3099, WYHER 539, WYHER 3097 and WYHER 3098). A number lead towards Tadcaster, which is believed to have been a small Roman town known as *Calcaria*[87].

9.3.15 Although evidence for activity in the immediate post-Roman period is scant in the archaeological record, there is place-name evidence which indicates that settlements were established in the early medieval period. Ulleskelf, for example, is a combination of the Scandinavian personal name' Ulfr' with 'kelf', deriving from the Norse word for calf. A number of the other settlements in the Garforth and Church Fenton Area are listed in the Domesday Book of 1086, including Church Fenton, Garforth and Saxton.

9.3.16 In the medieval period, a manor was established at Saxton which included a motte and bailey castle (Saxton Castle, NHLE 1008226). Other manorial estates included those at Church Fenton[88] and Micklefield[89], and there is record of a deserted medieval settlement around the Grade I listed building of Huddleston Hall (NYHER MNY16724). Many of these settlements contained a church or chapel and medieval examples of these include the Church of St Mary the Virgin at Church Fenton (NHLE 1148436) and two churches, both dedicated to All Saints, one at Sherburn in Elmet (NHLE 1148444) the other at Bolton Percy (NHLE 1296630)[90,91].

9.3.17 The Garforth and Church Fenton area contains a registered battlefield (Battle of Towton, 1461, NHLE 1000040). This was a key battle in the Wars of the Roses (1455 to 1485) and was fought between the Yorkist forces of Henry VI and the Lancastrian forces of Edward IV. It ended in a decisive victory for Edward and the Lancastrians. It is

[87] Pastscape, 2015, Record for Asset: Calcaria Roman Town (Monument Number Ref. 54930), Available online at http://www.pastscape.org.uk/hob.aspx?hob_id=54930
[88] The Domesday Book Online, 1999-2017, Yorkshire: West Riding C-G Church Fenton, Available online at http://www.domesdaybook.co.uk/westriding2.html
[89] Pastscape, 2015, Record for Asset: Earthworks, Sheep Dike, Old Micklefield (Monument Number Ref. 2838), Available online at http://www.heritagegateway.org.uk/Gateway/Results_Single.aspx?resourceID=105&uid=2838
[90] Gelling, M, 1992, *The West Midlands in the Early Middle Ages,* Leicester University Press, 185
[91] McDonagh, B A K, 2007, Manor Houses, Churches and Settlements: Historical Geographies of the Yorkshire Wolds Before 1600, unpublished PhD thesis, University of Nottingham, 32

recorded that this was 'the largest and longest battle fought on British soil'[92], and that after the battle 'the heralds estimated the death toll as being 28,000, although this may have included those killed at Ferrybridge and Dinting Dale[93].'

9.3.18 The monastic military order of the Knights Templar was also established in the medieval period. The order purchased the estate of Temple Newsam in 1155, allowing them to raise revenues to fund crusades of the 12th and 13th centuries[94]. It was under their ownership that a preceptory[95] was constructed at Temple Newsam; this feature survived into the 20th century when it was subsumed by open-cast coal mining. The Temple Newsam estate was seized by the Crown in 1308 and eventually passed to the Darcy family who, during the 16th century, built the current house (Temple Newsam House) and created the surrounding Grade II registered parkland (NHLE 1001356).

9.3.19 The post-medieval landscape of the Garforth and Church Fenton area was characterised by farmsteads and parliamentary enclosure[96], and was studded with a number of small country estates. These included Lotherton Hall, Austhorpe Hall, Huddleston Hall, Barrowby Hall, the Parlington Estate and Grimston Park, and were mostly constructed with the wealth gained from mining and other industrial activities. One family in particular, the Gascoignes, profited from the mineral wealth and extensive coal deposits of the Garforth and Church Fenton area.

9.3.20 The potential value of these coal deposits saw the Garforth and Church Fenton area transformed from a rural, agricultural landscape to an extractive landscape, dotted with quarries, open-cast pits and collieries with associated pumping stations and equipment. Coal mines within the Garforth and Church Fenton area included the Gascoigne Wood Colliery near Sherburn in Elmet and the Garforth Colliery; both owned by the Gascoigne family[97]. The family occupied a number of residences within the area, including the house within the Parlington Estate, since demolished, and Lotherton Hall. The pits associated with the Garforth Colliery were named after family members such as 'Three Sister's Pit' and 'Isabella Pit'[98].

9.3.21 A number of the estates fell into decline in the 20th century. There are a number of factors which contributed to this including the effect of the two world wars, the fall in value and demand for coal and the nationalisation of the coal mining industry. These factors required many families to sell off or abandon assets. Disuse of estates led to their dereliction, subsequent demolition and division. However, some, such as Lotherton Hall and Temple Newsam, survived, have since been restored and

[92] Battlefields Trust, 2018, UK Battlefields Resource Centre: Battle of Towton. Available online at http://www.battlefieldstrust.com/resource-centre/warsoftheroses/battleview.asp?BattleFieldId=46
[93] Historic England, 2018, National Heritage List Record for Asset: Battle of Towton, 1461 (NHLE 1000040), Available online at https://historicengland.org.uk/listing/the-list/list-entry/1000040
[94] Historic England, 2018, National Heritage List Record for Asset: Temple Newsam (NHLE Ref. 1001356), Available online at https://historicengland.org.uk/listing/the-list/list-entry/1001356
[95] A manor or estate owned and run by an order of knights and governed by a preceptor.
[96] Parliamentary enclosure was the process of consolidating small landholdings into larger farms. The process was undertaken primarily in the 18th and 19th centuries. Usually undertaken via an Act of Parliament but sometimes undertaken under private Acts or agreements.
[97] West Yorkshire Archive Service, no date, Gascoigne of Parlington, Family and Estate Records (WYL115), Available online at https://archiveshub.jisc.ac.uk/search/archives/953423ea-a506-33fc-9860-564439b285a1
[98] BBC, 2018, Domesday Reloaded Entry D-block GB-440000-432000 History of Garforth. Available online at http://www.bbc.co.uk/blogs/domesday

refurbished[99] and are in the care of LCC. Other estates, such as Parlington, saw their principal house demolished, but the estate and many of the landscape features within surviving. Parlington has recently been added to the National Heritage List as a Grade II registered park and garden.

9.3.22 The Garforth and Church Fenton area saw activity during World War I and World War II. Barnbow National Filling Station (Former World War I National Filling Factory at Barnbow, NHLE 1415057) employed 16,000 women to produce high-explosive shells[100]. A filling factory brought explosives and the components of munitions together in the manufacture and assembly of munitions. Barnbow was the first national filling factory to be designed and completed and its design was used in the construction of all subsequent explosive factories. A number of the country houses within the area were used during World War I, Lotherton Hall being an example of a house utilised as a hospital for the duration of the war.

9.3.23 Evidence of a World War II airfield and its defences survives at Church Fenton (World War II airfield defences at RAF Church Fenton, NHLE 1021191). This scheduled monument comprises the remains of fighter pens (E-shaped earthworks around an area of hard standing designed to take an aircraft), support buildings, sections of perimeter runways, one of the battle headquarters and some of the defensive posts[101]. There are a number of non-designated assets associated with this scheduled monument, including a number of aircraft crash sites (MNY26553, MNY46648, MNY26732, MNY26492, MNY26591, MNY26991).

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)[102] 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;
- removal of portable heritage assets, safe storage for the duration of construction and replacement following completion of construction works; and

[99] Leeds City Council, 2017, Lotherton: Things to do and see, Available online at https://www.leeds.gov.uk/museumsandgalleries/lothertonhall/things-to-do-and-see
[100] Historic England, 2018, Site of First World War Munitions Factory Where 35 Women Died in Explosion Given Heritage Protection. Available online at https://historicengland.org.uk/whats-new/news/fww-munitions-factory-given-heritage-protection
[101] Historic England, 2018, National Heritage List Record for Asset: World War II airfield defences at RAF Church Fenton (1021191). Availble online at https://historicengland.org.uk/listing/the-list/list-entry/1021191
[102] Supporting document: Draft Code of Construction Practice

- 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.

9.4.3 A specific mitigation measure is proposed in relation to the Grade II listed milepost at SE421344 (NHLE 1313208). It is proposed that this asset is removed and stored safely for the duration of construction, to be replaced at the same location or as near as physically possible later following completion of construction works.

Assessment of impacts and effects

Temporary effects

9.4.4 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.

9.4.5 The following significant effect is expected to occur as a result of temporary impacts on a designated heritage asset.

9.4.6 The milepost at SE421344 (NHLE 1313208) is a Grade II listed building of moderate value situated within the land required for the Proposed Scheme. It is a mid- 19th century stone milepost with cast-iron plates. Its historical interest lies in it being a survivor of a former road network, and its legibility is aided by its retention in its original location and context. Its function is readily understandable and remains valid for today's road user. The setting of the asset is formed by the A642 road, beside which it is situated to help guide travellers. This setting contributes greatly to the value of the asset by providing its context and the reason for its establishment.

9.4.7 The milepost at SE421344 would be physically affected by construction works associated with Weet Wood cut and cover tunnel and the A642 Aberford Road reinstatement. These works would require the removal of the milepost from its current location. This would greatly reduce its historic interest. However, the milepost would be stored safely during the construction period and replaced at its original location on completion of the Proposed Scheme. Therefore, taking into account the storage and restoration of the asset, this would constitute a medium magnitude of impact and a moderate adverse effect.

9.4.8 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.

9.4.9 Barrowby Hall with front steps and flanking screen walls and gate piers (NHLE 1200237) is a Grade II listed building of moderate value. Associated with it is the non-designated assets of its park and garden (WYHER 6871), stables (WYHER 8547) and ruined walls of its former kitchen garden. The stables and kitchen garden are curtilage listed. In addition to the historic and curtilage listed buildings, Barrowby Hall also has a number of modern agricultural sheds attached to the northern façade of the stables

and located to the north of the hall. The hall, front steps, flanking wall and gate piers are located between 43m and 70m to the south of the land required for the Proposed Scheme. The northern façade of the curtilage listed stables is located abutting the land required for the Proposed Scheme. The modern buildings attached to the stables and the curtilage listed walls of the former walled garden are located within the land required for the Proposed Scheme.

9.4.10 Barrowby Hall is a 17th century house, now a farmhouse, altered in the 18th, 19th and 20th centuries. Its value is derived primarily from its architectural and historic interest. The building is a good example of late 17th century architecture, with additions in the 18th century by William Blatty. The architectural value stems from decorative features such as the symmetrical classical façade and central panelled door with shouldered architrave. Internally, it stems from the retention of the full-height 17th century open-well staircase and some original moulded plaster panels. The asset's historic value derives from the information it provides on the landed gentry of the late 17th century and, despite the loss of some of its setting as a result of the M1 to the north, the legibility of the asset within its surrounding park and garden. Its setting is formed by the arrangement of farm buildings, remnant parkland to the south south-west and east which adds to the hall's significance by revealing the wider extent of its original setting, and the agricultural land to the west which aids appreciation of its value. The noise and visual disturbance of the M1 to the north has reduced the contribution made by the agricultural land to the north and west of the asset. Barrowby Hall also has wider, contextual relationships with smaller properties around the edge of the estate such as Barrowby Carr Cottage.

9.4.11 The setting of Barrowby Hall would be affected during construction by the excavation of West Garforth cutting and the presence of West Garforth cutting transfer node and main compound. These elements would be located within the agricultural land which forms part of the hall's setting and contributes to an understanding of its value. This would bring construction activity in proximity to the hall and will involve the removal of buildings within the curtilage of the hall. The excavation of the cutting will change the character of the agricultural land associated with hall and the land to the north of the hall, between Barrowby Lane and the hall also removing a portion of the lane, which contributes to its value. This would constitute a medium magnitude of impact and a moderate adverse effect.

9.4.12 North Milford Hall (NHLE 1172735) is a Grade II listed building of moderate value located 390m west of the land required for the Proposed Scheme. The hall is an 18th century house with later alterations and additions. It has architectural and historic interest, and its rural setting also contributes moderately to its value. The asset is an attractive example of Georgian architecture and a good example of an 18th century country house of the gentry. It has attractive external architectural details, and presents a strong symmetrical façade to the east. The setting is formed by its rural and agricultural surroundings and its relatively isolated location, set apart from surrounding settlements and developments. This setting contributes both to the aesthetic value of the asset and to its historical value. The eastern, principal façade has extensive views across the flat, rural landscape.

9.4.13 The setting of North Milford Hall would be affected during construction as a result of the Church Fenton embankment west transfer node and west satellite compound. This would introduce construction activity and movement of vehicles into the view from the principal façade of the house. Given the flat topography of this landscape, these activities would be noticeable elements within surroundings which are currently characterised by a sense of a rural, agricultural landscape. This would constitute a medium magnitude of impact and a moderate adverse effect.

Permanent effects

9.4.14 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

9.4.15 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.

9.4.16 There would be a physical impact on the curtilage listed wall of the former kitchen garden to the Grade II listed Barrowby Hall (Barrowby Hall with front steps and flanking screen walls and gate piers, NHLE 1200237) and the non-designated associated park and garden (WYHER 6871) and stables (WYHER 8547). This is an asset of moderate value located 57m south of the land required for the Proposed Scheme; however, the curtilage listed kitchen garden wall is located within the land required to construct the Proposed Scheme. The asset is a 17th century house, now a farmhouse, altered in the 18th, 19th and 20th centuries. Its value is primarily derived from its architecture and historic value as set out above. The setting of the asset has been changed by the construction of the M1 to the north. The setting is formed by the arrangement of farm buildings, agricultural land surrounding the asset to the west and the remnant parkland to the south and east of the asset, which still has legibility as the parkland to Barrowby Hall and as such, has been identified as a non-designated asset in its own right (WYHER 6871).

9.4.17 A portion of the wall of the former kitchen garden, which is curtilage listed, would be removed to enable the excavation of the West Garforth cutting and the establishment of the proposed landscaping plantation. Although the removal of a portion of the wall, including the two returns on the northern wall would reduce the physical fabric of the wall, thus affecting the wall's architectural value, there would be sufficient retention of fabric and form to retain the understanding of the function of the asset and its relationship with Barrowby Hall. The removal of modern buildings attached to the northern façade of the curtilage listed stables would physically impact upon the fabric of this building, but the building itself would remain standing and therefore its architectural and historic value would remain intact. This would constitute a high magnitude of impact and a major adverse effect.

9.4.18 There would be a physical impact on part of a non-designated asset, the former Friends' Burial Ground (MNY10809), an asset of high value. The asset is marked on the 2nd edition Ordnance Survey map of 1891 – 1892 as 'Friends' Burial Ground', but is already noted on that map as being disused. There is no associated Friend's Meeting House on the map. The northern part of this asset is located within the land required

for the Proposed Scheme and would be physically impacted by the construction of Barkston Ash Embankment Batching Plant. Construction activities would remove the northern part of the burial ground, should it still exist, and with it the potential evidential and historic value from which an understanding of post-medieval society, land use, and religious attitudes could be derived. This would constitute a medium magnitude of impact and a major adverse effect.

9.4.19 The following non-designated heritage assets date from the Iron Age and Roman period and provide evidence of agricultural activity and possible settlement. They are all of moderate value. The archaeological remains associated with these assets would be physically impacted by the construction of the West Garforth Cutting Transfer Node, West Garforth Cutting, the East Garforth Cutting and the Ridge Road Realignment, and also by a temporary material stockpile north of the M1. This would constitute a high magnitude of impact and a major adverse effect:

- cropmarks of possible Iron Age enclosures east of Barrowby Hall (WYHER 4971);
- cropmarks of a possible Roman-British field system observed on aerial photography (WYHER 15981);
- cropmarks of Iron Age enclosures visible on aerial photography and partially excavated and dated (WYHER 1035);
- cropmarks of a possible Iron Age or Roman enclosure identified from aerial photographs (WYHER 1179);
- cropmarks of a possible Iron Age or Roman double ditched enclosure and field system identified from aerial photography (WYHER 1057);
- cropmarks of a possible Iron Age or Roman field system and enclosure west of Dawson's Wood identified from aerial photography (WYHER 1058);
- cropmarks of a possible Iron Age or Roman field system visible on aerial photography (WYHER 5174);
- cropmark of possible enclosure associated with a trackway (NYHER MNY10158);
- cropmark on an enclosed field system (NYHER MNY10814); and
- cropmark of a field system at Kirkby Wharfe comprising two parallel trackways with attached enclosures (NYHER MNY10838).

9.4.20 The following non-designated heritage assets are classified as undated on the West Yorkshire and North Yorkshire Historic Environment Records. They are cropmarks of features such as trackways visible on aerial photographs. They provide evidence of agricultural and possible settlement activity and are all of low value. The archaeological remains associated with these assets would be physically impacted by the construction of the Proposed Scheme, various temporary material stockpiles, Church Fenton Embankment West Satellite Compound, the Church Fenton

Embankment West Transfer Node, and the Barkston Ash Embankment. This would constitute a high magnitude of impact and a moderate adverse effect:

- cropmark of a linear ditch visible on aerial photography (WYHER 1093);
- cropmark of a trackway (NYHER MNY10157);
- site of a possible enclosure identified from aerial photograph (NYHER MNY10163);
- cropmark of a possible structure identified from aerial photographs (NYHER MNY10864);
- cropmark of a possible sub-rectangular enclosure east of Bowlam Bridge (NYHER MNY17116); and
- cropmark of a possible field system north-east of Bowlam Bridge (NYHER MNY17125).

9.4.21 The site of the former Church Fenton Brick and Tile Works, which dates from the post-medieval period (NYHER MNY10847), is a non-designated heritage asset of low value. It provides evidence of the increasing industrialisation which stemmed from the exploitation of the natural resources of the area, and evidence of the type and scale of that industry. The archaeological remains associated with these assets would be physically impacted by the construction of the Proposed Scheme. This would constitute a high magnitude of impact and a moderate adverse effect.

9.4.22 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.

9.4.23 Barrowby Hall with front steps and flanking screen walls and gate piers (NHLE 1200237) is a Grade II listed building of moderate value located 57m to the south of the land required for the Proposed Scheme. Associated with this are the non-designated assets of its associated park and garden (WYHER 6871), stables (WYHER 8547) and former walled garden. The stables and walled garden are curtilage listed structures. Barrowby Hall is a 17th century house, now a farmhouse, altered in the 18th, 19th and 20th centuries. Its value is primarily derived from its architectural and historic interest, as set out above. Its setting is formed by the arrangement of farm buildings, the agricultural land that surrounds the asset to the west, and legible remnant parkland to the south and east. It is these elements of the setting that contribute most to the value of the asset, or understanding of that value. Other elements of the setting detract from the significance of the asset. For example, the construction of the M1 to the north has introduced noise into the setting and truncated the area of agricultural land surrounding the asset that once contributed to the significance of the asset. Barrowby Hall also has associations with smaller properties around the edge of the estate, such as Barrowby Carr Cottage.

9.4.24 The setting of Barrowby Hall and the stables would be permanently affected by the presence of West Garforth cutting, the Leeds Bridleway 125 accommodation overbridge and the access road to the balancing pond to the south-west of the asset, within the non-designated parkland of Barrowby Hall. The cutting would form a major

earthwork directly to the north of the asset and would remove a portion of the agricultural land, as well as parkland associated with the hall. The formation of the cutting would also require the removal of modern buildings attached to the curtilage listed stable block. The scale of the earthwork, its extent and its proximity to the asset would alter the setting of the asset detrimentally. Formation of the balancing pond would reduce the legibility of the historical association between parkland and hall and Leeds Bridleway 125 accommodation overbridge would introduce a tall, modern element into views north from the asset. Together, these elements would isolate the asset from key elements of its setting that contribute to the value of the asset, thereby reducing the contribution setting makes to the asset's value. In addition, the contextual relationship with Barrowby Carr Cottage would be severed by West Garforth Cutting. The setting of Barrowby Hall designated and non-designated assets would experience change with the introduction of landscape mitigation in the form of hedgerow habitat in the area of the former kitchen garden. This would introduce planting within the footprint of a curtilage listed asset. In addition, the context of the designated and non-designated assets of Barrowby Hall would be impacted by removal of the access to the property from the north, via the service buildings and severing the access route to the hall from Barrowby Carr Cottage, leaving only one access point to the property and preventing the possibility of travel past the asset in future. Overall, there would be a high magnitude of impact and a major adverse effect.

9.4.25 Huddleston Hall (NHLE 1167923) is a Grade II* listed building of high value located 450m to the south of the land required for the Proposed Scheme. This asset is the principal building within the Huddleston Hall estate, and is located within a close-knit grouping of listed buildings, all ancillary to the hall. This grouping comprises:

- Gatepiers to Huddleston Hall approximately 15 metres to north of house Grade II listed building (NHLE 1148438);
- Gatepiers to Huddleston Hall approximately 5 metres to east of house Grade II listed building (NHLE 1316337);
- Chapel to Huddleston Hall now Barn approximately 4metres to west of house Grade II* listed building (NHLE 1167970);
- Stables to Huddleston Hall approximately 2 metres to south of house Grade II listed building (NHLE 1148439);
- Stables to Huddleston Hall approximately one metre south east of house Grade II*(NHLE 1167953);
- Stables with hayloft to Huddleston Hall approximately 20 metres to south west of house Grade II listed building (NHLE 1316338); and
- Barn to Huddleston Hall approximately 30 metres to south of house Grade II listed building (NHLE 1167958).

9.4.26 The assessment considers the impact and significance of effect on the entire group of designated assets at Huddleston Hall. These are all of high value. The Grade II listed buildings within this grouping are considered to be of high value because of their clear historic and architectural association, forming part of a coherent group with the other buildings at Huddleston Hall.

9.4.27 The hall is a former manor house of late 16th century date. The significance of the asset is derived from its architectural value, its historic value for the information it provides for high-status land-use and the social stratification of the 16th century, as well as its setting. The architectural value is expressed by the survival in good condition of a 16th century manor house with ornate and intricate architectural detailing. This is expressed on the exterior by mullioned and transomed windows with leaded, diamond paned windows and the H-shaped plan of the building with an entrance framed by two Tudor arches. The architectural value is expressed in the interior by a reportedly contemporary staircase.

9.4.28 The asset provides information on the wealthy gentry classes of the Tudor period in this area, and its survival as a complete grouping of buildings, including a chapel, can provide information on the function of wealthy families at this time and the way that buildings and secular and religious life interacted. The setting of the asset includes the group of surrounding listed and non-listed buildings that form the service and ancillary buildings of the estate, listed above.

9.4.29 The survival of these ancillary buildings as a coherent group, particularly the survival of the chapel, contributes substantially to the significance of Huddleston Hall. The setting also includes the surrounding landscape, which was once occupied by the non-designated deserted medieval settlement around the hall, forming the manor of Huddleston. This element of the setting also contributes to the asset's significance. The primary façade of Huddleston Hall faces north towards the Proposed Scheme and, although there are no designed views, or avenues of trees to lead the eye, there are windows within this façade and on upper floors that would have views of the Proposed Scheme.

9.4.30 The view is currently of agricultural land, with the woodland of Far Fox Covert visible over the crest of the ridge to the north. There are also views to the west and east, along the approaching drive and out to more agricultural land divided with hedgerows and tree belts. These views contribute to the significance of the asset by adding to its aesthetic interest.

9.4.31 The setting of Huddleston Hall would be permanently affected by the presence of Ringhay Wood embankment to the north and the railway which it would carry, which together, although situated slightly over the crest of a hill, would be visible in direct views from the hall's primary façade. This would alter the rural and agricultural character of the view and thereby reduce the contribution made by the setting to the value of the asset. This would constitute a low magnitude of impact and a moderate adverse effect.

Other mitigation measures

9.4.32 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

9.4.33 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.

9.4.34 As no specific mitigation measures (other than those described in relation to the Grade II listed milepost [NHLE 1313208] above) have yet been identified in relation to the heritage assets described above, the residual effects are the same as those reported under permanent effects. Additionally, over time, the effect on the setting of some heritage assets could change as planting matures and the Proposed Scheme assimilates into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-06 Map Series within the Volume 2: LA16 Map Book:

- noise mitigation measures have been included within the Proposed Scheme to reduce potential impacts on identified assets; and
- landscape planting would 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:

- Barrowby Hall with front steps and flanking screen walls and gate piers (NHLE 1200237); and
- Huddleston Hall (NHLE1167923).

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, but 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 Garforth and Church Fenton 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), North Yorkshire County Council (NYCC), Selby District Council (SDC), the Environment Agency, the Coal Authority, 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: LA16 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 from the edge of proposed construction activities. In the case of groundwater abstractions, this buffer is increased up to 1km.

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

[103] Formerly known as the Food and Environment Research Agency.
[104] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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. It is intended that additional future site visits to some key sites will be 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 Plans).

10.2.8 The geo-conservation assessment is based upon publically 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 (OS) mapping, BGS, Coal Authority, LCC, NYCC, SDC, Public Health England, the Environment Agency, Natural England, FSL and APHA records, as well as web sources such as local geological trusts and publically available mineral plans.

Geology

10.3.2 This section describes the underlying ground conditions within the Garforth and Church Fenton area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[106].

[105] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)'.
[106] British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01.* Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904

10.3.3 Table 17 provides a summary of the geology (made ground, superficial and bedrock units) underlying the Proposed Scheme in the Garforth and Church Fenton area.

Table 17: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Significant deposits along pre-existing railway lines, the M1 and sections of the A1 (M). Sporadic deposits north of Garforth and in areas of landfill and historical coal mining areas.	Variable in composition; man-made deposits such as landfill, spoil heaps, infilled ground or earthworks mining.	Not classified
Superficial			
Alluvium	Along Cock Beck Along Dorts Dike South of Longbridge Dike and north of River Wharfe	Clay, organic clay, peat, silt, sand and gravel	Secondary A
Peat	Between Church Fenton and Ulleskelf and west of Busk Lane	Accumulation of partially decomposed vegetation	Unproductive strata
Head deposits	North of Hawk's Nest Wood North of Longroyd Wood to Huddleston Hall Along Stream Dike	Gravelly clay	Secondary (undifferentiated)
Hemingbrough Formation – Glacio-lacustrine Deposits	East of A162 London Road to 200m south-west of Mires Lane Track	Silt and clay	Unproductive strata
Glacio-lacustrine Deposits	Sporadic deposits north of Barkston Ash	Sand and gravel	Secondary A
Breighton Sand Formation - Loess Deposits	From 220m north of Common Lane to 270m south-west of Sandwath Lane From 430m south of Mires Lane Track to south of Longbridge Dike	Slightly clayey sand to silty sand, with occasional gravel layers	Secondary A
Glacio-fluvial deposits	North-west of Sherburn in Elmet	Slightly silty/clayey to silty/clayey sandy gravel	Secondary A
Harrogate Till - Glacio-fluvial sand and gravel deposits	Sporadic deposits from east of the A642 Aberford Road, west of Scott's Wood, Weet Wood, north of Far Fox Covert, east of Coldhill Lane, south-east of Scarthingwell and west of Mile Hill	Sand and gravel	Secondary (undifferentiated)
Bedrock			
Sherwood Sandstone	Ulleskelf (from Church Fenton Lane)	Sandstone, red, yellow and brown, part pebbly	Principal

Geology	Distribution	Formation description	Aquifer classification
Roxby Formation	From Bishop Dike to Church Fenton Lane (Ulleskelf)	Reddish brown and grey mudstone with gypsum and anhydrite present throughout	Secondary B
Brotherton Formation	East of Weet Wood and south of Scott's Wood to Bishop Dike	Pale grey to yellow hard limestone with interbeds of calcitic mudstone, marl, oolitic limestone, dolomite and gypsum	Principal
Edlington Formation	Around Weet Wood to the west, south-west and east and within Weet Wood Longroyd Wood to Huddleston Hall along the south of the route of the Proposed Scheme Outcrops from Ringhay Wood, Near Fox Covert and along Stream Dike	Red to brown mudstone with thin siltstone and marl beds. Fibrous and massive gypsum can be present throughout	Secondary B
Cadeby Formation (Magnesian Limestone) – Sprotbrough Member; Oolitic dolomitic; Limestone; and Wetherby Member	East of the A642 Aberford Road to the west of Weet Wood	Yellow and cream and granular dolomitic Limestone, with occasional oolites and compact beds.	Principal
Basal Permian Sand Formation	Outcrop parallel with the A642 Aberford Road	Yellow sand or sandstone.	Principal
Pennine Lower Coal Measures	From the western boundary of the Garforth and Church Fenton area to the west of the A642 Aberford Road along the south of the M1 from Barwick Road	Interbedded mudstone/siltstone/sandstone with coal seams.	Secondary A
Pennine Lower Coal Measures (Slack Bank Rock)	North of the M1 from Barnbow Common to the A642 Aberford Road roundabout at Junction 47 of the M1	Massive sandstone with mudstone interbeds.	Secondary A

Made ground

10.3.4 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled.

10.3.5 There is evidence of historical and authorised landfilling within the area, which may comprise more significant deposits of made ground. Furthermore, colliery spoil tips are present.

10.3.6 No known farm burial or pyre sites associated with the 2001 outbreak of foot and mouth disease (FMD) are known to be present within the Garforth and Church Fenton area. In all cases, records do not provide an exact location for the burial or pyre sites. However, older unrecorded sites may 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.

10.3.7 The APHA FMD County Status maps[107] show high risk, at risk and FMD free counties during the 2001-2002 outbreak. According to the maps, the study area falls within the FMD Free Counties category.

Superficial geology

10.3.8 Alluvium deposits variably comprising clay, organic clay, silt, sand, peat and gravel occur along the courses of streams and rivers. Alluvium is present in the study area associated with the River Wharfe near Ulleskelf and its tributaries including Dorts Dike, Longbridge Dike and Cock Beck.

10.3.9 Peat, comprising partially decomposed vegetation, is present between Church Fenton and Ulleskelf and west of Busk Lane.

10.3.10 Head deposits comprising gravelly clay are present along Stream Dike and to the north of Hawks Nest Wood and between the north of Longroyd Wood and Daniel Hartly's Wood and extending to the west of Huddleston Hall.

10.3.11 Hemingbrough Formation, comprising glacio-lacustrine silt and clay, is present from the east of the A162 London Road and 200m south-west of Mires Lane.

10.3.12 Glacio-lacustrine deposits comprising sand and gravel are present approximately 100m west of Barkston Ash in the vicinity of Common Lane and approximately 300m north of Barkston Ash.

10.3.13 Breighton Sand Formation, comprising loess[108] sand, is present from 220m north of Common Lane 270m south-west of Sandwath Lane and from 430m south of Mires Lane Track to south of Longbridge Dike.

10.3.14 Glacio-fluvial deposits, comprising slightly silty/ clayey to silty/ clayey sandy gravel, is present to the north-west of Sherburn in Elmet adjacent to Sir John's Lane, Cold Hill Lane and Mile Hill.

10.3.15 Harrogate Till, comprising glacio-fluvial sand and gravel, is present in sporadic patches from the east of the A642 Aberford Road, west of Scott's Wood, Weet Wood, north of Far Fox Covert, east of Coldhill Lane, south-east of Scarthingwell and west of Mile Hill.

Bedrock geology

10.3.16 The Sherwood Sandstone is located in the far north of the route of the Proposed Scheme at Ulleskelf, from Church Fenton Lane to the end of the land required for the Proposed Scheme in the Garforth and Church Fenton area. It typically comprises red, yellow and brown, part pebbly sandstone.

[107] APHA Foot and Mouth County Series Maps. Available online at: https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001
[108] Compacted deposit of wind-blown sediment.

10.3.17 The Roxby Formation is present from Bishop Dike to Church Fenton Lane (Ulleskelf). It typically comprises mudstone with gypsum and anhydrite.

10.3.18 The Brotherton Formation deposit is present from east of Weet Wood and south of Scott's Wood to Bishop Dike. It typically comprises a limestone with interbeds of calcitic mudstone and gypsum.

10.3.19 The Edlington Formation underlies the route of the Proposed Scheme to the east of the A1(M) and is present in the vicinity of Weet Wood, Longroyd Wood to Huddleston Hall, along the south of the route of the Proposed Scheme, and outcrops from Ringhay Wood, Near Fox Covert and along Stream Dike. It typically comprises a mudstone with siltstone, marl and gypsum.

10.3.20 The Cadeby Formation, extending from the north-east of Garforth to the east of the A1(M), is present from the east of the A642 Aberford Road to the west of Weet Wood. It is sub-divided into two members, the 'upper' Sprotbrough Member and 'lower' Wetherby Member. Cadeby Formation deposits exist in the form of calcitic dolomite and dolomitic limestone.

10.3.21 The Pennine Lower Coal Measures Formation that extend from the south-west boundary of the Garforth and Church Fenton area to the north-east of Garforth, these typically comprise cyclic sequentially deposited mudstone, siltstone and sandstone, with frequent coal seams and ironstone bands. The Slack Bank Rock comprises a massive sandstone with interbedded mudstone.

Radon

10.3.22 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].

10.3.23 The majority of the Garforth and Church Fenton area lies within a radon affected 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:

- the route of the Proposed Scheme immediately east of the M1, but excluding the north-west of the town of Garforth and excluding the area up to the M1 north-west of Garforth; and
- the section of the route of the Proposed Scheme from and including the north-east of Garforth to the east of Barkston Ash.

10.3.24 For the remainder of the Garforth and Church Fenton area, 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 (200Bq/m^3), as defined by the BGS Radon Potential Dataset.

[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

Groundwater

10.3.25 Four categories of aquifer and one category of unproductive strata as defined by the Environment Agency, have been identified within the study area:

- The Cadeby Formation, Brotherton Beds, Basal Permian Sand and Sherwood (Bunter) Sandstone are all designated as Principal aquifers;
- alluvium, Glaciolacustrine deposits, Breighton Sand Formation, Pennine Lower Coal Measures and Glacio-fluvial deposits are designated as Secondary A aquifers;
- The Roxby Formation and Edlington Formation are designated as Secondary B aquifers;
- head deposits and Harrogate Till Formation are designated as Secondary (undifferentiated) aquifers; and
- Hemingbrough Formation and peat are designated as unproductive strata.

10.3.26 The Environment Agency reports that there are nine groundwater abstraction licences located within the study area. Seven abstraction licences are for spray irrigation, one is for general farming and domestic use, and one is to top up water supply.

10.3.27 There is one groundwater source protection zone (SPZ)[110] identified within the study area, which is located approximately 670m west of Moor Lane track. The SPZ is designated as SPZ3.

10.3.28 Details of the licensed abstractions are provided in Section 15, Water Resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are by default designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius for SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.29 According to SDC records there are five private groundwater abstractions that do not require a permit registered within 1km of the Proposed Scheme for a mixture of domestic and commercial use.

10.3.30 The Environment Agency reports that there are two consented discharges to groundwater within the study area. Further details on the groundwater in the Garforth and Church Fenton area can be found in Section 15, Water resources and flood risk.

10.3.31 There are no Drinking Water Safeguarding Zones for groundwater in the Garforth and Church Fenton area.

10.3.32 Further information on the groundwater in the Garforth and Church Fenton area is provided in Section 15, Water resources and flood risk.

[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.

Surface water

10.3.33 The River Wharfe (Main River) is the main river within the Garforth and Church Fenton area and would be intersected by the Proposed Scheme near Ulleskelf. The Water Framework Directive (WFD) designation of the River Wharfe is moderate.

10.3.34 A number of ordinary watercourses are located within the study area and the WFD designation of each watercourse is shown in brackets. These include The Beck (moderate), Cock Beck (poor), Sturton Dyke (moderate), Sheep Dike (moderate), Stream Dike (poor), Bishop Dike (poor), Carr Dike (moderate), Dorts Dike (moderate), Longbridge Dike (moderate), Dam Drain (moderate) and a number of unnamed streams, tributaries, drains, ponds and culverts. The route of the Proposed Scheme traverses Sandwath Lake adjacent to the west of Sandwath Lane. This site was formerly a brick and tile works.

10.3.35 There are four licensed surface water abstractions located within the study area, for spray irrigation.

10.3.36 There are four consented discharges to surface waters within the study area, one of which is within the land required for the Proposed Scheme.

10.3.37 There are no Drinking Water Safeguarding Zones for surface water within the Garforth and Church Fenton area.

10.3.38 Further information on surface water in the Garforth and Church Fenton area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.39 Current potentially contaminative land uses within the study area include one active landfill site (located at Copley Lane Quarry), one sewage treatment works, one depot, two active railway lines, light commercial industry (warehouses), one railway depot and one garage workshop, together with several farms.

10.3.40 Historical land uses identified within the study area with the potential to have caused contamination include five historical landfill sites as shown in Table 18, two gasworks, evidence of two fuel storage tanks, two garages (petrol filling stations), one works, one sewage treatment works, two dismantled railway lines, one coal depot, several quarries, a brick and tile works, two spoil heaps, small infilled extraction pits, mine entry shafts and shallow mine workings.

10.3.41 Further details of these current and historical contaminative land uses within the study area are shown in Table 18, Table 19 and Table 20.

Table 18: Current and historical landfill sites located in the study area

Name and area reference[111]	Location	Description
Aberford Road historical landfill site. Aberford Road, East Garforth (LA16-3)	This historical landfill is located adjacent to the east of the A642 Aberford Road in east Garforth. The site is not located within the land required for the construction of the Proposed Scheme.	Environment Agency records state that this historical landfill previously accepted inert waste, including: glass, concrete, bricks, tiles, soil and stones. Active dates unknown and no record of licence or licence surrender.
Brierlands Quarry historical landfill (LA16-4608)	The site is not located within the land required for the construction of the Proposed Scheme.	Environment Agency records state that the Brierlands Quarry historical landfill previously accepted industrial, commercial and household waste. No further details are available.
CF Harris Ltd. landfill (operational) (LA16-20)	This active landfill is located at Copley Lane Quarry, Sherburn in Elmet, Tadcaster, Yorkshire, LS25 6BJ. Located 260m north-east of Mile Hill/Coldhill Lane. The site is not located within the land required for the construction of the Proposed Scheme.	Environment Agency records state that this active landfill, registered to CF Harris Ltd, currently receives waste, excluding inert waste. Active dates unknown and no record of licence or licence surrender.
Historical refuse tip near Sandwath Drive (LA16-24)	This historical landfill, identified on OS maps as a disused tip, is located north of Sandwath Drive and to the east of the existing York to Church Fenton line. The site is located within the land required for the construction of the Proposed Scheme.	This landfill was identified from historical OS maps and was not reported in Environment Agency records. Active dates and waste type unknown, no record of licence or licence surrender.
Historical refuse tip near Mires Lane (LA16-25)	This historical landfill, identified on OS maps as a refuse tip, is located to the south of Mires Lane, 90m west of the sewage works and 340m east of the existing York to Church Fenton line. The site is partially located within the land required for the construction of the Proposed Scheme.	This landfill was identified from historical OS maps and was not reported in Environment Agency records. Active dates and waste type unknown, no record of licence or licence surrender.
Historical refuse tip near Busk Lane (LA16-124)	This historical landfill, identified on the 1989 OS map as a refuse tip, is located west of Busk Lane. The site is not located within the land required for the construction of the Proposed Scheme.	This landfill was identified from a historical OS map and was not reported in Environment Agency records. Active dates and waste type unknown, no record of licence or licence surrender.

[111] Each potentially contaminated site is allocated a unique reference number.

Table 19: Current and historical mining, mineral sites and colliery spoil sites located within the study area

Name and Area Reference	Location	Description
Infilled brick works, quarries and clay pits (not listed as landfills) (LA16-11 and LA16-28)	Located at Copley Lane Quarry, west of Mile Hill; west of Sandwath Lane, Church Fenton; and Ridge Road to the south of the M1. The sites are located within the land required for the construction of the Proposed Scheme.	The northern portion of Copley Lane Quarry is registered as an active landfill (16-20). The southern portion of the quarry (16-11) is not registered as a landfill but appears to have been backfilled. The historical clay pit, brick and tile works west of Sandwath Lane is now occupied by Sandwath Lake.
Areas of historical localised shallow mineral extraction and historical mine entries	Historical areas of localised shallow mineral extraction and mine entry shafts at various locations across the study area. Several sites of shallow mineral extraction are located within the land required for the construction of the Proposed Scheme. Two mine entry shaft sites are located within the land required for the construction of the Proposed Scheme (16-73 and 16-79).	The historical areas of localised shallow mineral extraction and mine entry shafts were identified from historical OS maps and information obtained from the Coal Authority. There are sixteen historical shafts present.
Spoil heaps (LA16-19 and LA16-163)	Located within Hawk's Nest Wood and to the east of Ash Lane. The sites are located within the land required for the construction of the Proposed Scheme.	The spoil heaps were identified from historical OS maps.

Table 20: Current and historical industrial sites located within the study area

Name and area reference	Location	Description
Two historical gas works (LA16-43 and LA16-118)	Two historical gas works, Located east of Barwick Road, Garforth and east of Sandwath Lane, Church Fenton. The sites are not located within the land required for the construction of the Proposed Scheme.	Two historical gas works, which have been redeveloped with residential housing were identified from historical OS maps.
Two historical petrol filling stations (LA16-1 and LA16-2)	The historical Reg Vardy petrol filling station was located between Barrowby Lane and A642 Wakefield Road, Garforth. The historical Sunset Garage petrol filling station was located east of Church Fenton Lane, Ulleskelf.	Two historical petrol filling stations, which are no longer present in the current OS maps.

Name and area reference	Location	Description
	The sites are not located within the land required for the construction of the Proposed Scheme.	
Evidence of historical fuel storage tanks Ulleskelf and Garforth (LA16-115 and LA16-117)	Evidence of historical fuel storage tanks identified: east of Ash Lane, Garforth; and north of Sandwath Lane, Church Fenton. The sites are not located within the land required for the construction of the Proposed Scheme.	The evidence of historical fuel storage tanks was identified from historical OS maps.
Garage workshop (LA16-5)	Garage workshop located between Barrowby Lane and Nanny Goat Lane, Garforth. The site is not located within the land required for the construction of the Proposed Scheme.	An active garage workshop. No further details are available.
Various farms (LA16-35, LA16-36, LA16-37, LA16-41, LA16-42, LA16-49 and LA16-51)	Farms identified across the study area. Two sites are partially located within the land required for the construction of the Proposed Scheme (16-37 and 16-42).	Farms (i.e. ancillary buildings and areas for storing chemicals, fuel etc.).
Historical works (LA16-33)	Historical works located to the west of Barrowby Lane, Garforth. This site is partially located within the land required for the construction of the Proposed Scheme.	The historical works was identified from historical OS maps. No further information is available in relation to the type of facility or activities carried out. .
Sewage works at Mires Lane (LA16-140)	Sewage works located to the south of Mires Lane, Church Fenton. The site is partially located within the land required for the construction of the Proposed Scheme.	The sewage works was identified from OS maps.
Railways/disused railway lines, a railway depot and a coal depot (LA16-6, LA16-10, LA16-90, LA16-92, LA16-110, LA16-56 and LA16-7)	Existing Leeds to Selby Line. The existing Micklefield to Church Fenton Line between Laith Staid Lane and Ulleskelf. Historical mineral railway lines run adjacent to Hawk's Nest Wood, between Lilly Pit Cottage and Ash Lane, Garforth. Dismantled railway between the York to Church Fenton lines at	The existing Leeds to Selby railway lines were identified from historical OS maps. The active railway lines of the Normanton and Colton Junction were identified from the historical and current OS maps. The historical mineral railway lines were identified from historical OS maps. The dismantled railway lines were identified from historical OS maps. Railway depot was identified from historical OS maps.

Name and area reference	Location	Description
	Church Fenton and north of Sandwath Lane. Dismantled railway between the existing Leeds and Selby railway line and M1. Railway depot located at Ulleskelf Train Station. Historical coal depot located adjacent to the south of the Leeds to Selby Line. Four sites are located within the land required for the construction of the Proposed Scheme (16-6, 16-10, 16-90, 16-92).	The historical coal depot was identified from historical OS maps.
Warehouse over former pit (LA16-99)	Warehouses over a historical pit, located to the south of Hawk's Nest Wood. The site is not located within the land required for the construction of the Proposed Scheme.	The operational warehouses, which are located over a historical pit, were identified from OS maps. No further information is available in relation to the type of facility or activities carried out.

10.3.42 Contaminants commonly associated with sites in Table 18 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.

10.3.43 Contaminants associated with sites in Table 19 could include heavy metals, acid mine waters with low pH values and mine gases such as methane, carbon dioxide and hydrogen sulphide.

10.3.44 Contaminants commonly associated with industrial sites in Table 20 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

10.3.45 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).

10.3.46 There are no Control of Major Accident Hazards (COMAH) sites within the study area.

10.3.47 There were no major, two significant and 16 minor incidents reported over a nine year period between 1989 and 1998.

10.3.48 The two significant pollution incidents (Category 2) occurred in 1989 and involved the release of sewage/treated effluent south of the River Wharfe and the release of an unknown miscellaneous pollutant at Sheep Dike. There were two substantiated

pollution incidents (Category 2) which occurred up to 2018. A significant incident to water and a separate significant incident to water and land occurred in 2003.

10.3.49 The Environment Agency reports that there are two consented discharges to groundwater within the study area. Further details on the groundwater in the Garforth and Church Fenton area can be found in Section 15, Water resources and flood risk.

10.3.50 There are four discharge consents to surface water within the study area, one of which is located within the land required for the Proposed Scheme.

10.3.51 No private water supplies from surface water sources have been identified within the study area.

10.3.52 Two obsolete fuel station entries were registered as Reg Vardy Garforth located south of Barrowby Lane, Garforth and Sunset Garage located east of Church Fenton Lane, Ulleskelf.

10.3.53 The following sites hold Local Authority Pollution Prevention and Controls permits within the study area:

- Sherburn Quarries Ltd, located at Copley Lane Quarry, south of the CF Harris Ltd landfill. The permit is for quarrying processes; however, the status of the permit is unknown; and
- Van and Car North Yorkshire, located at Church Fenton for a waste oil burner.

10.3.54 There are two nationally significant ecological designations as defined in the land quality section of the SMR[112] located within the study area. These include two SSSI, registered as Hook Moor located either side of the A1(M) slip road and Kirkby Wharfe between Wath Lane and the B1223 New Road, Ulleskelf.

Mining/mineral resources

10.3.55 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These include sand, gravel, clay, stone, lime, salt, gypsum 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).

Minerals plans

10.3.56 LCC is responsible for the mineral and waste local plans for the western portion of the Garforth and Church Fenton area between The Beck and Scott's Wood. The Adopted Natural Resources and Waste Local Plan - Leeds Local Development Framework

[112] Sensitive ecological receptors are defined as national designations such as SSSIs.

(2013)[113] was adopted in January 2013 and sets out the LCC policies aimed at controlling mineral related developments within Leeds up to the year 2026.

10.3.57 NYCC is responsible for the mineral local plans for the eastern portion of the Garforth and Church Fenton area, from Scott's Wood to Church Fenton. The Minerals and Waste Joint Plan (2016)[114] was adopted in January 2016 and sets out the NYCC polices aimed at controlling mineral related developments within North Yorkshire up to December 2030.

10.3.58 There are no proposed Mineral Local Plans (MLP) allocations or areas of search within the study area. There is a mineral safeguarding area (MSA) for coal within the Garforth and Church Fenton area, which is managed by LCC. This MSA covers the western portion of the study area between The Beck and the A642 Aberford Road. There is an area of preferred stone and clay extraction to the west of Weet Wood.

10.3.59 The Garforth and Church Fenton area is underlain by the following mineral resources as identified by the BGS:

- brick clay: carboniferous, coal measures mudstone (coincident with shallow coal);
- primary opencast coal resource area;
- fireclay: carboniferous, coal measures (coincident with shallow coal);
- buried coal resources overlain by up to 50m overburden;
- dolomite and dolomitic limestone: Permian, Cadeby and Brotherton Formation;
- deep coal between 50m and 1,200m;
- brick clay: Quaternary, Glaciolacustrine deposits (clay and silt); and
- gypsum/anhydrite.

10.3.60 There is one Local Authority Pollution Prevention Control permit registered to Sherburn Quarries Ltd, located at Copley Lane Quarry, south of the CF Harris Ltd landfill; however, the status of the permit is unknown.

Sand, gravel and clay deposits

10.3.61 There are two MSA in the eastern portion of the Garforth and Church Fenton area. An MSA for sand and gravel is identified between Church Fenton and Ulleskelf. An MSA for limestone is located between the east of Micklefield and west of Church Fenton. There is also a preferred area for stone and clay extraction to the west of Weet Wood.

[113] Leeds City Council (2013) *Adopted Natural Resources and Waste Local Plan- Leeds Local Development Framework.* Available online: http://www.leeds.gov.uk/docs/Adopted%20Consolidated%20NRWLP%20Inc%20Policies%20Mins%2013-14.pdf
[114] The Minerals and Waste Joint Plan (2016). Available online at: https://www.northyorks.gov.uk/minerals-and-waste-joint-plan

Coal mining

10.3.62 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded historical coal mining activities, with historical mining operations taking place along the majority of the western half of the route. Coal was extracted from open cast sites and underground workings of varying depths. There are numerous mine entries throughout the study area, comprising both shaft and adit entries.

10.3.63 Coal seams of Pennine Lower Coal Measure Formation, outcrop between Barrowby Park and to the west of Hawk's Nest Wood. The named seams are Flockton Thick, Flockton Thin, First Brown Metal Coal, Second Brown Metal Coal, Third Brown Metal Coal and Middleton Main Coal.

10.3.64 According to the Adopted Natural Resources and Waste Local Plan - Leeds Local Development Framework (2013)[115] there are no active open cast coal sites within the LCC district. Historical open cast and shallow mineral workings were active between The Beck and the A642 Aberford Road. There is an MSA for coal between The Beck and Daniel Hartly's Wood.

Open cast and shallow coal mining

10.3.65 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded historical opencast and shallow workings (defined as less than 30m below ground level) between The Beck and Daniel Hartly's Wood.

Deep coal mining

10.3.66 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded historical underground coal mining activities between The Beck and Daniel Hartly's Wood.

10.3.67 No licences for future coal mining have been identified within the study area.

Petroleum Exploration Development Licences/Hydrocarbons

10.3.68 The Garforth and Church Fenton area is within a Petroleum Exploration and Development Licence (PEDL) area, reference PEDL 146. This licensed block begins at New Road, Ulleskelf and extends beyond the northernmost point of the study area. Data provided on the UK Oil and Gas Authority website[116] indicates that PEDL 146 is covered by petroleum Block SE54a and has been awarded to Ineos Upstream Limited. The remainder of the study area to Ulleskelf is also within the Onshore 14th Onshore Oil and Gas Licencing Round blocks offered.

10.3.69 The entirety of the Garforth and Church Fenton area is located within the Bowland Shale Gas Study Area. The area between Mile Hill and the northern end of the

[115] Leeds City Council (2013) *Adopted Natural Resources and Waste Local Plan- Leeds Local Development Framework.* Available online: http://www.leeds.gov.uk/docs/Adopted%20Consolidated%20NRWLP%20Inc%20Policies%20Mins%2013-14.pdf
[116] Oil and Gas Authority; Onshore Oil and Gas Authority. Available online at: https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b0024841 8e545d222e57ddaa

Garforth and Church Fenton area is located within a Bowland Shale Gas Prospective Area.

Geo-conservation resources

10.3.70 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geo-conservation resources has been undertaken.

Receptors

10.3.71 The sensitive receptors that have been identified within the study area are summarised in Table 21. A definition of receptor sensitivity is given in the SMR.

Table 21: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, nurseries, schools, study centres, play areas, parks and public open space.	High
		Employees and visitors at commercial areas, retail parks and hotels	Moderate
		Industrial	Low
	Groundwater	Principal Aquifers associated with the Cadeby Formation, Brotherton Beds, Basal Permian Sand and Sherwood (Bunter) Sandstone	High
		Secondary A Aquifers associated with the alluvium, Breighton Sand Formation, Pennine Lower Coal Measures and Glacio-fluvial deposits.	Moderate
		Secondary B and Secondary (undifferentiated) Aquifers associated with the Roxby Formation, Edlington Formation, Head deposits and Harrogate Till Formation	Low
	Surface waters	The Beck (Water Framework Directive (WFD) status Moderate) Cock Beck (WFD status Bad) Sturton Dyke (WFD status Moderate) Sheep Dike (WFD status Moderate) Stream Dike (WFD status Poor) Bishop Dike (WFD status Poor) Carr Dike (WFD status Moderate) Dorts Dike (WFD status Moderate) Longbridge Dike (WFD status Moderate) Dam Drain (WFD status Moderate) River Wharfe (WFD status Moderate) Ponds and lakes Unnamed streams, tributaries, drains and	Moderate

		culverts	
	Built environment	Underground structures and buried services	Low
	Natural environment	Hook Moor SSSI and Kirkby Wharfe SSSI	High
Impacts on mining/ mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	MSA - LCC for sand and gravel and coal. MSA – North Yorkshire for surface minerals including sand and gravel, limestone and shallow coal. Petroleum Exploration Development Licence PEDL 146 – Onshore licensed block Bowland Shale Gas Exploration Prospective Area	Medium High 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)[117]. 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 (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Sections 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);

[117] Supporting document: Draft Code of Construction Practice

- traffic management to ensure that there is a network of designated haul roads to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[118] and British Standards BS10175[119] and BS8576[120].

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[121]. The preferred option would then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA16 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

[118] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[119] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*.
[120] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*
[121] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, commercial and mining sites.

10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

10.4.10 A simple summary of the baseline CSM is provided in Table 22. 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 22: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[122]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On site[123]						
LA16-20	CF Harris Ltd landfill (operational) partially over former Copley Lane Quarry	Low to moderate	Moderate/ low	Low	N/A	Low to moderate/ low
LA16-24	Historical tip near Sandwath Drive	Low to moderate	Low	Low	N/A	Low to moderate/ low

[122] Each potentially contaminated site is allocated a unique reference number.
[123] 'On site' is within the area of land required for construction of the Proposed Scheme.

Area reference[122]	**Area name**	**Human health risk**	**Ground water risk**	**Surface water risk**	**Ecosystem risk**	**Buildings risk**
LA16-25	Historical tip near Mires Lane	Low to moderate	Low	Low	N/A	Low to moderate/ low
LA16-11, 16-28,	Infilled brick works, quarries and clay pits (not listed as landfills)	Low to moderate/ low	Low	Low	N/A	Very low to low
LA16-60, 16-61, 16-62, 16-63, 16-64, 16-106, 16-107, 16-111, 16-116, 16-128, 16-150, 16-152, 16-66, 16-67, 16-68, 16-69, 16-70, 16-71, 16-73, 16-75, 16-79, 16-80, 16-83, 16-84, 16-85, 16-86 16-167, 16-168	Localised shallow mineral extraction including mine entries	Low to moderate/low	Moderate/low	Moderate/low	N/A	Low to Moderate/low
LA16-37, 16-42	Various farms – Ridge Road Farm, Barrowby Hall	Very low to low	Low	Low	N/A	Low
LA16-33	Historical works south of Barrowby Lodge	Very low to low	Low	Low	N/A	Low
LA16-6, 16-10, 16-90, 16-92	Railways/disused railway lines	Very low to low	Moderate/ low	Moderate/ low	N/A	Low
LA16-14	Sewage works at Mires Lane	Very low to low	Very low	Very low	N/A	Low
Off site[124]						
LA16-3, 16-4608	Historical Aberford Road and Brierlands Quarry landfills	Low to moderate	Moderate/ low	Low	N/A	Low to moderate/ low

[124] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it.

Area reference[122]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA16-124	Historical tip near Busk Lane	Low to moderate	Low	Low	N/A	Low to moderate/ low
LA16-19, 16-163	Spoil heaps	Low to moderate	Moderate/low	Low	N/A	Low to moderate/low
LA16-115, 16-117	Evidence of historical fuel storage tanks at Ulleskelf and Garforth	Low to moderate	Low	Moderate/ low	N/A	Low
LA16-35, 16-36, 16-41, 16-49, 16-51	Various farms – White House Farm, Well House Farm, Sandwath Farm, anaerobic digester at Ridge Road Farm, farm storage area	Very low to low	Low	Low	N/A	Low
LA16-43, 16-118	Historical gas works at Garforth and Church Fenton (16-118 was subsequently an engineering works 16-22 and factory 16-18)	Low to moderate/ low	Moderate/ low	Very low	N/A	Very low to moderate/low
LA16-11, 16-28	Infilled brick works, quarries and clay pits (not listed as landfills)	Low to moderate	Moderate/ low	Moderate/low	N/A	Very low to moderate/low
LA16-1, 16-2	Historical petrol filling stations - Reg Vardy Garforth and Sunset Garage	Low to moderate/ low	Moderate/ low	Low	N/A	Very low to moderate/low
LA16-110, 16-56	Railways/disused railway lines and railway depot	Very low to low	Moderate/ low	Moderate/ low	N/A	Low
LA16-5	Active garage workshop north of Barrowby Lane	Low to moderate/ low	Low	Low	N/A	Low
LA16-99	Warehouse over former pit	Low to moderate	Low	Low	N/A	Low to moderate/ low

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP. This will also include mining related contamination.

10.4.14 All of the sites set out in Table 22 have been assessed for the change in impact associated with the construction stage of the work. Table 23 presents the summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 22 were found to have non-significant effects.

Table 23: Summary of construction CSM effects

Name and area ref[125]	Receptor	Main baseline risk	Main construction risk	Temporary effect
Shallow underground coal workings and mine entries (various locations)	Human health (inhalation of ground gases on site)	Moderate/low	High	Moderate adverse effect (significant)
	Human health (inhalation of ground gases off site)	Moderate/low	High	Moderate adverse effect (significant)
	Controlled waters – groundwater	Low	Moderate	Moderate adverse effect (significant)
	Controlled waters – surface water	Low	Moderate	Moderate adverse effect (significant)
	Property (exposure to vapours)	Moderate/low	High	Moderate adverse effect (significant)

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.

[125] Each potentially contaminated site is allocated a unique reference number.

10.4.16 For mining sites, a potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. Any mitigation measures will be identified in consultation with authoritative consultees, including measures to be set out in the draft CoCP to mitigate any significant adverse effects.

10.4.17 Table 23 indicates that there are a number of locations where there is the potential for a significant temporary adverse effect to be present. The adverse effects are expected to reduce with the application of site-specific remediation.

10.4.18 The assessment has considered the engineering design together with the specific nature of the potential current and historical contamination sources and receptors identified. A number of historical refuse tips located within the area required for the construction of the Proposed Scheme, have been identified as a key issue which the draft CoCP would address. Consideration would be given to the potential adverse effects on nearby receptors arising from excavation into historic waste materials. This would particularly apply in areas of cutting, excavation and piling.

10.4.19 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials resulting in no significant effects.

Permanent effects

10.4.20 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.

10.4.21 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in negative effects and an improvement would result in positive effects.

10.4.22 All of the sites set out in Table 22 have been assessed for the change in impact associated with the post-construction (permanent) stage. The assessment has shown that whilst there are a number of minor beneficial impacts at the post-construction stage, none of these would be regarded as significant in line with the methodology set out in the SMR.

10.4.23 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.

10.4.24 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 in the ground, the principal risk in this area, would be controlled to an acceptable level.

Mining/mineral resources

10.4.25 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[126] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.26 The route of the Proposed Scheme would cross MSA for coal, limestone and sand and gravel extraction. There is also a preferred area for stone and clay extraction west of Weet Wood. There are no proposed MLP allocations or areas of search within the study area.

Temporary effects

10.4.27 Temporary adverse effects may occur where construction compounds are proposed within the MSA. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

10.4.28 The following compounds fall within the MSA:

- West Garforth cutting main compound;
- Micklefield embankment satellite compound;
- Micklefield cutting satellite compound;
- Stream Dike embankment satellite compound;
- Barkston Ash embankment satellite compound;
- Church Fenton viaduct satellite compound;
- Church Fenton embankment east satellite compound; and
- Church Fenton embankment west satellite compound.

Permanent effects

10.4.29 The majority of effects on mining and mineral sites would be permanent.

[126] 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.

Sand, gravel and clay deposits

10.4.30 The effects of construction of the Proposed Scheme on the sand and gravel MSA would be permanent where underlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. However, as a proportion of the total MSA, this strip is less than 1% of the total, and the effect on the MSA is considered to be minor and therefore not significant. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, LCC and NYCC and the mineral owner.

10.4.31 There is an area of preferred stone and clay extraction to the west of Weet Wood; which is partially underlain by the footprint of the permanent works; however, the effect on the area is considered to be minor and therefore not significant.

Coal Mining – open cast and shallow

10.4.32 The route of the Proposed Scheme would cross an MSA for coal, which covers the western portion of the Garforth and Church Fenton area, between The Beck and the A642 Aberford Road. The effect of construction of the Proposed Scheme on future open cast and shallow coal mine areas would be permanent where they are present beneath 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, the Coal Authority and the mineral owner. Construction of the Proposed Scheme is unlikely to place a constraint; however, the effect is not considered to be significant.

Coal Mining - deep

10.4.33 The permanent effect of the Proposed Scheme on the identified deep coal resource is considered to be negligible and therefore not significant. Deep reserves are not currently worked beneath the Garforth and Church Fenton area and whilst future application to resume deep extraction cannot be fully excluded, given the narrow strip of permanent works and likely depth of coal workings, significant effects associated with construction of the Proposed Scheme are unlikely.

Petroleum Exploration Development Licences

10.4.34 The permanent effect of the Proposed Scheme on the identified PEDL is considered to be negligible.

10.4.35 The route of the Proposed Scheme would cross a Licence to Search and Bore For and Get Petroleum area. It is unlikely that construction of the Proposed Scheme will place a constraint on future exploitation of potential sources of coal gas.

10.4.36 Table 24 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 24: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Sand and gravel	MSA	MSA for sand and gravel extraction, defined by the local County Councils	Medium	Minor	Negligible (N)
Limestone	MSA	MSA for limestone as defined by the local County Council	Medium	Minor	Negligible (N)
Coal	MSA	MSA for coal as defined by the local County Council	Medium	Minor	Negligible (N)
PEDL 146	Licensed by the UK Oil and Gas Authority	Licence to Search and bore for and get petroleum	High	Negligible	Negligible (N)
Carboniferous Bowland – Shale Prospective Area	Land parcels offered within the 14th Onshore Oil and Gas Licensing Round	An area of identified shale gas potential	High	Negligible	Negligible (N)

10.4.37 There would be negligible effects to mining, mineral and gas resources, in the Garforth and Church Fenton area, which are not significant.

Geo-conservation sites

10.4.38 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

10.4.39 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.

10.4.40 Mitigation of the effects on mineral resources within the proposed MSAs could include extraction of the resource in landscaping areas within the route of the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at LCC and NYCC 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

10.4.41 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 three auto-transformer stations, located 225m east of Barwick Road, 300m south of Ringhay Wood and 500m west of Common Lane. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

10.5.6 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Garforth and Church Fenton 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 North Yorkshire County Council (NYCC), Selby District Council (SDC) 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: LA16 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)[127].

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

[127] 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 2.5km have also been considered at settlement edges, such as at Leeds, Garforth, Micklefield, Newthorpe, Sherburn in Elmet, Saxton, Barkston Ash, Church Fenton, Towton and Ulleskelf.

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 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 the urban edge of Leeds in the south-west and town of Garforth in the south, to the villages of Church Fenton in the north-east and Ulleskelf in the north. The underlying Pennine Coal Measures geology has defined the undulating form of the landscape near Leeds and Garforth, which ranges in height between 102m above Ordnance Datum[128] (AOD) at the eastern edge of Leeds near Barrowby Hall and 55m AOD near Barwick Road. Several sinuous stream valleys traverse the undulating landscape, such as Cock Beck to the north of Garforth and The Beck east of Leeds. Land cover near Leeds and Garforth is predominantly medium-scale arable fields with isolated, small-scale pasture fields, bordered by hedgerows and fences. Woodland blocks are present in the farmland such as Hawk's Nest Wood and Barnbow Wood. There is limited evidence of coal extraction remaining in the landscape; the former Garforth Colliery, for example, is now the site of industrial units along the northern edge of Garforth. There are former open cast mining areas in isolated locations, which have been restored with grassland.

11.3.2 A limestone ridge runs through the centre of the study area east of Garforth in a north-south alignment and ranges from 104m AOD at Cliff Top Park in Garforth to 60m AOD near Lotherton Hall. The land slopes gently east from the limestone ridge towards the River Wharfe where the landform is flatter and at a height of around 10m AOD. The limestone ridge has influenced soils, resulting in a land cover of fertile, intensively managed arable farmland with a strong rural character. Fields are medium to large in scale and regular in shape, with evidence of field amalgamation to enable intensification of agriculture. Smaller, less regular fields are close to settlements such as the strip fields near Barkston Ash. The limestone ridge has resulted in the presence of ecological habitats such as magnesium limestone grassland at Sherburn Willows Site of Special Scientific Interest.

11.3.3 Vegetation within the arable farmland is limited to hedgerow field boundaries and small copses along streams, roads and settlement edges. This relatively open landscape contrasts with the large woodland blocks that are present near Huddleston Hall, in former parkland areas such as at Scarthingwell Park, and at the intact registered park and gardens of Temple Newsam, the Parlington Estate and Lotherton Hall (Grade II). The woodland blocks, some of which are classed as ancient woodland, provide a sense of enclosure and contain views. In addition to the registered park and gardens, other key historical features in the landscape include the Roman road along Ridge Road, and the registered battlefield at Towton.

11.3.4 Around Leeds and Garforth the landscape is urban fringe in nature with evidence of horse paddocks, light industry and restored open cast coal mining areas. East of Garforth, towns, villages and isolated residential properties and farmsteads are

[128] 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.

scattered throughout the farmland. The limestone ridge has influenced building materials in villages such as Saxton, where properties are predominantly built in limestone. There are also limestone quarries present within the landscape. The flat landscape near the River Wharfe has enabled the development of airfields at Church Fenton and Sherburn in Elmet. Linear infrastructure routes cross the landscape including the M1, the A1(M), the East Coast Main Line, Leeds to Selby Line, Micklefield to Church Fenton Line and the York to Church Fenton Line. Large wind turbines and overhead power lines are also prominent.

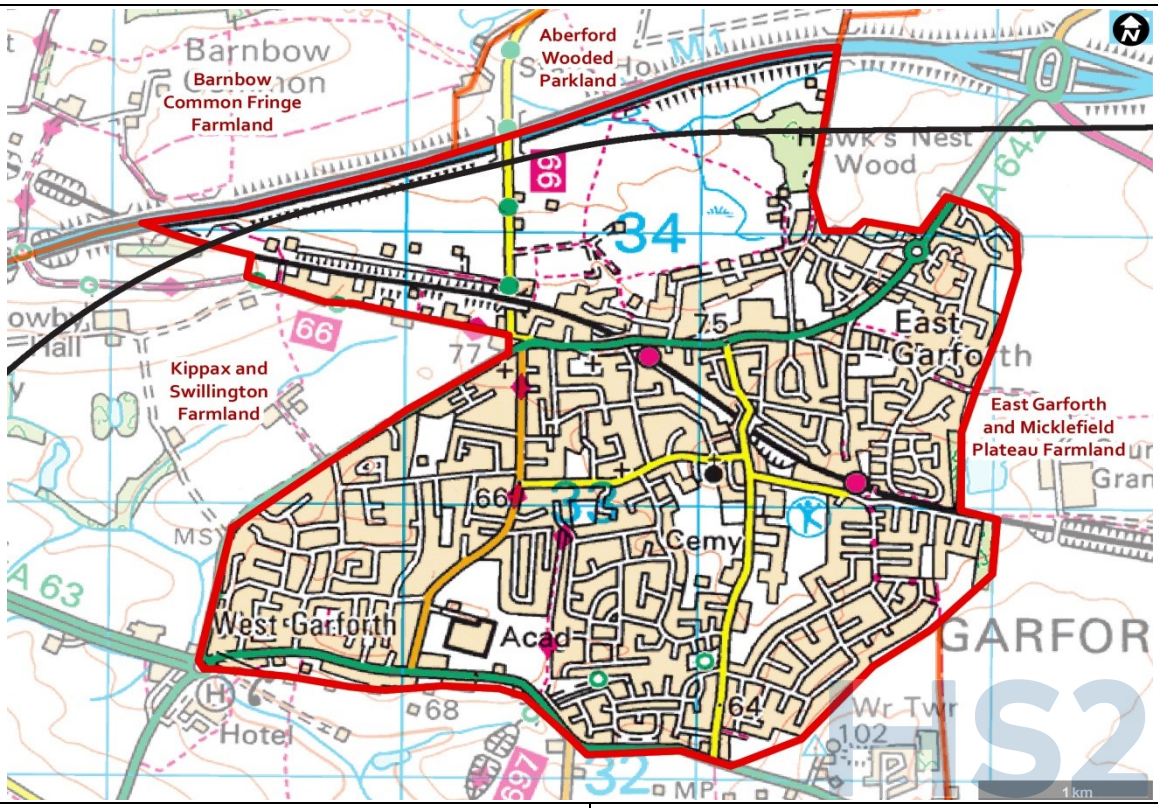
11.3.5 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic 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 records and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[129], the Leeds Landscape Assessment[130], the Leeds Landscape Character Review[131] and the Landscape Assessment of Selby District[132]. 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 Garforth and Church Fenton has been subdivided into 14 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. Seven of the 14 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. The Swillington and Kippax Farmland LCA would be significantly affected by the Proposed Scheme and is included in Volume 2: Community area report LA15, Warmfield to Swillington and Woodlesford, as it is located for the most part within the Warmfield to Swillington and Woodlesford area. A summary of the remaining six LCAs that would be significantly affected within the Garforth and Church Fenton area is provided in Table 25.

[129] 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
[130] Leeds City Council (1994), *Leeds Landscape Assessment*. Available online at: http://www.leeds.gov.uk/docs/CD11-15%20LA%20Composite%20version.pdf
[131] Leeds City Council (2011), *Landscape Character Review*. Available online at: http://www.leeds.gov.uk/docs/CD11-14%20Leeds%20Landscape%20Review%20Maps%202011.pdf
[132] Woolerton Dodwell Associates on behalf of Selby District Council (1999), *Landscape Assessment of Selby District*. Available online at: http://www.selby.gov.uk/sites/default/files/Documents/Landscape_Assessment_of_Selby_District_Jan_99.pdf

Table 25: Summary of significantly affected LCAs

Garforth Urban Area and Urban Fringe



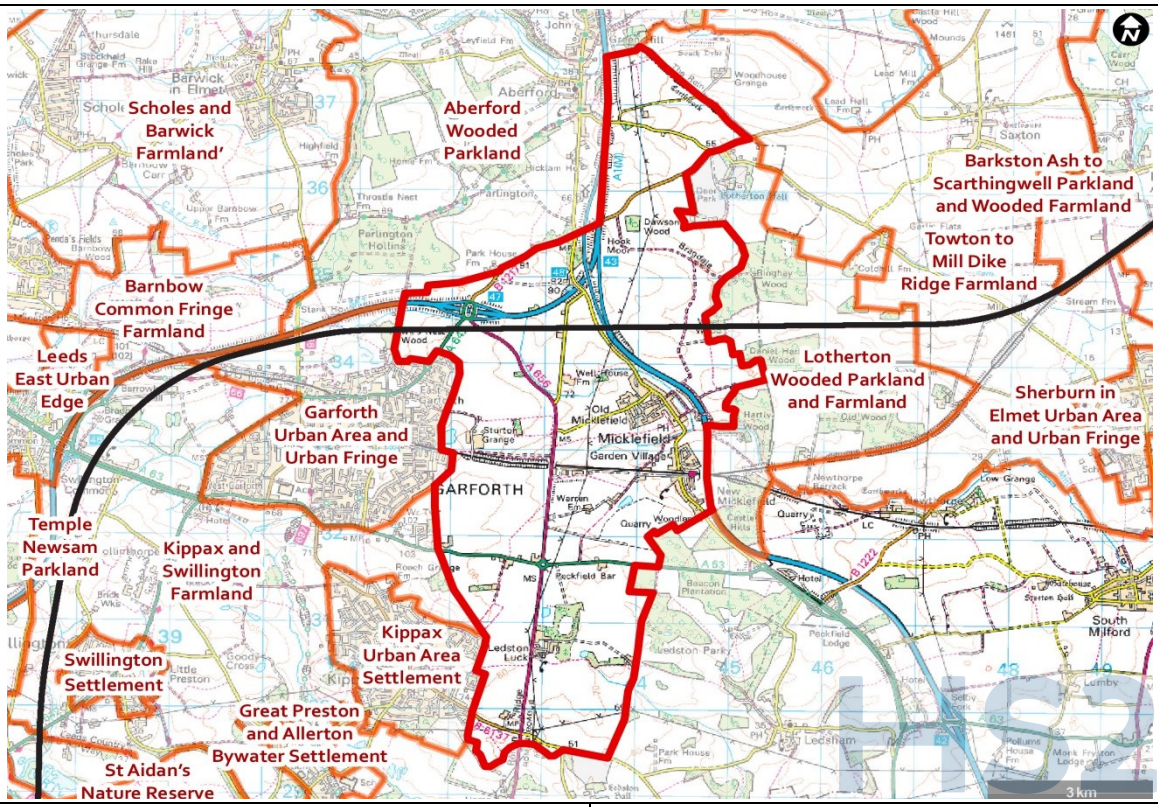
Pasture fields and industrial units north of Garforth

Residential street within Garforth

The Garforth Urban Area and Urban Fringe LCA encompasses the former mining town of Garforth. The land gently slopes north-west from a height of 95m AOD near Acaster Drive to 55m AOD near Barwick Road. The historic core of Garforth is situated between Main Street, Garforth Station and the Grade II listed St. Mary's Church and comprises shops and houses interspersed with private gardens, allotments and larger green spaces such as Garforth Cricket and Social Club. Large 20th century housing estates surround the historic core with predominantly semi-detached houses, although there are detached and terraced houses including some former miners' cottages along Town End. The northern edge of Garforth is defined by industrial units along Lotherton Way and within an industrial estate at Helios 47, which are located on the site of the former Garforth Colliery. The units impart an urban fringe character on the farmland area between Garforth and the M1. Fields are small in size, a mixture of arable and pasture, and bordered by fences and hedgerows. Hawk's Nest Wood is the most notable woodland block in the LCA, which is a local wildlife site. The Leeds Country Way, National Cycle Network route 66 and a network of public rights of way (PRoW) north of Garforth contribute to recreational value. Due to the proximity of the M1 and Leeds to Selby Line, and regular pedestrian and vehicular activity within Garforth, the level of tranquillity is low.

The value of this LCA is medium due to the small-scale field pattern, recreational routes and woodland at Hawk's Nest Wood; however, tranquillity is affected by motorway noise, and nearby industrial units impart an urban fringe character.

East Garforth and Micklefield Plateau Farmland



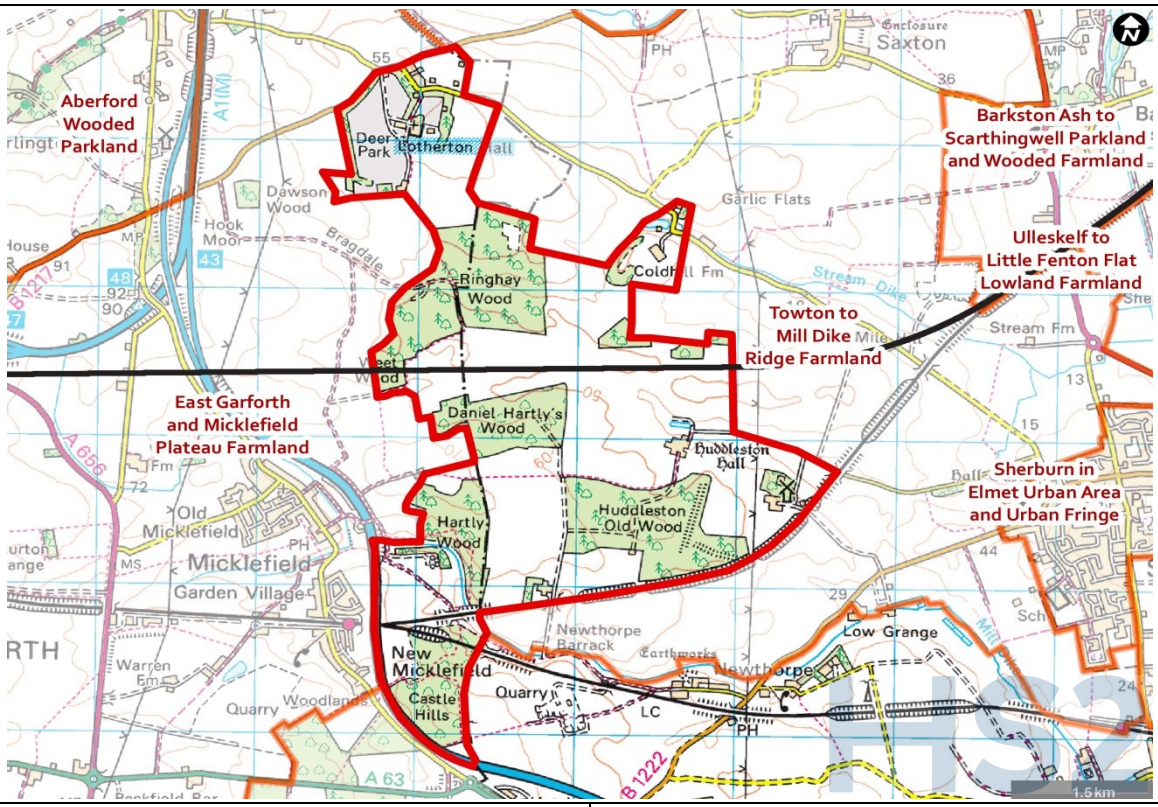
Large arable fields west of Micklefield

Large arable fields and wind turbines east of A1(M)

The East Garforth and Micklefield Plateau Farmland LCA comprises flat to rolling farmland on a plateau between Garforth, Micklefield and Aberford at 50m to 90m AOD. Fields are predominantly large in size, regular in shape, bordered by fences and hedgerows and intensively farmed for arable crops. Tree cover is scarce and mature trees and shrubs are limited to screening belts along the A656 Ridge Road, the A1(M) and the Leeds to Selby Line. The amalgamation of fields for intensive agriculture has influenced the openness of the landscape, and has limited historic continuity and aesthetic qualities. Settlement consists of the village of Micklefield, including the large Garden Village estate, scattered farms and residential properties. A network of PRoW between Micklefield and the surrounding farmland adds recreational value to the landscape. The straight Roman road along Ridge Road is also a prominent feature. Detractors in the landscape include a landfill site south of Micklefield, polytunnels north-east of Garforth, overhead power lines, the M1 and A1(M) corridors and wind turbines. A restored open cast coal mine is present in the landscape to the west of A642 Aberford Road. Due to the proximity of the A1(M), the M1, the A656 Ridge Road, the A63 Selby Road and the Leeds to Selby Line, the level of tranquillity is low. The open, large-scale landscape is expansive and rural in character, and away from the main transport routes there is a sense of remoteness.

The value of this LCA is low to medium as the landscape is largely modified by arable farming, and tranquillity is influenced by motorway noise; however, there is an expansive, rural character and valued features such as the Roman road at Ridge Road.

Lotherton Wooded Parkland and Farmland



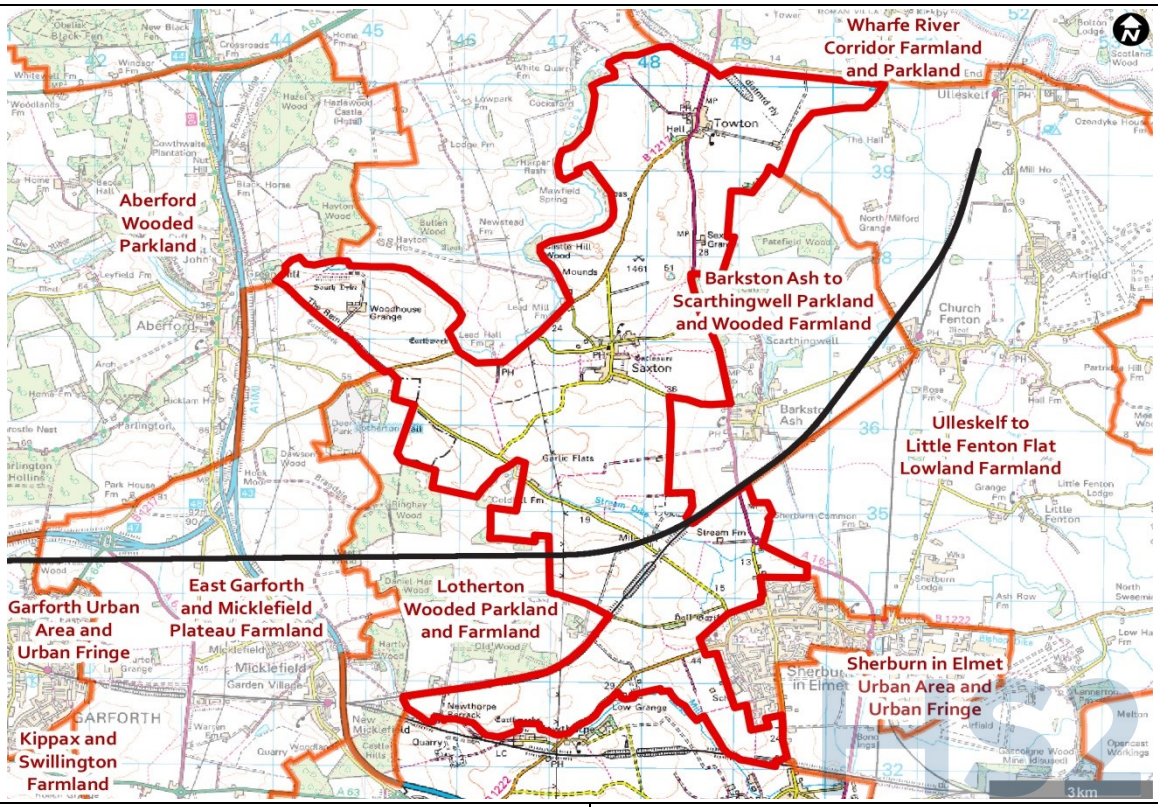
Large arable fields and woodland blocks near Huddleston Hall

Parkland at Lotherton Hall

The Lotherton Wooded Parkland and Farmland LCA consists of gently rolling farmland between 20m and 70m AOD interspersed with large woodland blocks, many of which are either classed as ancient woodland or associated with the registered park and garden at Lotherton Hall. Fields are open, large, regularly shaped and intensively managed for arable crops. This contrasts with large woodland blocks, which provide a strong sense of enclosure in the landscape. Other features contributing to a sense of place and historic continuity include mature trees within pasture, designed gardens, tree avenues, the Castle Hills prehistoric settlement and listed buildings at Lotherton Hall and Huddleston Hall. The positive effect of these features is reduced by detracting overhead power lines and wind turbines. Settlement is limited to scattered farms and residential properties. There is a network of PRoW providing connectivity with Lotherton Hall, which is open to the public as a visitor attraction. The A1(M), the A63 Selby Road and the Leeds to Selby and Micklefield to Church Fenton Lines reduce tranquillity in the landscape, although in the undeveloped, rural areas the level of tranquillity is higher. The mosaic of farmland and woodland blocks creates a series of spaces that are remote and intimate.

The value of this LCA is medium due to the large woodland blocks and the intimate rural character within them; however, the arable farmland is intensively managed and relatively monotonous, and tranquillity is influenced by motorway noise to the west.

Towton to Mill Dike Ridge Farmland



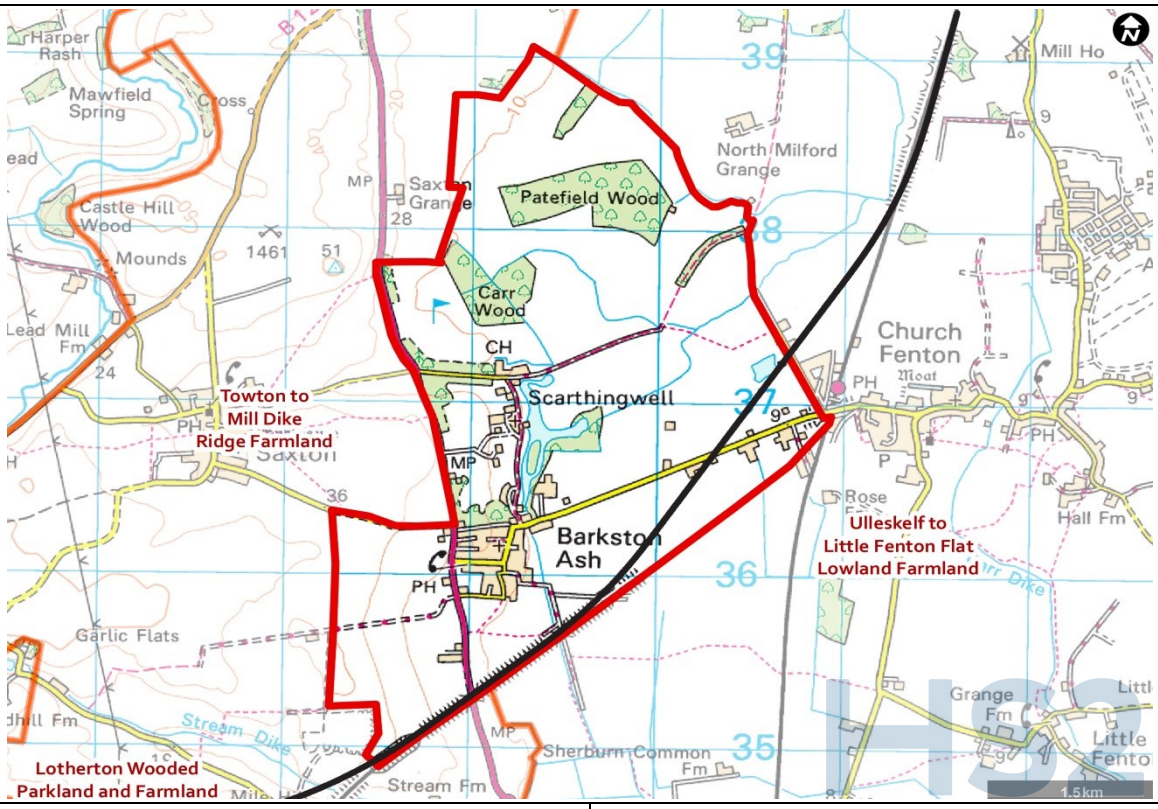
Large arable fields near Sherburn in Elmet

Rolling arable fields near Coldhill Lane

The Towton to Mill Dike Ridge Farmland LCA consists of rolling farmland along a Magnesian limestone ridge between 10m and 50m AOD. Fields are large, regularly shaped and intensively farmed for arable crops, and there is limited vegetation cover resulting in an open, simple, large-scale landscape. Individual trees and tree clumps are dispersed intermittently within the farmland such as along the narrow, winding valley of Stream Dyke, the Micklefield to Church Fenton Line and along roads such as Coldhill Lane. Settlement consists of Saxton village and scattered residential properties and farmsteads. A network of PRoW crosses the landscape, particularly near Saxton, which adds recreational value to the landscape. Features contributing to a sense of place and historic continuity include: the registered battlefield at Towton; a medieval manor complex along the B1217; and listed buildings, a motte and bailey castle and a designated conservation area at Saxton. The A162 London Road and the Micklefield to Church Fenton Line reduce tranquillity in the landscape, although in the undeveloped, rural areas the level of tranquillity is higher. The LCA has a remote and expansive character with panoramic views afforded across the surrounding rural landscape.

The value of this LCA is medium to high due to valued features such as Towton battlefield, rolling landform and the expansive, rural character; however, the arable farmland is intensively managed and relatively monotonous.

Barkston Ash to Scarthingwell Parkland and Wooded Farmland



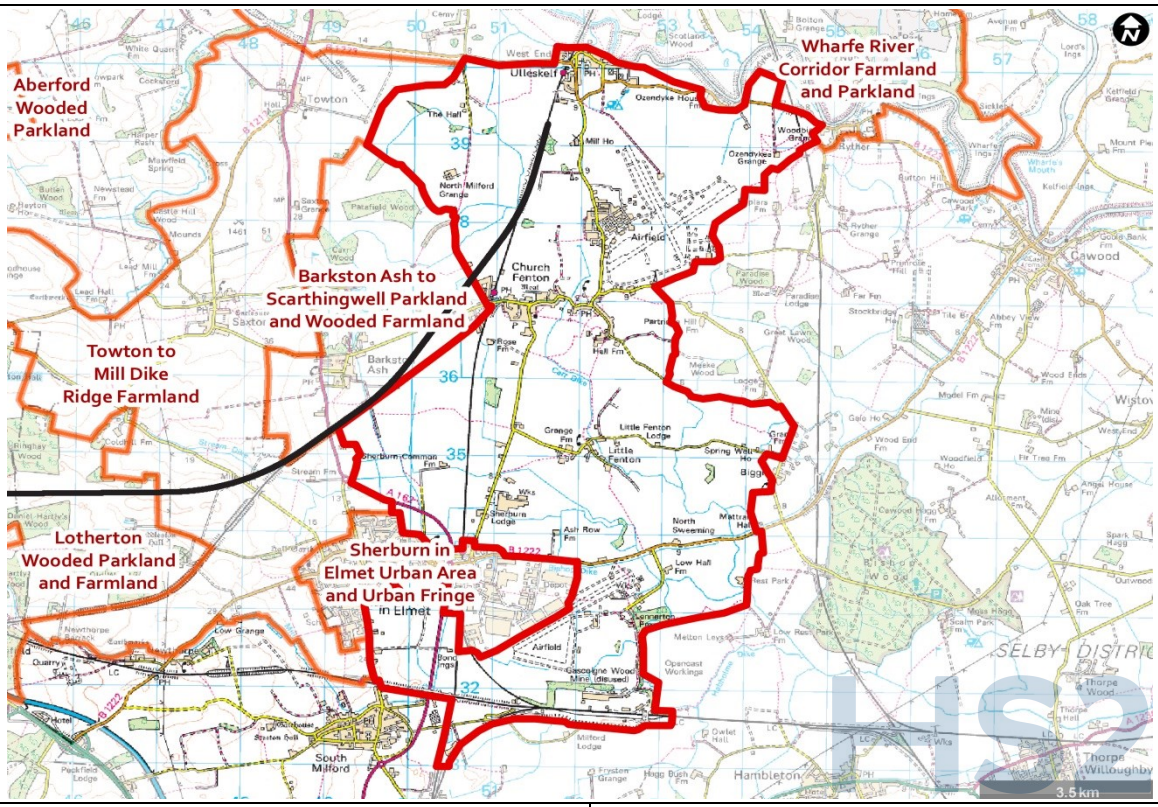
Strip fields south of Barkston Ash

Parkland at Scarthingwell Park

The Barkston Ash to Scarthingwell Parkland and Wooded Farmland LCA consists of flat to gently sloping farmland between 10m and 40m AOD, former parkland at Scarthingwell Park and Barkston Ash village. The village is focused along Main Street and Church Street and comprises detached and semi-detached houses of mixed age with private gardens and driveways. There are a few PRoW within the LCA linking the village to surrounding farmland. Fields are small, arable, narrow and regularly shaped, with some pasture fields closer to the village. Field boundaries are open, fenced or lined by ditches, with occasional clipped hedgerows and intermittent mature trees. The farmland is open in character, which contrasts with the woodland areas at Scarthingwell Park and Scarthingwell Golf Course. This tree cover creates enclosure in the landscape and a strong sense of place. Other features contributing to a sense of place and historic continuity include mature trees within pasture, designed lakes, tree avenues and listed buildings at Scarthingwell Park and Barkston Ash. However, the parkland landscape is not wholly intact due to the introduction of modern residential buildings at Highfield Care Home and along Lakeside Approach, which limits the strength of character somewhat. In addition, the landscape is influenced by the Micklefield to Church Fenton Line and the A162 London Road, and these transport infrastructure routes reduce tranquillity in the landscape. The small-scale field pattern and enclosure by woodland has resulted in an intimate, rural character within the LCA.

The value of this LCA is medium due to the large woodland blocks, parkland trees, small-scale field pattern and intimate, rural character; however, tranquillity is influenced by road noise and the existing Micklefield to Church Fenton Line.

Ulleskelf to Little Fenton Flat Lowland Farmland



Large, flat arable fields north of Church Fenton

Arable fields and isolated tree clumps near Brackenhill Lane

The Ulleskelf to Little Fenton Flat Lowland Farmland LCA comprises flat, low-lying land farmed intensively for arable crops. The amalgamation of fields has resulted in an open, simple, large-scale landscape with limited historic continuity. Field boundaries are open, fenced or lined by ditches, with occasional clipped hedgerows, individual trees and tree clumps. Woodland blocks are present intermittently and there are screening belts at settlements, along roads and at the British Gypsum works. Settlement is limited to villages such as Church Fenton, isolated farmsteads and residential properties, and airfields near Church Fenton and Sherburn in Elmet. A network of PRoW between villages and the River Wharfe corridor in the north add recreational value to the landscape. Features contributing to a sense of place include listed buildings at Church Fenton and Ulleskelf and the World War II defences at the airfield in Church Fenton. Limited built development has resulted in a strong rural character, although the York to Church Fenton Line, Sherburn-in-Elmet and Church Fenton airfields, and development at the British Gypsum works reduce tranquillity. The flat landform has a strong influence on the character of the surrounding landscape and contributes positively to its aesthetic quality; however, this is reduced by detracting features such as the British Gypsum works. The LCA has a remote, rural and expansive character due to the flat landform and limited development.

The value of this LCA is medium due to the flat landform, expansive, rural character and sense of remoteness; however, the arable farmland is intensively managed and relatively monotonous.

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: LA16 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[133], 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 Garforth and Sherburn in Elmet; the villages of Micklefield, Newthorpe, Saxton, Barkston Ash, Church Fenton and Ulleskelf; and numerous farmsteads and isolated residential properties.

11.3.9 Views from residences are filtered[134] or open depending on the location. Mature trees and shrubs along the northern edge of Garforth restrict views, whereas the fields south of Barkston Ash are open in character. Many views are open due to limited boundary vegetation within the intensively farmed arable fields. Large woodland blocks such as those near Huddleston Hall serve to limit long distance views in places, as does the combination of the flat landscape and intermittent hedgerows and tree copses near Ulleskelf.

11.3.10 Several PRoW (such as footpaths and bridleways) are located within farmland throughout the study area. The Leeds Country Way runs between Garforth and the M1, and the National Cycle Network route 66 is located along Barwick Road and Barrowby Lane near Garforth. Generally, the highest densities of PRoW are near to the towns and villages.

11.3.11 Similar to the residences above, views from recreational routes tend to be relatively open, with some filtering of views where there are hedgerow field boundaries and blocks of screening vegetation along roads, existing railways between Leeds and York and Leeds and Selby, and settlement edges.

11.3.12 Views from rural roads such as Common Road to the east of Barkston Ash and the B1223 New Road in Ulleskelf are relatively open except where filtered by roadside hedgerows. Views are rural in character although moving trains along the Micklefield to Church Fenton and York to Church Fenton Lines are visible.

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

[133] Reference to specific footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath.
[134] Filtered views are less open due to vegetation.

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 2030. 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)[135] 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[136];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings, drainage features and replacement floodplain storage areas; erection of viaducts and a grade separated junction; construction of embankments; the removal of existing landscape elements including trees and

[135] Supporting document: Draft Code of Construction Practice
[136] *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*. London, BSI Standards Limited

hedgerows; and the closures and diversions of existing public highways and PRoW. Other key changes include: the construction of overbridges and underbridges; the construction of auto-transformer stations; utility diversions; the presence of transfer nodes, Sherburn railhead, compounds and material stockpiles, and the demolition and removal of existing buildings and structures.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 26 would be significantly affected during construction of the Proposed Scheme.

Table 26: Summary description and assessment of effects on LCAs

Garforth Urban Area and Urban Fringe	**Medium susceptibility and sensitivity**
Susceptibility to change: The urban fringe character, gently sloping landform, woodland block at Hawk's Nest Wood and small-scale field pattern have a medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for the Leeds to Selby overbridge, East Garforth cutting, Micklefield embankment and cutting and structures such as Barwick Road overbridge and the Leeds Bridleway 123 accommodation overbridge, which would be at variance with the urban fringe character. There would also be the presence of ancillary features such as Micklefield embankment satellite compound, which would notably alter landscape character. Construction works would result in the partial removal of woodland at Hawk's Nest Wood, hedgerow field boundaries and tree and shrub belts, which would erode aesthetic qualities and reduce the strength of character and enclosure. Large-scale earthworks and temporary material stockpile areas would be prominent in the gently sloping landform. The small-scale field pattern would partially be removed. Construction movements and machinery would reduce tranquillity and introduce visual disturbance, albeit in an urban fringe area adjacent to the M1. The Proposed Scheme would result in substantial changes to key characteristics, in particular due to vegetation removal at Hawk's Nest Wood and changes in landform and field pattern. There would therefore be a high magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
East Garforth and Micklefield Plateau Farmland	**Low to medium susceptibility and sensitivity**
Susceptibility to change: The large-scale rolling farmland with limited tree cover and a rural, expansive character has a low to medium susceptibility to change arising from the Proposed Scheme. Construction works for Micklefield cutting, Weet Wood cut and cover tunnel, Weet Wood cutting, A1(M) cutting, Ringhay Wood cutting and embankment and structures such as the Ridge Road overbridge would directly affect the LCA and would be at variance with the expansive, rural character. There would also be the presence of ancillary features such as Weet Wood cutting satellite compound and site haul routes, which would be uncharacteristic in the rural landscape. Large-scale earthworks and temporary material stockpile areas would be prominent in the rolling landform. A small number of hedgerows and tree and shrub blocks would be removed, and construction works would result in the removal of arable farmland, a reduction in the size of some fields and change in their shape. The Roman road along Ridge Road would also be directly affected, and the straight road would be less defined in the landscape. In addition, construction movements and machinery would reduce tranquillity and introduce visual disturbance, although this would be in the context of traffic on the M1 and the A1(M), and trains on the Leeds to Selby Line. The Proposed Scheme would result in substantial changes to key characteristics, in particular the severance of the landscape pattern and changes in landform. There would therefore be a high magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Lotherton Wooded Parkland and Farmland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The gently rolling farmland and large woodland blocks with a remote and intimate character have a medium to high susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction activity associated with Ringhay Wood embankment and site haul routes, which would be at considerable variance with the remote and intimate character. Construction movements and machinery would reduce tranquillity and introduce visual disturbance in this notably rural and tranquil part of the LCA. In addition, construction works would result in the removal of arable farmland, a reduction in the size of some fields and change in their shape. The landform would be altered by earthworks and temporary material stockpile areas, although they would be relatively small in scale and visually screened from the majority of the LCA by existing woodland blocks. The works would result in the removal of a section of woodland at Weet Wood, although components of the ancient woodland would not be affected. The Proposed Scheme would result in substantial changes in key characteristics, in particular due to changes in the remote and intimate character, and reduction in tranquillity. There would therefore be a high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Towton to Mill Dike Ridge Farmland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The rolling, tranquil farmland and remote, expansive, rural character have a medium to high susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for the Ringhay Wood embankment, Stream Dyke viaduct, Barkston Ash embankment and Far Fox Covert and Coldhill Lane underbridges, as well as ancillary features such as the Stream Dyke embankment satellite compound, which would be at considerable variance with the remote, expansive, rural character. Large-scale earthworks and temporary material stockpile areas would be prominent in the rolling landscape. Removal of trees and a hedgerow along Coldhill Lane, and trees and shrubs at Copley Lane landfill site and along the Micklefield to Church Fenton Line would erode aesthetic qualities and reduce the strength of character. Construction works would result in the removal of arable farmland, a reduction in the size of some fields and change in their shape. Construction movements and machinery would reduce tranquillity and introduce visual disturbance, although this would be in the context of trains on the Micklefield to Church Fenton Line. The Proposed Scheme would result in substantial changes in key characteristics, in particular due to changes in the remote, expansive, rural character, changes in landform, and reduction in tranquillity. There would therefore be a high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Barkston Ash to Scarthingwell Parkland and Wooded Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The small-scale farmland, intimate rural character, flat to gently sloping landform and large woodland blocks have a medium susceptibility to change arising from the Proposed Scheme. Construction works for the Barkston Ash embankment, Church Fenton viaduct, Common Lane realignment and structures such as the A162 London Road underbridge would directly affect the LCA and would be at considerable variance with the intimate, rural character. There would also be the presence of ancillary features such as the Barkston Ash embankment satellite compound and batching plant, which would introduce uncharacteristic features into the rural landscape. Removal of mature trees and shrubs along the Micklefield to Church Fenton Line, woodland at Sandwath Lake and dense hedgerow field boundaries south of Common Lane would erode aesthetic qualities and reduce the strength of character and enclosure. Large-scale earthworks and temporary material stockpile areas would be prominent in the flat to gently sloping landform. Construction works would alter the historic landscape pattern by further reducing the small-scale field size and resulting in the removal of arable land. Construction movements and machinery would reduce tranquillity and introduce visual	Level of effect: Major adverse (significant)

disturbance, although this would be in the context of moving trains on the Micklefield to Church Fenton Line. The Proposed Scheme would result in substantial changes in key characteristics, in particular the severance of the small-scale landscape pattern, removal of vegetation and changes in landform and the intimate, rural character. There would therefore be a high magnitude of change and major adverse effect.	
Ulleskelf to Little Fenton Flat Lowland Farmland	**Low to medium susceptibility and medium sensitivity**
Susceptibility to change: The large-scale, flat farmland with limited tree cover and an expansive, remote, rural character has a low to medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works for the Common Lane realignment, Sandwath Lane diversion, Church Fenton viaduct and embankment and the grade separated junction over the realigned down Leeds track[137], which would be at considerable variance with the expansive, remote, rural character. There would also be the presence of ancillary features such as the Church Fenton viaduct satellite compound, which would introduce uncharacteristic features into the rural landscape. Temporary material stockpile areas and earthworks at the Church Fenton embankment would be prominent in the flat landscape. Removal of a hedgerow along Common Lane, and mature trees, shrubs and woodland along the York to Church Fenton Line would erode aesthetic qualities and reduce the strength of character. Construction works would result in the removal of arable farmland, a reduction in the size of some fields and change in their shape. Construction movements and machinery would reduce tranquillity and introduce visual disturbance, although this would be in the context of moving trains on the Micklefield to Church Fenton and York to Church Fenton Lines. The Proposed Scheme would result in substantial changes in key characteristics, in particular due to changes in landform and the expansive, remote, rural character, and removal of vegetation. There would therefore be a high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)

Visual assessment

Introduction

11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.10 Night time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

[137] Northbound York to Church Fenton Line

11.4.11 The construction phase potentially significant visual effects based on the current design of the Proposed Scheme are described in Table 27. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA16 Map Book.

Table 27: Construction phase potentially significant visual effects

Views east from Temple Newsam bridle path near Bullerthorpe Lane (VPs 428-03-025 and 428-03-021 (Map Number LV-03-428))	**High sensitivity receptors**
Users of PRoW would experience a noticeable change in near distance views as construction works for Swillington cutting and Swillington Footpath 1 and Bridleway 11 overbridges, and ancillary features such as West Garforth south embankment transfer node and temporary material stockpiles, would be visible as uncharacteristic features in the rural landscape to the east (these features are within LA15 Warmfield to Swillington and Woodlesford). Removal of hedgerow field boundaries would open up and change the character of views, and removal of streamside vegetation would result in more open views into the Aire valley from PRoW to the south. Views towards construction works would be filtered by mature trees and shrubs along the M1. In addition, construction works would be viewed in the context of moving traffic and road signs on the M1. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from Austhorpe Footpath 6 west of Garforth and a residence and caravan park along the footpath (VP 429-03-022 (Map Number LV-03-429b))	**High sensitivity receptors**
Users of PRoW would experience a substantial change in near distance views as construction activity, earth moving and machinery associated with West Garforth north embankment would be visually prominent to the east, and there would be views towards uncharacteristic temporary material stockpile areas and site haul routes. The removal of woodland at Carr Wood would alter the character of views to the north-east, as well as opening up views towards construction works. Removal of hedgerow field boundaries would also be visible to the east. Construction works would be viewed against a backdrop of elevated landform and buildings at Garforth. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north-west from non-definitive footpath Austhorpe and south-east from the Leeds Country Way/National Cycle Network route 66 north-west of Garforth (VPs 429-03-023 and 429-03-017 (Map Number LV-03-429b))	**High sensitivity receptors**
Construction works for the West Garforth north embankment, West Garforth cutting, A63 Selby Road viaduct, Leeds Bridleway 125 accommodation overbridge and the Leeds to Selby overbridge would reduce the scenic quality of views north-west or south-east and result in a substantial change in near distance views from PRoW (some of these features are within LA15 Warmfield to Swillington and Woodlesford). Excavation works for the West Garforth cutting would be most prominent as the shape of the ridgeline would be altered. The associated removal of distinctive mature beech trees would notably alter the character of views. The West Garforth cutting main compound, temporary material stockpile areas and site haul routes would also represent uncharacteristic features in the view. Views of construction works would be against a backdrop of road infrastructure along the M1 and buildings within Thorpe Park. There would therefore be a high magnitude of change and a major adverse effect. There would potentially be views towards construction works from the residential property (Barrowby Hall) in proximity to these viewpoints. However, this property is not publicly accessible and views could not be assessed. It is likely that views would be filtered by vegetation on the property boundary.	**Level of effect:** Major adverse (significant)
Views north-west from Garforth Footpath 5 and residences along the north-west edge of Garforth (VPs 429-03-008, 428-02-023, 429-02-018 and 429-02-009 (Map Number LV-03-429b))	**High sensitivity receptors**

Occupants of residences and users of PRoW would experience a noticeable change in middle to long distance views as construction works for West Garforth north embankment, West Garforth cutting, A63 Selby Road viaduct, Leeds Bridleway 125 accommodation overbridge and the Leeds to Selby overbridge would be visually prominent within farmland to the north-west (some of these features are within LA15 Warmfield to Swillington and Woodlesford). Ancillary features such as the West Garforth cutting main compound would also represent uncharacteristic features in the view. Removal of woodland at Carr Wood would open up views to construction works. In addition, removal of distinctive mature beech trees would alter the character of views towards the horizon. Views of construction works would be against a backdrop of road infrastructure along the M1 and buildings within Thorpe Park. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from Leeds Bridleway 125 on Barrowby Lane west of the M1 (VP 429-03-020 (Map Number LV-03-429b))	**High sensitivity receptors**
Users of PRoW would experience a noticeable change in near distance views as construction works for West Garforth north embankment and cutting would reduce the scenic quality of views east, as would the West Garforth cutting main compound and temporary material stockpile areas. Removal of woodland at Carr Wood would open up and change the character of views to the south-east and there would be glimpsed views towards the removal of mature trees at Barrowby Hall and along the Leeds Country Way to the north-east. Construction works would be viewed against a backdrop of elevated landform and buildings at Garforth, and in the context of moving traffic and road signs along the M1. Views would also be filtered by intervening hedgerows and mature trees along the M1. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views north from Barwick Bridleway 10 and residences on Nanny Goat Lane north-west of Garforth (VP 429-03-021 (Map Number LV-03-430))	**High sensitivity receptors**
Construction works for East Garforth cutting and Leeds to Selby overbridge, temporary material stockpile areas and site haul routes would be highly prominent in fields to the north-west and would result in a substantial change in near distance views from residences and PRoW. There would also be views towards uncharacteristic construction works for Leeds Bridleway 123 accommodation overbridge. Removal of mature trees and shrubs along the Leeds to Selby Line and field boundaries to the north-east would open up and change the character of views. Construction works would be viewed against a backdrop of existing road infrastructure and moving traffic along the M1. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north from Nanny Goat Lane/non-definitive Bridleway Barwick (VP 429-03-014 (Map Number LV-03-430))	**High sensitivity receptors**
Users of PRoW would experience a noticeable change in near distance views as construction activity, earth moving and machinery for the East Garforth cutting and Barwick Road overbridge would be visible to the north. The Micklefield embankment satellite compound and temporary material stockpile areas would also represent uncharacteristic features in the view. Removal of mature trees and shrubs along the M1 would open up views towards moving traffic slightly. Removal of woodland at the existing Barwick Road overbridge would notably change the character of views. Views of construction works would be against a backdrop of existing road infrastructure and moving traffic along the M1, and would be filtered by a dense hedgerow to the north of Nanny Goat Lane. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south from Barwick Bridleway 12 and non-definitive Bridleway Parlington near Barwick Road north of the M1 (VP 430-03-003 and 430-03-006 (Map Number LV-03-430))	**High sensitivity receptors**
Construction works for East Garforth cutting and Barwick Road overbridge would be visually prominent to the south and would result in a substantial change in near distance views from PRoW. Construction works for the Leeds to Selby overbridge and Micklefield embankment, and ancillary features such as the Micklefield embankment satellite compound, would also represent uncharacteristic features in the view. Removal of distinctive mature beech trees would alter the character of views towards the horizon, and partial removal of woodland at Hawk's Nest Wood would open up views towards construction works and industrial units north of Garforth. In addition, the removal of woodland at the existing Barwick Road overbridge would notably change the character of views. Construction works would be viewed in the context of moving traffic and road signs on	**Level of effect:** Major adverse (significant)

the M1. There would therefore be a high magnitude of change and a major adverse effect.	
Views north from Sturton Grange Footpath 1, Garforth Footpaths 7 and 8, and residences along the northern edge of Garforth (VPs 430-03-002, 430-03-001 and 431-02-009 (Map Number LV-03-431))	**High sensitivity receptors**
Occupants of residences and users of PRoW would experience a substantial change in near distance views as construction works for the Micklefield embankment and cutting and Sturton Grange Footpath 6 accommodation overbridge, and ancillary features such as Micklefield cutting satellite compound and temporary material stockpile areas, would reduce the scenic quality of views north. Partial removal of woodland at Hawk's Nest Wood would notably change the character of views and would open up views towards construction works and moving traffic on the M1. Occupants of residences would also have views towards construction works and machinery associated with Weet Wood cut and cover tunnel and the A642 Aberford Road reinstatement. Views of construction works would be against a backdrop of road infrastructure along the M1, and would be filtered by intervening tree and shrub vegetation. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views south from residences along Aberford Road (VPs 431-02-006 (Map Number LV-03-432))	**High sensitivity receptors**
Occupants of residences would experience a noticeable change in middle distance views as construction works for Weet Wood cutting and Ridge Road overbridge would introduce uncharacteristic features into views south. The Weet Wood cutting transfer node, temporary material stockpile areas and site haul routes would also detract from views. Removal of mature trees and shrubs along Sturton Dyke, the A642 Aberford Road and the A656 Ridge Road would open up and change the character of views. Construction works would be viewed in the context of road infrastructure along the M1, and would be filtered by intervening tree and shrub vegetation along the M1. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views north from residences and Micklefield Footpath 3 off Ridge Road north-west of Micklefield (VPs 432-02-007 and 432-03-008 (Map Number LV-03-432))	**High sensitivity receptors**
Users of PRoW and occupants of residences would experience a substantial change in near to middle distance views as construction works for Weet Wood cutting and the Ridge Road, Great North Road, A1(M) Northbound and Southbound overbridges would reduce the scenic quality of views north. Ancillary features such as the Weet Wood cutting satellite compound and temporary material stockpile areas would also be prominent. Removal of distinctive tree copses and field boundary hedgerows would alter the character of views. Construction works would be present across a large proportion of the view, although viewed against a backdrop of moving traffic along the M1 and A1(M), pylons and wind turbines. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north and south from Micklefield Footpaths 1 and 11 at Ringhay Wood (VPs 433-03-014 (Map Number LV-03-433) and 432-03-006 (Map Number LV-03-432))	**High sensitivity receptors**
Construction activity, earth moving and machinery associated with Ringhay Wood cutting and embankment, Weet Wood cutting, A1(M) cutting and the A1(M) Northbound and Southbound overbridges would be visually prominent to the north or south and would result in a noticeable change in near to middle distance views from PRoW. There would also be views towards uncharacteristic ancillary features such as Ringhay Wood cutting satellite compound and transfer node. Removal of woodland at Weet Wood would alter the character of views slightly, and removal of mature trees and shrubs along the A1(M) would open up views towards moving traffic. Construction works would be viewed in the context of road infrastructure and moving traffic along the A1(M), and wind turbines. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south from Micklefield Footpath 1 at Weet Wood (VPs 433-03-008 and 433-03-009 (Map Number LV-03-433))	**High sensitivity receptors**
Users of PRoW would experience a substantial change in near distance views as construction works for the Ringhay Wood embankment, temporary material stockpile areas and site haul routes would be visible to the south as uncharacteristic features in the rural landscape. Removal of woodland at Weet Wood would open up and change the character of views slightly to the south-west. Construction works would be viewed against a backdrop of large woodland blocks. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)

Views north from Footpath 35.57/16/1 at Huddleston Hall (VP 433-03-002 (Map Number LV-03-433))	**High sensitivity receptors**
Users of PRoW would experience a noticeable change in middle to long distance views as construction works for Ringhay Wood embankment, temporary material stockpile areas and site haul routes would be visible to the north as uncharacteristic features in the rural landscape. Removal of woodland at Middle Fox Covert would open up and change the character of views slightly to the north-east. Construction works would be viewed against a backdrop of woodland blocks and distant farmland and views would be filtered by intervening hedgerow field boundaries and trees. There would therefore be a medium magnitude of change and a moderate adverse effect. There would potentially be views towards construction works from the upper floors of the residential property (Huddleston Hall) in proximity to this viewpoint. However, the upper floors of this property are not publicly accessible and views could not be assessed. It is likely that views would be filtered by vegetation in the property garden.	**Level of effect:** Moderate adverse (significant)
Views south-east from Footpath 35.57/5/1 north of Coldhill Lane (VP 434-03-011 (Map Number LV-03-434))	**High sensitivity receptors**
Construction works for the eastern end of the Ringhay Wood embankment, Coldhill Lane underbridge, Stream Dyke viaduct and Barkston Ash embankment would be visually prominent in fields to the south-east and would result in a noticeable change in middle distance views from PRoW. Ancillary features such as Stream Dyke embankment satellite compound, temporary material stockpile areas and site haul routes would also represent uncharacteristic features in the view. Removal of a hedgerow and intermittent trees along Coldhill Lane and mature trees and shrubs at the Copley Lane landfill site and along the Micklefield to Church Fenton Line would open up and alter the character of views. Views further east and west would be screened by rolling landform. Construction works would be viewed in the context of moving machinery within Copley Lane landfill site, which is an existing detractor in the view. There would therefore be a medium magnitude of change and a moderate adverse effect. There would potentially be views towards construction works from the residential property (Coldhill Farm) approximately 500m west of this viewpoint. However, this property is not publicly accessible and views could not be assessed. It is likely that views would be filtered by woodland at Near, Middle and Far Fox Covert.	**Level of effect:** Moderate adverse (significant)
Views north-west from Footpath 35.57/29/1 north-west of Sherburn in Elmet (VP 434-03-009 (Map Number LV-03-434))	**High sensitivity receptors**
Construction works for Ringhay Wood embankment, Coldhill Lane underbridge, Stream Dyke embankment and viaduct and Barkston Ash embankment would be visible as uncharacteristic features to the north and would result in a noticeable change in middle distance views from PRoW. Removal of mature trees and shrubs along the Micklefield to Church Fenton Line and within the Copley Lane landfill site would also change the character of views. Construction works would be partially screened by the embankments of the Micklefield to Church Fenton Line, and viewed in the context of moving trains and against a backdrop of the Copley Lane landfill site. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Views south-east from Footpath 35.4/6/1 south of Barkston Ash (VP 435-03-003 (Map Number LV-03-435))	**High sensitivity receptors**
Users of PRoW would experience a substantial change in near distance views as construction activity and machinery associated with Barkston Ash embankment and A162 London Road and Saw Wells Lane underbridges would reduce the scenic quality of views south. Ancillary features such as the Barkston Ash embankment satellite compound and temporary material stockpile areas would also represent uncharacteristic features in the view, as would construction works for Stream Dyke viaduct and Ringhay Wood embankment in oblique views west. Removal of mature trees and shrubs along the Micklefield to Church Fenton Line would open up and change the character of views slightly. Construction works would be viewed in the context of embankments and moving trains along the Micklefield to Church Fenton Line. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
	High sensitivity

Views north from Footpaths 35.4/8/1, 35.4/9/1 and 35.57/1/1 north of Sherburn in Elmet (VPs 435-03-002, 434-03-004 and 435-03-007 (Map Number LV-03-435))	**receptors**
Construction works for Barkston Ash embankment and A162 London Road and Saw Wells Lane underbridges would be visually prominent in fields to the north and would result in a noticeable change in middle distance views from PRoW. There would also be views towards the uncharacteristic Barkston Ash embankment batching plant, and long distance views north towards construction works for the large-scale Church Fenton viaduct. Removal of mature trees and shrubs along the Micklefield to Church Fenton Line would open up and change the character of views slightly. Construction works would be viewed in the context of embankments and moving trains along the Micklefield to Church Fenton Line, with the existing embankments providing some screening of construction works. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from residences on Common Road in Barkston Ash (VP 435-02-004 (Map Number LV-03-435))	**High sensitivity receptors**
Occupants of residences would experience a noticeable change in near distance views as construction works for Barkston Ash embankment, Church Fenton viaduct, Common Lane realignment and Sandwath Lane diversion would reduce the scenic quality of views south-east. Ancillary features such as Church Fenton viaduct satellite compound and temporary material stockpile areas would also represent uncharacteristic features in the view. Removal of dense hedgerows and woodland south of Common Lane, hedgerows and intermittent trees along Common Lane and mature trees and shrubs along the Micklefield to Church Fenton Line would open up and change the character of views. Construction works to the south would be viewed in the context of embankments and moving trains along the Micklefield to Church Fenton Line, and views would be filtered by intermittent vegetation along the property boundaries. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east for road users along Common Road east of Barkston Ash (VP 435-04-006 (Map Number LV-03-436))	**Medium sensitivity receptors**
Construction activity, earth moving and machinery associated with Barkston Ash embankment, Church Fenton viaduct, Common Lane realignment and Sandwath Lane diversion would be visually prominent to the south-east and would result in a substantial change in near distance views for road users along Common Road. There would also be views towards uncharacteristic features such as the Church Fenton viaduct satellite compound and temporary material stockpile areas. Removal of dense hedgerows and woodland south of Common Lane, hedgerows and intermittent trees along Common Lane and mature trees and shrubs along the Micklefield to Church Fenton Line would open up and change the character of views. Removal of woodland at Sandwath Lake would also change the character of views to the east. Construction works to the south would be viewed in the context of embankments and moving trains along the Micklefield to Church Fenton Line. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west for road users along Common Lane at Church Fenton (VP 436-04-013 (Map Number LV-03-436))	**Medium sensitivity receptors**
Large-scale construction works for Church Fenton viaduct and Common Lane realignment would be highly prominent in the flat, rural landscape to the west and viewed against the skyline, resulting in a substantial change in near distance views for road users along Common Lane. There would also be views towards uncharacteristic features such as site haul routes, temporary material stockpile areas and Church Fenton viaduct satellite compound, and construction works for the replacement floodplain storage area. Removal of mature trees along Common Lane and woodland at Sandwath Lake would notably change the character of views. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from Bridleway 35.55/14/1 east of Scarthingwell Lane (VP 435-03-010 (Map Number LV-03-436))	**High sensitivity receptors**

Users of PRoW would experience a noticeable change in middle to long distance views as construction works for Church Fenton viaduct, Barkston Ash embankment, Common Lane realignment and Sandwath Lane diversion would be visible across a large proportion of views south-east and viewed against the skyline. There would also be views towards uncharacteristic ancillary features such as Church Fenton viaduct satellite compound and temporary material stockpile areas, as well as construction works for replacement floodplain storage areas to the north-east and south-east. Removal of woodland at Sandwath Lake, field boundary hedgerows and woodland south of Common Lane would notably 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 north-west or south from Bridleway 35.42/2/1, Footpath 35.22/1/1 and residences on Sandwath Lane **(VPs 436-03-005, 436-03-004, 436-02-002 and 436-02-012 (Map Number LV-03-436))**	**High sensitivity receptors**
Occupants of residences and users of PRoW would experience a substantial change in near distance views as large-scale construction works for Church Fenton viaduct would be highly prominent in the flat, rural landscape to the north-west or south-east and would be present across a large proportion of the view. There would also be views towards the uncharacteristic Church Fenton satellite compound, temporary material stockpile areas and site haul routes. Construction works for the replacement floodplain storage, Common Lane realignment and Sandwath Lane diversion area would also be visible from the PRoW. Removal of woodland at Sandwath Lake would open up views towards construction works and notably 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)
Views north from residences north of Sandwath Drive in Church Fenton **(VPs 436-02-007 and 436-02-008 (Map Number LV-03-436))**	**High sensitivity receptors**
Large-scale construction works for Church Fenton viaduct, the grade separated junction over the realigned down Leeds track[138] and a balancing pond would be highly prominent in the flat, rural landscape and would be present across a large proportion of views to the north, resulting in a substantial change in near distance views from the residences. Removal of woodland at Sandwath Lake would notably change the character of views west, and removal of intermittent mature trees and shrubs along the York to Church Fenton Line would result in more open views of moving trains. Construction works would be viewed in the context of moving trains along the York to Church Fenton Line. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north-west from residences at Church Fenton **(VPs 437-02-001 (Map Number LV-03-437) and 436-02-003 (Map Number LV-03-436))**	**High sensitivity receptors**
Occupants of residences would experience a substantial change in middle distance views as large-scale construction works for Church Fenton viaduct and the grade separated junction over the realigned down Leeds track[139] would be highly prominent in the flat, rural landscape and would be present across a large proportion of views north-west. There would also be near distance views towards uncharacteristic construction works for the replacement floodplain storage area in fields adjacent to the residences. Removal of intermittent mature trees and shrubs along the York to Church Fenton Line would result in more open views of moving trains. Removal of tree copses for the construction of the replacement floodplain area would change the character of near distance views. Construction works would be viewed in the context of moving trains along the York to Church Fenton Line. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from residences on Church Fenton Lane south of Ulleskelf **(VP 437-02-009 (Map Number LV-03-437))**	**High sensitivity receptors**
Occupants of residences would experience a substantial change in middle to long distance views as large-scale construction works for Church Fenton viaduct and embankment and the grade separated junction over the realigned down Leeds track would be highly prominent in the flat, rural landscape and viewed against the skyline to the west. There would also be views north-west towards uncharacteristic features such as Church Fenton embankment east satellite compound and temporary material stockpile areas, and south-west towards	**Level of effect:** Major adverse (significant)

[138] Northbound York to Church Fenton Line

construction works for the replacement floodplain storage area. Removal of woodland to the east of the existing York to Church Fenton Line would notably change the character of views. There would therefore be a high magnitude of change and a major adverse effect.	
Views south-east from Footpath 35.70/1/1 west of Ulleskelf (VPs 437-03-002 and 437-03-014 (Map Number LV-03-437))	**High sensitivity receptors**
Users of PRoW would experience a substantial change in near to middle distance views as large-scale construction works for Church Fenton viaduct and embankment and the grade separated junction over the Northbound York to Church Fenton Line would be highly prominent in the flat, rural landscape and would be present across a large proportion of views south-east. The Church Fenton embankment west satellite compound and transfer node, and construction works for the replacement floodplain storage area, would also be highly prominent as they would be located in fields adjacent to the PRoW. Removal of intermittent mature trees and shrubs along the York to Church Fenton Line would result in more open views of moving trains. Construction works would be viewed in the context of moving trains along the York to Church Fenton Line. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from Footpath 35.70/5/1 south-east of Ulleskelf (VP 437-03-003 (Map Number LV-03-437))	**High sensitivity receptors**
Construction works for Church Fenton viaduct and embankment and the grade separated junction over the Northbound York to Church Fenton Line would reduce the scenic quality of views west and would result in a noticeable change in near distance views from PRoW. The Church Fenton embankment west satellite compound and transfer node, and construction works for the replacement floodplain storage area, would also represent uncharacteristic features in views west although would be partially screened by existing embankments. Removal of woodland blocks to the south would open up views towards construction works and notably change the character of views. Removal of intermittent mature trees and shrubs along the York to Church Fenton Line would result in more open views of moving trains. Construction works would be viewed in the context of moving trains along the York to Church Fenton Line. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-west for road users along B1223 New Road (VP 437-04-005 (Map Number LV-03-438))	**Medium sensitivity receptors**
Road users of the B1223 New Road would experience a substantial change in near distance views as construction works for Church Fenton embankment and the grade separated junction over the realigned down Leeds track[140] would introduce uncharacteristic features into views south-west. There would also be middle to long distance views south-west towards construction works for Church Fenton viaduct. The Church Fenton embankment west satellite compound and transfer node, and construction works for the replacement floodplain storage area, would be highly prominent as they would be located in fields close to the B1223 New Road. Removal of intermittent mature trees and shrubs along the York to Church Fenton Line would result in more open views of moving trains. Construction works would be viewed in the context of moving trains along the York to Church Fenton Line. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from Footpath 35.70/4/2 near Outwood Lane south-east of Ulleskelf (VP 437-03-010 (Map Number LV-03-437))	**High sensitivity receptors**
Construction works for Church Fenton viaduct and embankment and the grade separated junction over the realigned down Leeds track would be visually prominent in long distance, rural views west from the PRoW and would result in a noticeable change. Ancillary features such as Church Fenton embankment east satellite compound and temporary material stockpile areas, and construction works for the replacement floodplain storage area would also be prominent. Removal of woodland to the east of the existing York to Church Fenton Line would notably change the character of views. Construction works would be visible across a large proportion of long distance views, and viewed against the skyline. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

[140] Northbound York to Church Fenton Line

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 and 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 four LCAs;
- moderate adverse landscape effects in relation to two LCAs;
- major adverse visual effects on views from nine residential viewpoint locations;
- major adverse visual effects on views from 16 recreational viewpoint locations;
- moderate adverse visual effects on views from five residential viewpoint locations;
- moderate adverse visual effects on views from 16 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 West Garforth north embankment and Barkston Ash 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 and appropriate complementary species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the partial loss of woodland at Barrowby Hall, Hawk's Nest Wood at Garforth and woodland at Sandwath Lake in Church Fenton, 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 north of Garforth, near to Huddleston Hall and between Church Fenton and Ulleskelf; and
- provision of new areas of informal semi natural green space at Garforth and Church Fenton.

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 Leeds to Selby overbridge; Weet Wood cut and cover tunnel; Stream Dyke and Church Fenton viaducts; bridges such as the Great North Road, A1(M) Northbound and Southbound and Ridge Road overbridges and A162 London Road and Saw Wells Lane underbridges; the Barwick Road overbridge; the permanent highway diversion of Sandwath Lane; and the presence of earthworks such as Micklefield cutting and embankment, Weet Wood cutting, Ringhay Wood cutting and embankment and Barkston Ash embankment. Other aspects include the presence of overhead line equipment, auto-transformer stations and a noise fence barrier.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCAs described in Table 28 would be significantly affected during operation of the Proposed Scheme.

Table 28: Operational phase significant landscape effects

Garforth Urban Area and Urban Fringe	**Medium susceptibility and sensitivity**
Susceptibility to change: The urban fringe character, gently sloping landform, woodland block at Hawk's Nest Wood and small-scale field pattern have a medium susceptibility to change arising from the Proposed Scheme. **Year 1**: The Proposed Scheme would be at variance with the urban fringe landscape. The gently sloping LCA would be directly affected by new earthworks associated with the East Garforth cutting and Micklefield embankment and cutting, which would result in the partial loss of the small-scale field pattern. The largest earthworks would be at the western end of the East Garforth cutting, which would be up to 17m deep. Vegetation loss would result in a more open landscape, particularly due to the partial loss of woodland at Hawk's Nest Wood. The Barwick Road overbridge would be more prominent in the landscape than the existing overbridge as the embankments would be longer, and mitigation vegetation would not yet have established to integrate the structure into the landscape. Moving trains would reduce tranquillity, although this would be perceived within an urban fringe area adjacent to the M1. Two PRoW would be permanently diverted along longer routes than existing, reducing the recreational value in the landscape slightly. The Proposed Scheme would result in substantial changes to key characteristics, in particular due to changes in landform and field pattern and vegetation loss at Hawk's Nest Wood. There would therefore be a high magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Partial maturity of tree and shrub planting along the Proposed Scheme, in particular along the embankments of the Barwick Road overbridge, would help to integrate structures and earthworks into the surrounding landscape and reduce the magnitude of change to medium. In addition, a new woodland block to the south of the Proposed Scheme would help to mitigate for the loss of woodland at Hawk's Nest Wood. However, a moderate adverse effect would remain due to noticeable changes in landform and field pattern.	Level of effect: Moderate adverse (significant)
East Garforth and Micklefield Plateau Farmland	**Low to medium susceptibility and sensitivity**
Susceptibility to change: The large-scale rolling farmland with limited tree cover and a rural, expansive character has a low to medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme would be at variance with the expansive, rural character. The rolling landform would be directly affected by earthworks along the Micklefield cutting, Weet Wood cutting, the A1(M) cutting and Ringhay Wood cutting and embankment. The majority of earthworks would be cuttings, which would be less apparent in the wider landscape compared to large embankments. In addition, moving trains would predominantly be screened. The Proposed Scheme would alter landscape pattern due to the permanent loss of arable land, reduction in the size of some fields and change in their shape. The Ridge Road overbridge would be prominent in the rolling farmland and the straight alignment of the Roman road would become less apparent due to the proximity of the structure. Moving trains would reduce the tranquillity of the landscape, although in the context of traffic on the M1 and the A1(M), and trains on the Leeds to Selby railway Line. The Proposed Scheme would result in noticeable changes to key characteristics, in particular the severance of the landscape pattern and changes in the expansive, rural character. There would therefore be a medium magnitude of change and 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
Lotherton Wooded Parkland and Farmland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The gently rolling farmland and large woodland blocks with a remote and intimate character have a medium to high susceptibility to change arising from the Proposed Scheme.	Level of effect: Moderate adverse

Year 1: The Proposed Scheme would be at variance with the remote and intimate landscape. Moving trains would reduce tranquillity and increase the perception of movement in this notably rural and tranquil part of the LCA. In addition, the Proposed Scheme would result in the loss of arable farmland, a reduction in the size of some fields and change in their shape. The Ringhay Wood embankment would directly affect the gently rolling landform, although it would be relatively small in scale and visually contained from the majority of the LCA by existing woodland blocks. The largest earthworks would be up to 11m in height at the culverts; away from these, embankments would be smaller. Woodland loss at Weet Wood would erode aesthetic qualities and result in a more open character. The Proposed Scheme would result in substantial changes in key characteristics, in particular due to changes in the remote and intimate character and reduction in tranquillity. There would therefore be a high magnitude of change and moderate adverse effect	(significant)
Year 15: Partial maturity of tree and shrub planting along some of the Proposed Scheme would help to replace woodland lost at Weet Wood and integrate earthworks into the surrounding landscape. However, the magnitude of change would continue to be high in year 15, as there would be substantial changes in key characteristics, in particular due to changes in the remote, intimate, tranquil character. The Proposed Scheme would be highly prominent in the rural landscape and a moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Towton to Mill Dike Ridge Farmland	**Medium to high susceptibility and sensitivity**
Susceptibility to change: The rolling, tranquil farmland and remote, expansive, rural character have a medium to high susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme would be at variance with the remote, expansive, rural character. Stream Dyke viaduct and associated earthworks would be up to 20m in height and would be prominent in the rolling landscape. Earthworks associated with Ringhay Wood embankment west of Coldhill Lane would be smaller, but would still be apparent above the surrounding farmland. The loss of trees and shrubs at Copley Lane landfill site and along the Micklefield to Church Fenton Line would erode aesthetic qualities and result in a more open character. The Proposed Scheme would alter landscape pattern due to the permanent loss of arable land, reduction in size of some fields and change in their shape. Moving trains would reduce tranquillity and increase the perception of movement, although this would be in the context of the existing Micklefield to Church Fenton Line. The Proposed Scheme would result in noticeable changes to key characteristics such as the rolling landform, remote and expansive character and tranquillity. There would therefore be a medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Partial maturity of tree and shrub planting along some of the Proposed Scheme would help to integrate earthworks into the surrounding landscape and replace vegetation lost at the Copley Lane landfill site and along the Micklefield to Church Fenton Line. However, there would continue to be noticeable change in key characteristics such as the landform, due to the size of embankments at the Stream Dyke viaduct. The Proposed Scheme would be at variance with the remote and expansive character and a medium magnitude of change and a moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Barkston Ash to Scarthingwell Parkland and Wooded Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The small-scale farmland, intimate rural character, flat to gently sloping landform and large woodland blocks have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme would be at variance with the intimate, rural character. The flat to gently sloping LCA would be directly affected by new earthworks up to 21m high along the Barkston Ash embankment. Church Fenton viaduct would represent a prominent man-made structure in the farmland west of Church Fenton. The loss of mature trees and shrubs along the Micklefield to Church Fenton Line, dense hedgerow field boundaries and woodland around Sandwath Lake would erode aesthetic qualities and result in a more open character. The historic landscape pattern would be permanently altered due to the loss of arable land, further reduction in the small-scale field size and change in field shape. Moving trains would reduce tranquillity and increase the perception of movement, although this would be in the context of the	Level of effect: Moderate adverse (significant)

existing Micklefield to Church Fenton Line. The Proposed Scheme would result in substantial changes in key characteristics, in particular the severance of the small-scale landscape pattern, changes in the intimate, rural character and loss of vegetation. There would therefore be a high magnitude of change and moderate adverse effect.	
Year 15: Partial maturity of tree and shrub planting along some of the Proposed Scheme and compensatory woodland planting near to Sandwath Lake would help to integrate earthworks into the surrounding landscape and replace vegetation lost along the Micklefield to Church Fenton Line, along field boundaries, around Sandwath Lake and south of Common Lane. The magnitude of change would reduce to medium; however, there would continue to be noticeable changes in key characteristics such as the small-scale field pattern and the intimate, rural character, and a moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Ulleskelf to Little Fenton Flat Lowland Farmland	**Low to medium susceptibility and medium sensitivity**
Susceptibility to change: The large-scale, flat farmland with limited tree cover and an expansive, remote, rural character has a low to medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme would be at variance with the expansive, remote, rural character. The flat LCA would be directly affected by earthworks at the realigned Common Lane and Church Fenton embankment, with the latter up to 7.4m in height. The Church Fenton viaduct would be up to 18m in height and would be particularly prominent at the grade separated junction over the realigned down Leeds track[141], which would introduce a large-scale feature into the flat landscape. Loss of a hedgerow along Common Lane and mature trees, shrubs and woodland along the York to Church Fenton Line would result in a more open character and increase the perceptibility of moving trains. The Proposed Scheme would result in the loss of arable farmland, a reduction in the size of some fields and change in their shape. In addition, moving trains would reduce tranquillity and increase the perception of movement, although in the context of the existing Micklefield to Church Fenton and York to Church Fenton Lines. The Proposed Scheme would result in noticeable changes to key characteristics, particularly due to the scale of Church Fenton viaduct within flat farmland and changes in the rural character. There would therefore be a medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Partial maturity of tree and shrub planting along some of the Proposed Scheme would help to integrate new earthworks and Church Fenton viaduct into the landscape and replace vegetation lost along the York to Church Fenton Line and Common Lane. However, a medium magnitude of change and moderate adverse effect would remain in year 15 due to noticeable changes in key characteristics arising from the scale of the Church Fenton viaduct and permanent changes in landform, landscape pattern and the rural character.	Level of effect: Moderate adverse (significant)

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.

[141] Northbound York to Church Fenton Line

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 29 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: LA16 Map Book.

Table 29: Operation phase significant visual effects

Views east Temple Newsam bridle path near Bullerthorpe Lane (VPs 428-03-025 and 428-03-021 (Map Number LV-04-428))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a noticeable change in near distance views at both winter and summer of year 1. Swillington cutting would be visible as a break in landform to the east, and Swillington Footpath 1 and Bridleway 11 overbridges would be prominent above the farmland (these features are within LA15 Warmfield to Swillington and Woodlesford). Moving trains would largely be screened by the cutting; however, overhead line equipment is likely to be intermittently visible. The Proposed Scheme would be viewed against a backdrop of undulating farmland. Loss of hedgerow field boundaries and streamside woodland would change the character of views and open up views towards the Aire valley. The Proposed Scheme would be largely characteristic of existing views due to the presence of the M1 and an existing overbridge. In addition, views would be filtered by existing trees and shrubs along the M1. 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-east from Austhorpe Footpath 6 west of Garforth and a residence and caravan park along the footpath (VP 429-03-022 (Map Number LV-04-429b))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a noticeable change in near distance views at both winter and summer of year 1. West Garforth north embankment, overhead line equipment and moving trains would be prominent above surrounding farmland to the east. Loss of woodland at Carr Wood would result in more open views to the north-east and loss of hedgerow field boundaries would change the character of views to the east. The Proposed Scheme would be viewed against a backdrop of elevated landform and buildings at Garforth. 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: Partial maturity of tree and shrub planting to the west of the Proposed Scheme would filter views of the West Garforth north embankment, overhead line equipment and moving trains. However, this planting would also foreshorten views considerably. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views north-west from non-definitive footpath Austhorpe and south-east from the Leeds Country Way/National Cycle Network route 66 north-west of Garforth (VPs 429-03-023 and 429-03-017 (Map Number LV-04-429b))	**High sensitivity receptors**

Year 1 – winter and summer: There would be a noticeable change in near distance views from PRoW at both winter and summer of year 1. The West Garforth cutting would be prominent in views as it would change the shape of the ridgeline, and the associated loss of mature beech trees would notably change the character of views. Overhead line equipment and moving trains would be largely screened by West Garforth cutting; however, these uncharacteristic features would be visible between the edge of West Garforth cutting and the A63 Selby Road viaduct, particularly in elevated views south (some of these features are within LA15 Warmfield to Swillington and Woodlesford). Partial loss of Carr Wood would also open up and change the character of views south. Immature mitigation planting would provide limited screening or landscape integration at this stage. The Proposed Scheme would be characteristic of views to a certain extent due to the presence of moving traffic and earthworks along the M1. There would therefore be a medium magnitude of change and a moderate adverse effect. There would potentially be views towards the Proposed Scheme from the residential property (Barrowby Hall) in proximity to these viewpoints. However, this property is not publicly accessible and views could not be assessed. It is likely that views would be filtered by vegetation on the property boundary.	**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 Barwick Bridleway 10 and residences on Nanny Goat Lane north-west of Garforth (VP 429-03-021 (Map Number LV-04-430))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW and occupants of residences would experience a noticeable change in near distance views at both winter and summer of year 1. East Garforth cutting would be visible as a break in landform to the north, although the cutting would screen views towards overhead line equipment and moving trains. Leeds Bridleway 123 accommodation overbridge and the Leeds to Selby overbridge would be prominent in views, although viewed against a backdrop of existing road infrastructure and moving traffic along the M1. Loss of mature trees and shrubs along the Leeds to Selby Line and hedgerow field boundaries would result in views being more open in character. 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: Partial maturity of tree and shrub planting to the south of the Proposed Scheme would help to disguise the break in landform at East Garforth cutting. However, Leeds Bridleway 123 accommodation overbridge and the Leeds to Selby overbridge would result in a noticeable change in views. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south from Barwick Bridleway 12 and non-definitive Bridleway Parlington near Barwick Road north of the M1 **(VP 430-03-003 and 430-03-006 (Map Number LV-04-430))**	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a noticeable change in near distance views at both winter and summer of year 1. Micklefield embankment, overhead line equipment and moving trains would be visually prominent in fields to the south. The Barwick Road overbridge would be similar in character to the existing bridge; however, mitigation vegetation would not yet have established to integrate the structure into the landscape. Loss of mature beech trees at the Leeds to Selby overbridge would alter views towards the horizon, and the partial loss of woodland at Hawk's Nest Wood would open up views towards industrial units north of Garforth. Immature mitigation planting would provide limited screening or landscape integration at this stage. The Proposed Scheme would be characteristic of existing views to a certain extent due to the presence of moving traffic and earthworks along the M1. 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 Sturton Grange Footpath 1, Garforth Footpaths 7 and 8, and residences along the northern edge of Garforth **(VPs 430-03-002, 430-03-001 and 431-02-009 (Map Number LV-04-431))**	**High sensitivity receptors**

Year 1 – winter and summer: There would be a noticeable change in near distance views from PRoW and residences at both winter and summer of year 1. Micklefield embankment, overhead line equipment and moving trains would reduce the scenic quality of views north, although these features would be viewed against a backdrop of undulating farmland. Partial loss of woodland at Hawk's Nest Wood would notably change the character of views and open up views towards the Proposed Scheme and moving traffic on the M1. There would be views north towards the break in landform at Micklefield cutting from residences on A642 Aberford Road. Immature mitigation planting would provide limited screening or landscape integration at this stage. The Proposed Scheme would be characteristic of existing views to a certain extent due to the presence of moving traffic and earthworks along the M1. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: Partial maturity of tree and shrub planting to the south of the Proposed Scheme would help to replace woodland partially lost at Hawk's Nest Wood and disguise the break in landform at Micklefield cutting. However, Micklefield embankment, overhead line equipment and moving trains would result in a noticeable change in views. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect**: Moderate adverse (significant)
Views north from residences and Micklefield Footpath 3 off Ridge Road north-west of Micklefield (VPs 432-02-007 and 432-03-008 (Map Number LV-04-432))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW and occupants of residences would experience a noticeable change in near distance views at both winter and summer of year 1. Weet Wood cutting would be visible as a break in landform to the north, although the cutting would largely screen views towards overhead line equipment and moving trains. However, overhead line equipment and moving trains would be visible to the north-west where Weet Wood cutting is shallower. The Ridge Road realignment and Ridge Road overbridge would be prominent above surrounding farmland in views north. In addition, this road corridor would appear wider when combined with the original alignment of Ridge Road, which would be retained as farm access. Loss of distinctive tree copses to the north-west and along Ridge Road would alter 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 and south from Micklefield Footpaths 1 and 11 at Ringhay Wood (VPs 433-03-014 (Map Number LV-04-433) and 432-03-006 (Map Number LV-04-432))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a noticeable change in near to middle distance views at both winter and summer of year 1. Ringhay Wood embankment, overhead line equipment and moving trains would be prominent in rural views to the east, although viewed against a backdrop of undulating farmland and large woodland blocks. The break in landform at the Ringhay Wood and A1(M) cuttings would be visible to the west. Overhead line equipment and moving trains would largely be screened within the cuttings. Loss of woodland at Weet Wood and mature trees and shrubs along the A1(M) would alter the character of views slightly. Immature mitigation planting would provide limited screening or landscape integration at this stage. The Proposed Scheme would be characteristic of existing views to a certain extent due to the presence of moving traffic and earthworks along the A1(M). 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 Micklefield Footpath 1 at Weet Wood (VPs 433-03-008 and 433-03-009 (Map Number LV-04-433))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near distance views from PRoW at both winter and summer of year 1. Ringhay Wood embankment, overhead line equipment and moving trains would be prominent in rural, undeveloped views, although the features would be viewed against a backdrop of	**Level of effect:** Major adverse

woodland. There would also be glimpsed views towards the Micklefield Footpath 11 accommodation overbridge, which would be an uncharacteristic feature in views. Loss of woodland at Weet Wood would be visible and 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 high magnitude of change and a major adverse effect.	(significant)
Year 15 – summer: Partial maturity of tree and shrub planting along some of the Proposed Scheme would help to integrate earthworks into the landscape and filter views of Ringhay Wood embankment, overhead line equipment and moving trains. However, there would be a substantial change in views due to the prominence of the Proposed Scheme in rural, undeveloped views. There would remain a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north from Footpath 35.57/16/1 at Huddleston Hall (VP 433-03-002 (Map Number LV-04-433))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a noticeable change in middle to long distance views at both winter and summer of year 1. Ringhay Wood embankment, overhead line equipment and moving trains would reduce the scenic quality of views north, although new features would be viewed against a backdrop of woodland blocks and distant farmland, and filtered by intervening hedgerow field boundaries and trees. Far Fox Covert underbridge would be screened by intervening buildings at Huddleston Hall. Views further west would be screened by large woodland blocks, and views east by rolling landform. Woodland loss at Middle Fox Covert would be visible but would not notably change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. The Proposed Scheme would be uncharacteristic in the relatively rural, undeveloped landscape. There would therefore be a medium magnitude of change and a moderate adverse effect. There would potentially be views towards the Proposed Scheme from the upper floors of the residential property (Huddleston Hall) in proximity to this viewpoint. However, the upper floors of this property are not publicly accessible and views could not be assessed. It is likely that views would be filtered by vegetation in the property garden.	**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-east from Footpath 35.57/5/1 north of Coldhill Lane (VP 434-03-011 (Map Number LV-04-434))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in middle distance views from PRoW at both winter and summer of year 1. The greatest change in views would result from Stream Dyke viaduct, which would be approximately 20m in height, and the associated Ringhay Wood and Barkston Ash embankments. These features would be viewed against the skyline and would be highly prominent within the farmland. Loss of a hedgerow and intermittent trees along Coldhill Lane and mature trees and shrubs at the Copley Lane landfill site and along the Micklefield to Church Fenton Line would open up and alter the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. The Proposed Scheme would be characteristic of existing views to a certain extent due to the presence of the existing Micklefield to Church Fenton Line. There would therefore be a medium magnitude of change and a moderate adverse effect. There would potentially be views towards the Proposed Scheme from the residential property (Coldhill Farm) approximately 500m west of this viewpoint. However, this property is not publicly accessible and views could not be assessed. It is likely that views would be filtered by woodland at Near, Middle and Far Fox Covert.	**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-east from Footpath 35.4/6/1 south of Barkston Ash (VP 435-03-003 (Map Number LV-04-435))	**High sensitivity receptors**

Year 1 – winter and summer: Users of PRoW would experience a noticeable change in near distance views at both winter and summer of year 1. Barkston Ash embankment, which would be up to 21m in height, overhead line equipment and moving trains would be prominent in views south and viewed against the skyline. Loss of mature trees and shrubs along the Micklefield to Church Fenton Line would open up and 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: Hedgerow planting along the Proposed Scheme would help to filter views towards Barkston Ash embankment. However, Barkston Ash embankment, overhead line equipment and moving trains would result in a noticeable change in views. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from residences on Common Road in Barkston Ash (VP 435-02-004 (Map Number LV-04-435))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in near distance views from residences at both winter and summer of year 1. Barkston Ash embankment, Church Fenton viaduct, overhead line equipment and moving trains would be prominent in rural views south-east and these features would be viewed against the skyline. However, in views south-east this would be in the context of embankments and moving trains at the existing Micklefield to Church Fenton Line. Loss of hedgerows and trees along Common Lane, mature trees and shrubs along the Micklefield to Church Fenton Line and woodland at Sandwath Lake would open up and change the character of views. Views would be filtered by intermittent vegetation along the property boundaries. 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: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to integrate earthworks into the landscape and replace vegetation lost at Common Lane, along the Micklefield to Church Fenton Line and at Sandwath Lake. However, due to the prominence of Barkston Ash embankment and Church Fenton viaduct in the flat, rural landscape there would be a noticeable change in views. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east for road users along Common Road east of Barkston Ash (VP 435-04-006 (Map Number LV-04-436))	**Medium sensitivity receptors**
Year 1 – winter and summer: Road users of Common Lane would experience a substantial change in near distance views at both winter and summer of year 1. Barkston Ash embankment and Church Fenton viaduct would be highly prominent in fields close to Common Road, and would represent large-scale features in the flat, rural landscape. Overhead line equipment and moving trains would also be visible above the skyline. Loss of dense hedgerows and woodland south of Common Lane, hedgerows and intermittent trees along Common Lane and mature trees and shrubs along the Micklefield to Church Fenton Line would open up and change the character of views. Loss of woodland at Sandwath Lake would also change the character of views to the east. The Proposed Scheme would be characteristic of existing views to a certain extent due to the presence of the Micklefield to Church Fenton 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 moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to integrate earthworks into the landscape and replace vegetation lost at Common Lane, along the Micklefield to Church Fenton Line and at Sandwath Lake. However, due to the prominence of Barkston Ash embankment and Church Fenton viaduct in the flat, rural landscape there would be a substantial change in views. There would remain a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from Bridleway 35.55/14/1 east of Scarthingwell Lane (VP 435-03-010 (Map Number LV-04-436))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in middle to long distance views from PRoW at both winter and summer of year 1. Church Fenton viaduct and Barkston Ash embankment, overhead line equipment and moving trains would be prominent in rural views south-east. These features would be viewed against the skyline and would be present across a large proportion of the view. Loss of woodland at Sandwath Lake, field boundary hedgerows and woodland south of Common Lane would result in views being	**Level of effect:** Moderate adverse (significant)

more open in character. 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.	
Year 15 – summer: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to integrate earthworks into the landscape and replace vegetation lost at Common Lane and Sandwath Lake. However, due to the prominence of Church Fenton viaduct in the flat, rural landscape there would be a noticeable change in views. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views north-west or south from Bridleway 35.42/2/1, Footpath 35.22/1/1 and residences on Sandwath Lane **(VPs 436-03-005, 436-03-004, 436-02-002 and 436-02-012 (Map Number LV-04-436))**	**High sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near distance views from residences and PRoW at both winter and summer of year 1. Church Fenton viaduct, overhead line equipment and moving trains would be prominent in rural views north-west or south and viewed against the skyline. Vegetation loss at Sandwath Lake would change the character of views and result in more open views of Church Fenton viaduct. Immature mitigation planting would provide limited screening or landscape integration at this stage. The large-scale Church Fenton viaduct would be highly prominent in the flat, rural landscape and would be present across a large proportion of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to soften views towards the Church Fenton viaduct and replace mature trees, shrubs and woodland lost. However, there would be a substantial change in views due to the uncharacteristic scale of the Church Fenton viaduct in the flat, rural landscape. There would remain a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north from residences north of Sandwath Drive in Church Fenton **(VPs 436-02-007 and 436-02-008 (Map Number LV-04-436))**	**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. Church Fenton viaduct would be highly prominent in the rural landscape to the north, in particular at the grade separated junction over the realigned down Leeds track[142]. Church Fenton viaduct, overhead line equipment and moving trains would be viewed against the skyline. The realigned down Leeds track would be slightly closer to the residences, and a balancing pond would be an uncharacteristic feature in the foreground of views east. Loss of woodland at Sandwath Lake and intermittent mature trees and shrubs along the York to Church Fenton Line would notably change the character of views. Immature mitigation planting would provide limited screening or landscape integration at this stage. The large-scale Church Fenton viaduct would be highly prominent in the flat, rural landscape and would be present across a large proportion of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to soften views towards the Church Fenton viaduct and replace mature trees, shrubs and woodland lost. However, there would be a substantial change in views due to the uncharacteristic scale of the Church Fenton viaduct in the flat, rural landscape. There would remain a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views north-west from residences at Church Fenton **(VPs 437-02-001 (Map Number LV-04-437) and 436-02-003 (Map Number LV-04-436))**	**High sensitivity receptors**
Year 1 – winter and summer: There would be a substantial change in near to middle distance views from residences at both winter and summer of year 1. Church Fenton viaduct would be highly prominent in the rural landscape to the north-west, in particular at the grade separated junction over the realigned down Leeds track. Church Fenton viaduct, overhead line equipment and moving trains would be viewed against the skyline. The realigned down Leeds track would be located slightly further from the residences. The replacement floodplain	**Level of effect:** Major adverse (significant)

[142] Northbound York to Church Fenton Line

storage area would be visible in near distance views, although would not be too dissimilar in character to the existing farmland. Loss of mature trees and shrubs and woodland along the York to Church Fenton Line would open up views towards moving trains. The large-scale Church Fenton viaduct would be highly prominent in the flat, rural landscape and would be present across a large proportion of the view. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15 – summer: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to soften views towards the Church Fenton viaduct and replace mature trees, shrubs and woodland lost. However, there would be a substantial change in views due to the uncharacteristic scale of the Church Fenton viaduct in the flat, rural landscape. There would remain a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from residences on Church Fenton Lane south of Ulleskelf (VP 437-02-009 (Map Number LV-04-437))	**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. Church Fenton viaduct and embankment, overhead line equipment and moving trains would reduce the scenic quality of views west, with Church Fenton viaduct particularly prominent at the grade separated junction over the realigned down Leeds track. Loss of woodland to the east of the York to Church Fenton Line would result in views being more open in character, including towards moving trains along both the Proposed Scheme and the York to Church Fenton 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: Partial maturity of trees and shrubs along some of the Proposed Scheme would help to integrate earthworks into the landscape and replace vegetation lost to the east of the York to Church Fenton Line. However, due to the prominence of Church Fenton viaduct in the flat, rural landscape there would be a noticeable change in views. There would remain a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views south-east from Footpath 35.70/1/1 west of Ulleskelf (VPs 437-03-002 and 437-03-014 (Map Number LV-04-437))	**High sensitivity receptors**
Year 1 – winter and summer: Users of PRoW would experience a substantial change in near to middle distance views at both winter and summer of year 1. Church Fenton embankment and viaduct would be prominent in the flat landscape and overhead line equipment and moving trains would be viewed against the skyline. The realigned down Leeds track[143] would be slightly closer to the PRoW, and a balancing pond would be an uncharacteristic feature in near distance views. Loss of mature trees, shrubs and woodland along the York to Church Fenton Line would result in more open views towards moving trains. The replacement floodplain storage area would be in the foreground, although it would not be too dissimilar in character to the existing farmland. The large-scale Church Fenton viaduct would be highly prominent in the flat, rural landscape and would be present across a large proportion of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Partial maturity of trees and shrubs along the Proposed Scheme would help to soften views towards the Church Fenton viaduct and embankment and replace mature trees, shrubs and woodland lost along the York to Church Fenton Line, reducing the magnitude of change to medium. However, there would remain a noticeable change in views due to the uncharacteristic scale of the Church Fenton viaduct in the flat, rural landscape, and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from Footpath 35.70/5/1 south-east of Ulleskelf (VP 437-03-003 (Map Number LV-04-437))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in near to long distance views from PRoW at both winter and summer of year 1. Church Fenton embankment and viaduct would be prominent in the flat landscape and overhead line equipment and moving trains would be viewed against the skyline. The loss of mature trees, shrubs and woodland along the York to Church Fenton Line would result in more open views	**Level of effect:** Moderate adverse

[143] Northbound York to Church Fenton Line

towards moving trains. Long distance views south-west towards the western end of Church Fenton viaduct would be filtered by intervening vegetation in the fields west of Busk Lane. 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 Footpath 35.70/4/2 near Outwood Lane south-east of Ulleskelf (VP 437-03-010 (Map Number LV-04-437))	**High sensitivity receptors**
Year 1 – winter and summer: There would be a noticeable change in long distance views from PRoW at both winter and summer of year 1. Church Fenton viaduct, overhead line equipment and moving trains would be prominent in views west, particularly at the grade separated junction over the realigned down Leeds track. There would also be views towards Church Fenton embankment, and the character of views would be more open due to the loss of woodland to the east of the York to Church Fenton Line. Vegetation loss would also result in more open views of trains along the Proposed Scheme and the York to Church Fenton 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

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:

- moderate adverse landscape effects on five LCAs;
- major adverse visual effects on views from six residential viewpoint locations;
- major adverse visual effects on views from four recreational viewpoint locations;
- moderate adverse visual effects on views from three residential viewpoint locations;
- moderate adverse visual effects on views from eight recreational viewpoint locations; and
- moderate adverse visual effects on views from one transport viewpoint location.

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 Garforth and Church Fenton 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 Garforth and Church Fenton 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), North Yorkshire County Council (NYCC) and Selby District Council (SDC) 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: LA16 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[144].

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

12.2.3 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 Garforth and Church Fenton area. It lies within the administrative area of LCC and SDC. The west of the area falls within the Leeds City Region Local Enterprise Partnership area[145], and the east of the

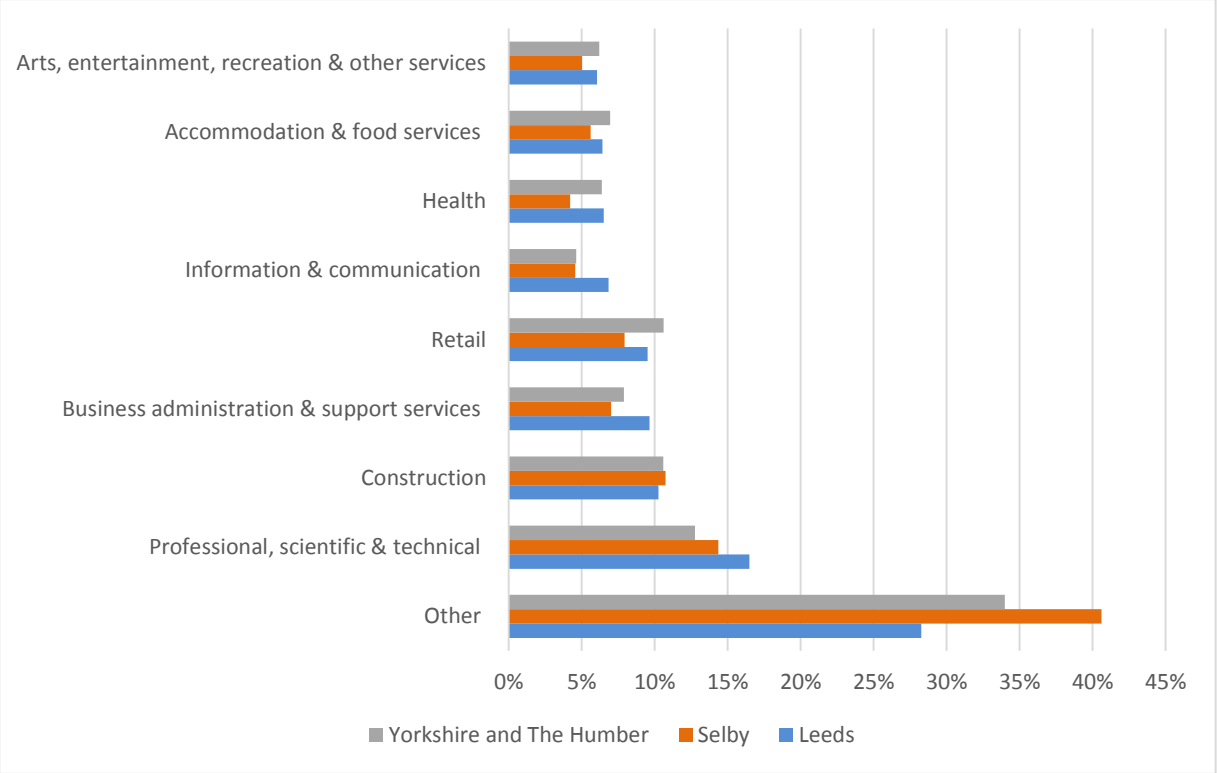
[144]Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[145] Leeds City Region Local Enterprise Partnership – Strategic Economic Plan (2016). Available online at: http://www.the-lep.com/LEP/media/New/SEP%20documents/SEP-2016-2036-FINAL.pdf

area falls within the York, North Yorkshire and East Riding Local Enterprise Partnership area[146]. The area is part of the Yorkshire and Humber region.

Business and labour market

12.3.2 Within 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. Within the SDC area, professional, scientific and technical (14%), agriculture, forestry and fishing (12%) and construction (11%) sectors also accounted for relatively large proportions. This is shown below in Figure 8. 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[147].

Figure 8: Business sector composition in LCC and SDC areas and the Yorkshire and Humber region

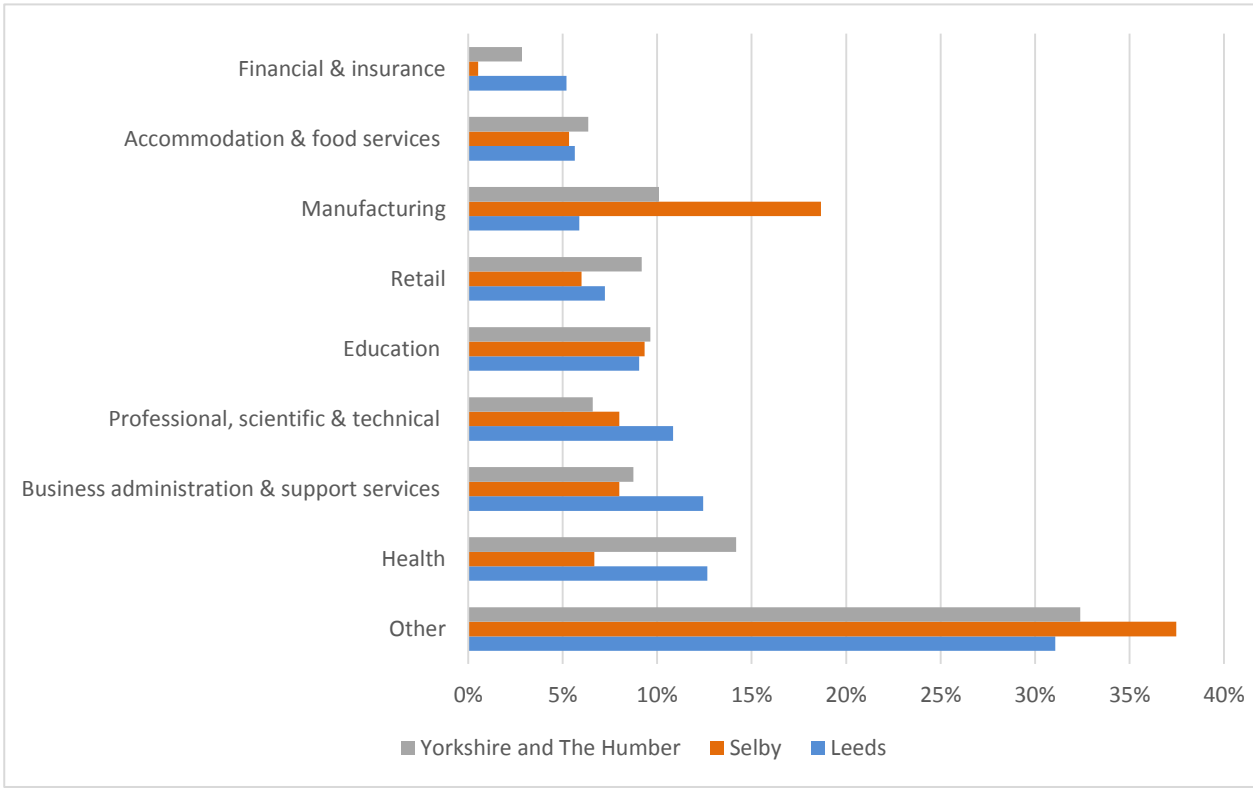


12.3.3 In 2016, approximately, 443,000 people worked in the LCC area[148], representing both employed residents and commuters living outside the area, and 37,000 people worked in the SDC area[149]. According to the Office for National Statistics Business Register

[146] York, North Yorkshire and East Riding Local Enterprise Partnership – Strategic Economic Plan Update (2016). Available online at: https://www.businessinspiredgrowth.com/wp-content/uploads/2016/07/SEP-Update-2016.pdf
[147] Office for National Statistics – UK Business Counts – Local Units (2017). Office for National Statistics, London. Available online at: https://www.nomisweb.co.uk
[148] 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
[149] 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.

and Employment Survey 2016, the top five sectors in terms of share of employment in the LCC area were: health (13%); business administration and support services (12%); professional, scientific and technical (11%); education (9%) and retail (7%) sectors. In the SDC area, the top five sectors in terms of employment were: manufacturing (19%); transport and storage (including postal) (12%); education (10%); professional, scientific and technical (8%) and business administration and support services (8%). 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 9[150].

Figure 9: Employment by industrial sector in the LCC and SDC areas and the Yorkshire and Humber region



12.3.4 According to the Annual Population Survey (2016)[151], the employment rate[152] within the LCC area was 74% (376,000 people) representing both residents employed within the area and those working outside it, and 84% (44,000 people) within the SDC area. These compare with the recorded rates for Yorkshire and the Humber region (72%) and England (74%). In 2016, the unemployment rate[153] in the LCC area was 5% and in

[150] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk
[151] Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk
[152] The proportion of working age (16-64 year olds) residents that is in employment.
[153] 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.

the SDC area was 4%. These compare to the rate in the Yorkshire and Humber region (5%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[154], 34% of the LCC 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 10% of residents had no qualifications, which was the same as Yorkshire and the Humber region (10%) but higher than England (8%). In the SDC area, 31% of residents aged 16-64 were qualified to NVQ4 and above, with 9% of its residents having no qualifications.

Property

12.3.6 A review of employment land supply identified 844ha in the LCC area[155]; this is set against a forecast employment land requirement for 460ha – 526ha of B2/B8 (Industry/Warehousing) and 706,250m2 B1 (Office)[156]. A review of employment land supply identified 225ha in the SDC area[157]; this is set against a forecast employment land requirement for 60ha of employment land.

12.3.7 The average vacancy rate for industrial and warehousing property in the LCC area in December 2017 has been assessed as 15% based on marketed space against known stock[158]. The average vacancy rate for industrial and warehousing property in the SDC area was 30%.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[159] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);

[154] Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk
[155] Leeds City Council – Local Development Framework Authority Monitoring Report (2016) (page 12). Available at: http://www.leeds.gov.uk/docs/2016%20AMR%20Final%20vash.pdf
[156] Leeds City Council (August 2011) Leeds Employment Land Review, 2010 Update: https://www.leeds.gov.uk/SiteAllocationMaps/Evidence%20Base%20Documents/Employment%20Land%20Review%20%202010%20Update.pdf
[157] Selby District Council – Employment Land Refresh (2010) (January 2011) (Appendix 6). Available at: http://www.selby.gov.uk/sites/default/files/Documents/ELR10_Jan2011_Appendix_6_Site_Assessments.pdf
[158] 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).
[159] Supporting document: Draft Code of Construction Practice

- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, both will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

In-combination effects

12.4.3 Businesses within the Garforth and Church Fenton 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 Garforth and Church Fenton area. Isolation effects will be reported in the formal ES.

Construction employment

12.4.5 It is currently expected that there will be two main construction compounds (the West Garforth Cutting main construction compound and the Sherburn railhead main construction compound) and nine satellite compounds in the Garforth and Church Fenton area. These sites could result in the creation of up to 3,210 person years of

construction employment opportunities[160], broadly equivalent to 320 full-time jobs[161], 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 project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.7 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 required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.9 There are five business accommodation units or sites where the construction footprint requires the demolition of properties and/ or loss of land, but where the associated employment losses do not present particular relocation problems. This is because of the occupier's site requirements, and the availability of alternative locations/ premises. These business accommodation units comprise of:

- Nanny Goat Lane, Garforth (one unit providing equestrian-related leisure activities);
- Ridge Road Farm, Ridge Road, Micklefield (one anaerobic digester unit);
- Sturton Grange Farm, Ridge Road, Micklefield, Garforth (one food and drink manufacturer unit);
- Land off Mile Hill, Leeds (one unit for a waste disposal operation); and
- Sandwath Lake, Sandwath Lane, Church Fenton (domestic building contractor).

12.4.10 It is currently expected that no businesses would experience significant permanent direct effects as a result of construction of the Proposed Scheme. It is currently estimated that 40 jobs would either be displaced or possibly lost in the wider Garforth and Church Fenton 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

[160] 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.
[161] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

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 LCC area (approximately 376,000 jobs) and in the SDC area (approximately 44,000 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 line of route 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 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently 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 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

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

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Garforth and Church Fenton 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 Garforth and Church Fenton 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[162]; and
- 'non-residential receptors'[163] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas[164]; 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[165], planning policy, planning practice guidance on noise (PPGN)[166] and EIA Regulations as describes in the Scope and Methodology Report[167] (SMR).

13.1.3 Engagement has been undertaken with Leeds District Council and North Yorkshire County Council (NYCC) 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 Garforth and Church Fenton area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation

[162] '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.
[163] 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.
[165] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[166] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[167] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

(Map series SV-01), can be found in the Volume 2: LA16 Map Book. Map series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The area is characterised by small towns, villages, hamlets, isolated residential properties and farms in a predominantly rural setting. The sound environment is generally dominated by local and distant road traffic, rail lines and local neighbourhood sources, with contributing natural and agricultural sounds.

13.3.3 Several main roads contribute to the sound environment within the Garforth and Church Fenton area including: the M1, which runs broadly parallel to the route of the Proposed Scheme between junctions 46 and 47, where it then merges with the A1(M);

the A6120/A63 Selby Road; the A642 Aberford Road; and the A162 London Road. The existing Leeds to Selby railway line (specifically trains running on the section between Micklefield and Leeds) and the existing York to Church Fenton railway line (trains running on the section between Church Fenton and Leeds) also contribute to the sound environment within the area.

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 would not generally be adversely affected by vibration. Further information is provided in Volume 1, Section 8.

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[168], Roads[169] or Railways[170]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA16 Map Book) shows any noise Important Areas in the Garforth and Church Fenton 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)[171]. 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 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.

[168] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs
[169] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs
[170] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs
[171] Supporting document: Draft Code of Construction Practice

Avoidance and mitigation measures

13.4.3 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- Best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[172].
- 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.
- 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.

13.4.4 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 an estimate of the buildings that are likely to qualify for such measures, which will be reported in the formal ES.

[172] Including local businesses and quiet areas designated by the local authority.

13.4.5 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

13.4.6 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: LA16 Map Book):

- Garforth (in the vicinity of Nanny Goat Lane), arising from construction activities such as cutting formation, overbridge construction, road realignment and landscape bund construction;
- East Garforth, arising from construction activities such as use of transfer nodes, cutting formation, embankment formation, overbridge construction, balancing pond construction, road realignment and landscape bund construction;
- Micklefield, arising from construction activities such as road realignment and balancing pond construction;
- Barkston Ash, arising from construction activities such as embankment formation and landscape bund construction;
- Church Fenton, arising from construction activities such as cutting formation, viaduct construction, balancing pond construction, ecological pond construction, road realignment and landscape bund construction; and
- Ulleskelf, arising from construction activities such as embankment formation, balancing pond construction and landscape bund construction.

13.4.7 Map Series SV01 (Volume 2: LA16 Map Book) shows key non-residential properties that have been identified within the study area. Of these, the Rainbow Nursery School, Barkston Ash is likely to experience significant effects (to be confirmed in the formal ES).

13.4.8 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.9 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:

- B1217 (Aberford Road) South of Aberford between M1 and B1217 (Collier Lane);
- Ridge Road between the A656 (Ridge Road) and the Great North Road North of Micklefield;

- B1222 (Bishopdyke Road), Fenton Lane, Ash Lane, Church Street, Station Road and Common Lane, between the A162 (London Road) at Sherburn in Elmet and Common Road West of Church Fenton; and
- B1223 (Church Fenton Lane) and B1223 (Raw Lane/New Road), between the Proposed Scheme and the A162 (London Road) North of Towton.

13.4.10 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

13.4.11 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

13.4.12 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary effects from construction traffic.

13.4.13 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 Garforth and Church Fenton 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 four trains per hour in each direction on the main lines with an operating speed of around 230kph reducing to around 160kph at the north end of the area. 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. 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[173].

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: LA16 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[174] 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[175] or the maximum noise level criteria[176] defined in the 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.

[173] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[174] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[175] World Health Organization (2010), *Night time Noise Guidelines for Europe*.
[176] Dependent on the number of train passes.

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.

Assessment of impacts and effects

13.5.12 Map Series SV-01 (Volume 2: LA16 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $Lp_{Aeq,day}$) 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 $Lp_{Aeq,night}$) 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.

13.5.13 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.

13.5.14 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.15 Likely significant airborne noise or vibration effects arising from permanent changes to existing roads, will be reported in the formal ES.

Other mitigation measures

13.5.16 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.17 Mitigation, including noise barriers, described in Volume 1, Section 9, Section 2.2 and presented in Map Series SV-01 (Volume 2: LA16 Map Book) and Map Series CT-06 (Volume 2: LA16 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.

13.5.18 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 noise levels at or around Church Fenton: occupants of residential properties on Common Lane and Sandwath Lane, located closest to the Proposed Scheme, identified by LA16-C01 on Map SV-01-406.

13.5.19 The initial assessment indicates that, the forecast noise from long-term railway operation would not 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.

13.5.20 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.

13.5.21 Further assessment work is being undertaken to identify operational sound and vibration significant effects. This will be reported in the formal ES.

13.5.22 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

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

13.5.24 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles; at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.25 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Garforth and Church Fenton area.

14.1.2 Engagement with Highways England, Leeds City Council (LCC), North Yorkshire County Council (NYCC), West Yorkshire Combined Authority (WYCA) and Selby District Council (SDC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA16 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[177].

14.2.2 The study area for traffic and transport includes Garforth, Micklefield, Sherburn in Elmet, Barkston Ash, Church Fenton and Ulleskelf.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including: the M1 and the A1(M), which are the only strategic roads in the Garforth and Church Fenton area.

14.2.4 It also includes the following local roads: the A63 Selby Road; the A162 London Road; the A642 Aberford Road; the A656 Ridge Road; the B1217 Aberford Road; the B1223 Raw Lane/New Road/Church Fenton Lane; Barwick Road; Ridge Road; Great North Road; Coldhill Lane/Mile Hill; Saw Wells Lane; Fenton Lane/Ash Lane; Station Road/Common Lane/Common Road; Sandwath Lane; Mires Lane; Colton Lane/Braesgate Lane; New Road and Old Road.

14.2.5 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

[177] 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, LCC, NYCC, WYCA and SDC (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 Highways England, LCC, NYCC, WYCA and SDC. 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 (1% to 8%) 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 November 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 PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are: the M1 and the A1(M). The strategic road network on the M1 and the A1(M) around junctions 46 and 47 is busy at peak times and delays can be experienced.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A63 Selby Road; the A162 London Road; the A642 Aberford Road; the A656 Ridge Road; the B1217 Aberford Road; the B1223 Raw Lane/New Road/Church Fenton Lane; Barwick Road; Ridge Road; Great North Road; Coldhill Lane/Mile Hill; Saw Wells Lane; Fenton Lane/Ash Lane; Station Road/Common Lane/Common Road; Sandwath Lane; Mires Lane; Colton Lane/Braesgate Lane; New Road and Old Road. The local road network in this area generally operates well although some localised delays can be experienced, particularly at peak times on the A162 London Road and the A63 eastbound and the A162 southbound approaches to the junction of the A162 London Road and the A63.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[178]. Data for the three-year period (mid-2014 to mid-2017) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three-year period) have been examined.

14.3.7 No accident clusters were identified within the Garforth and Church Fenton area.

14.3.8 The route of the Proposed Scheme would cross four roads with footways within the Garforth and Church Fenton area. These are: Barwick Road; the A642 Aberford Road; Great North Road; and the A162 London Road. In addition, Coldhill Lane/Mile Hill, Saw Wells Lane, Common Lane/Common Road and Sandwath Lane have no footways but were observed to be used by pedestrians.

Parking and loading

14.3.9 There is no parking or loading identified in the Garforth and Church Fenton 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 Eight bus routes operate on five roads that are crossed by the route of the Proposed Scheme in the Garforth and Church Fenton 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 includes:

- Barwick Road: Service 173A (Wetherby – Garforth – Wakefield); Service 174 (Wetherby – Garforth – Wakefield); and Service 174A (Wetherby – Garforth – Wakefield);
- the A642 Aberford Road: Service 402 (Leeds City Centre – Garforth – Micklefield – Selby); and Service 403 (Leeds City Centre – Garforth – Micklefield – Selby);
- the A656 Ridge Road: Service 402 (Leeds City Centre – Garforth – Micklefield – Selby); and Service 403 (Leeds City Centre – Garforth – Micklefield – Selby);
- the A162 London Road: Service 492 (Tadcaster – Ulleskelf – Church Fenton – Sherburn in Elmet); Service 494 (Tadcaster – Ulleskelf – Church Fenton – Sherburn in Elmet); and
- Common Lane: Service 494 (Tadcaster – Ulleskelf – Church Fenton – Sherburn in Elmet); and Service 495 (Tadcaster – Church Fenton – Sherburn in Elmet).

14.3.11 CityZAP services between Leeds and York and Intercity coach services use the M1 and the A1(M).

14.3.12 National and local rail services are accessible via Garforth Station and local rail services are accessible via East Garforth, Micklefield, Church Fenton and Ulleskelf Stations. Garforth Station provides access to national services to Leeds, York, Hull,

[178] Department for Transport; Crashmap.co.uk; www.crashmap.co.uk. CrashMap provides accident data for the UK.

Middlesbrough and Manchester Airport. East Garforth Station and Micklefield station provide access to local services to Leeds, York and Selby. Church Fenton Station and Ulleskelf Station provide access to local services to Leeds, York, Hull and Selby.

Non-motorised users

14.3.13 There are pedestrian footways adjacent to many of the roads in the built-up areas of Garforth, Micklefield, Sherburn in Elmet, Barkston Ash, Church Fenton and Ulleskelf. 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 19 PRoW within the Garforth and Church Fenton area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades including for maintenance access to the Proposed Scheme. The surveys undertaken to inform the assessment showed that there were fewer than 10 people a day recorded on two of the PRoW. The routes with the greatest usage during the survey day were: Common Lane, used by 44 pedestrians, 17 cyclists and one equestrian during the survey day; the A162 London Road, used by 35 pedestrians and 72 cyclists during the survey day; and Definitive Bridleway Barwick 10, used by 70 pedestrians, 24 cyclists and 18 equestrians during the survey day.

14.3.15 National Route 66 (part of the National Cycle Network) passes through the Garforth and Church Fenton area to the north of Garforth. It crosses the route of the Proposed Scheme along Leeds Bridleway 125 (part of the Leeds Country Way), and along Barwick Road. Leeds Bridleway 125 was used by 24 cyclists during the survey day.

Waterways and canals

14.3.16 There are no navigable waterways in the Garforth and Church Fenton area. Consequently, this topic is not considered further in this assessment.

Air transport

14.3.17 Leeds East Airport is located within the Garforth and Church Fenton area. Leeds East Airport offers airfield and hangarage services (storage and maintenance of aircraft). The airport also provides office and film studio facilities. The airport is primarily accessed from the local road network via Busk Lane, approximately 1.5 km north-east of Church Fenton. However, it is not expected that there would be any effects on air transport and this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;

- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[179] 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.

[179] Supporting document: Draft Code of Construction Practice

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[180] 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;
- 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 Garforth and Church Fenton area are likely to include:

- construction vehicle movements to and from construction compounds and transfer nodes;
- road closures and associated realignments and diversions;
- alternative routes for PRoW; and
- possessions and blockades on the conventional rail network.

[180] 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.

14.4.9 The construction assessment has also considered any impacts in the Garforth and Church Fenton 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 the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA16 Map Book.

Strategic and local highway 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 47;
- the A1(M) junctions 42 and 44;
- the A642 Aberford Road for a short-distance (approximately 300m) south of the M1;
- the A656 Ridge Road between the M1 and Ridge Road;
- the A63 between the A1(M) and the A162 London Road;
- the A162 London Road between the A63 and the B1223 New Road;
- the B1217 Aberford Road between the M1 and just east of the A1(M);
- the B1223 Raw Lane/New Road/Church Fenton Lane;
- the B1222 Bishopdyke Road between the A162 London Road and Fenton Lane;
- Ridge Road;
- Great North Road;
- Station Road/Common Lane; and
- Fenton Lane/Ash Lane.

14.4.13 There are a number of construction routes that would have limited[181] use including: Great North Road; Ridge Road (for a short-section where it meets Great North Road); Fenton Lane/Ash Lane; and Station Road/Common 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 highway closures and diversions or realignments as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. These are expected to include:

- temporary realignment of the A1(M) northbound at its junction with the M1;
- temporary realignment of the A1(M) southbound at its junction with the M1;
- overnight and weekend closures of the A162 London Road just north of where it is crossed by the existing railway line;
- temporary realignment of the A642 Aberford Road at junction 47 of the M1;
- temporary realignment of the A656 Ridge Road at junction 47 of the M1;
- temporary closure of Great North Road between Micklefield and the M1, with local diversion routes available; and
- overnight and weekend closures of Saw Wells Lane.

14.4.15 Permanent changes to highways are reported under operation.

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 changes 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 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes 402, 403, 492 and 494. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of the Leeds to Selby Line and the Micklefield to Church Fenton Line and their passenger and rail freight services. Rail possessions would be required to

[181] 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.

undertake localised works, including the construction of bridges and where the Proposed Scheme connects with the existing York to Church Fenton Line to the south of Ulleskelf. This could potentially result in disruption to services, although many of the interventions would be combined to reduce the frequency of potential disruption.

14.4.21 The construction of the Leeds to Selby overbridge at Garforth would require the closure of the Leeds to Selby Line (potentially under an extended possession). This closure would impact on Garforth, East Garforth and Micklefield Stations and the operation of rail services that run north from Leeds.

14.4.22 The effects of railway possessions and closures will be assessed and reported in the formal ES.

Non-motorised users

14.4.23 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.

14.4.24 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:

- Leeds Bridleway 125 (part of the Leeds Country Way) (on Barrowby Lane south of the M1);
- Leeds Bridleway 123 (on Nanny Goat Lane where it crosses under the M1);
- Barwick Bridleway 10 (between the M1 and the existing railway line);
- Non-definitive Bridleway Barwick (on Nanny Goat Lane between the M1 and the existing railway line);
- Non-definitive Parlington Bridleway (Bridleway 5) (to the east of Leeds, north of Garforth);
- Sturton Grange Footpath 6 (south of the M1);
- Church Fenton Footpath 35.22/1/1 (west of the settlement of Ulleskelf);
- Saxton-cum-Scarthingwell Footpath 35.55/16/1 (north-west of Church Fenton);
- Saxton-cum-Scarthingwell Footpath 35.55/14/2 (north-west of Church Fenton);
- Church Fenton Footpath 35.22/6/1 (north-west of Church Fenton);
- Ulleskelf Footpath 35.70/3/1 (to the west of the settlement of Ulleskelf); and
- Church Fenton Footpath 35.70/1/1 (to the west of the settlement of Ulleskelf).

14.4.25 Permanently diverted PRoW are reported under operation, although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.26 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.

Permanent effects

14.4.27 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

14.4.28 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.

14.4.29 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

14.4.30 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 A1(M); the A63; the A162 London Road; the A642 Aberford Road; the A656 Ridge Road; the B1217 Aberford Road; the B1222 Bishopdyke Road; the B1223 Raw Lane/New Lane; Great North Road; Ridge Road; Fenton Lane/Ash Lane; and Common Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of these routes and changes in traffic could result in changes in accident risk.

14.4.31 Construction of the Proposed Scheme is also likely to require the temporary closures and diversions or realignments of the following: the A1(M) northbound; the A1(M) southbound; the A162 London Road; the A642 Aberford Road; the A656 Ridge Road; Great North Road and Saw Wells Lane.

14.4.32 Construction of the Proposed Scheme would require the temporary diversion of four bus routes, including: bus routes 402, 403, 492 and 494. This could result in increased bus journey times and the need to relocate bus stops.

14.4.33 Construction activities would result in disruption to rail passengers on the Leeds to Selby Line and potentially rail passengers on the York to Church Fenton Line.

14.4.34 Construction of the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW, including: Leeds Bridleway 125 (part of the Leeds Country Way); Leeds Bridleway 123; Barwick Bridleway 10; Non-definitive Bridleway Barwick (Nanny Goat Lane); Non-definitive Parlington Bridleway (Bridleway 5); Sturton Grange Footpath 6; Church Fenton Footpath 35.22/1/1; Saxton-cum-Scarthingwell Footpath 35.55/16/1; Saxton-cum-Scarthingwell Footpath 35.55/14/2; Church Fenton Footpath 35.22/6/1; Ulleskelf Footpath 35.70/3/1 and Church Fenton Footpath 35.70/1/1.

14.4.35 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 Garforth and Church Fenton 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:

- Barwick Road would be permanently realigned to the west with access would be retained to existing properties on the existing Barwick Road on both sides of the route of the Proposed Scheme;
- Ridge Road would be realigned to the east with access retained to properties;
- Great North Road would be realigned via an overbridge to accommodate the Proposed Scheme;
- Coldhill Lane would be realigned to the north-east of its current alignment and cross the route of the Proposed Scheme via Coldhill Lane underbridge;
- Saw Wells Lane would be realigned via an underbridge to accommodate the Proposed Scheme;
- Common Lane would be permanently diverted on a new alignment to the

north-west of its existing alignment; and

- Sandwath Lane would be diverted to the west, north of the route of the Proposed Scheme, to join the realigned Common Lane with access to properties retained.

14.5.6 The permanent highway changes are not expected to result in significant changes in travel distances. The effects of these changes including on non-motorised users will be reported in the formal ES

Accidents and safety

14.5.7 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Parking and Loading

14.5.8 It is currently expected that there would be a permanent loss of car parking or loading at locations along the route of the Proposed Scheme in this area. Where car parking or loading is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect. The effects of these changes would be reported in the formal ES.

Public transport network

14.5.9 It is expected that the Proposed Scheme would generate beneficial effects for rail passengers, as a result of:

- the increase in rail capacity at the existing Leeds station, which is accessible by rail within approximately 10 minutes from Garforth station, and from the introduction of HS2 services at the HS2 Leeds Station;
- significantly improved journey times between Leeds and the north of the UK, the Midlands and the south of England; and
- released capacity on the existing rail network easing pressure and reducing crowding on other passenger rail services creating significant major beneficial effects to local commuters and potentially freeing up space for freight.

Non-motorised users

14.5.10 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Leeds Bridleway 125 (part of the Leeds Country Way) would be realigned to the south of its current alignment to cross the route of the Proposed Scheme via the Leeds Bridleway 125 accommodation overbridge;
- Leeds Bridleway 123 (Nanny Goat Lane) would be realigned to cross the route of the Proposed Scheme via the Leeds Bridleway 123 accommodation overbridge;
- Leeds Footpath 122 (at Nanny Goat Lane) would be closed where it would cross the route of the Proposed Scheme;

- Barwick Bridleway 10 (on Nanny Goat Lane) would be realigned to the south of its existing alignment to cross the route of the Proposed Scheme via the Leeds Bridleway 123 accommodation overbridge;
- Garforth Footpath 8/Parlington Non-definitive Bridleway would be diverted along the south side of the Proposed Scheme to connect to Barwick Road. It would reconnect with its existing alignment to the north of the Proposed Scheme via Barwick Road and the diverted Non-definitive Parlington Bridleway (Bridleway 5);
- Garforth Footpath 7a/Parlington Non-definitive Bridleway would be diverted onto the realigned Barwick Road;
- Non-definitive Parlington Bridleway (Bridleway 5) would be diverted to the north of its existing alignment to connect with the realigned Barwick Road;
- Sturton Grange Footpath 1 (south of the M1) would be diverted to the south of the Proposed Scheme to Garforth Footpath 8 and to the north of route of the Proposed Scheme to Sturton Grange Footpath 6;
- Sturton Grange Footpath 6 (south of the M1) would be realigned to cross the route of the Proposed Scheme via the Sturton Grange Footpath 6 accommodation overbridge;
- Micklefield Footpath 1 (west of the A1(M) junction with the M1) would be realigned to the west of its existing alignment to connect with Micklefield Footpath 11, where it would cross the route of the Proposed Scheme via the Micklefield Footpath 11 accommodation overbridge and then diverted to meet Micklefield Footpath 11;
- Micklefield Footpath 11 (west of the A1(M) junction with the M1) would be realigned to cross the Proposed Scheme via the Micklefield Footpath 11 accommodation overbridge; and
- Barkston Ash Footpath 35.4/5/2 (south of Barkston Ash) would be diverted to the north of its existing alignment on the west side of the Proposed Scheme.

14.5.11 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the greatest increases in journey distance (likely to be in excess of an additional 500m) would affect the users of Sturton Grange Footpath 1 and Micklefield Footpath 1. The assessment of these changes will be reported in the formal ES.

Other mitigation measures

14.5.12 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

14.5.13 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.5.14 Operation of the Proposed Scheme would require the permanent diversion of: Barwick Road, Ridge Road, Coldhill Lane, Common Lane, and Sandwath 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 It is expected that the Proposed Scheme would generate beneficial effects for rail passengers, as a result of the increase in rail capacity at the existing Leeds station and the introduction of HS2 services at the HS2 Leeds station. There would also be released capacity on the existing rail network.

14.5.16 Operation of the Proposed Scheme would require the permanent closure of one PRoW, Leeds Footpath 122. In addition, the operation of the Proposed Scheme would require the permanent realignment or diversion of 11 PRoW including: Leeds Bridleway 125; Leeds Bridleway 123; Barwick Bridleway 10; Parlington Non-definitive Bridleway (Bridleway 5); Garforth Footpath 7a; Garforth Footpath 8; Sturton Grange Footpath 1; Sturton Grange Footpath 6; Micklefield Footpath 1; Micklefield Footpath 11 and Barkston Ash Footpath 35.4/5/2. These closures, realignments or diversions could result in changes to journey distance for some users.

14.5.17 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

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

14.5.19 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Garforth and Church Fenton 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 Garforth and Church Fenton 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), North Yorkshire County Council (NYCC) and Leeds City Council (LCC) which are the Lead Local Flood Authorities (LLFA) and Selby District Council (SDC). Engagement has also been undertaken with Yorkshire Water Services Limited (the local water and sewerage undertaker) and Ainsty and Selby Internal Drainage Boards (IDBs). 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: LA16 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)[182].

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 Part B, Section 21 of the SMR[183].

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

[182] National Planning Policy Framework, DCLG, 2015.
[183] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Garforth and Church Fenton area, the study area has been extended by approximately 500m to the north of the Proposed Scheme at Ulleskelf across the existing Network Rail crossing of the River Wharfe. This is to incorporate land within the existing York to Church Fenton railway corridor that is potentially required during the construction of the Proposed Scheme.

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 Cock Beck, Stream Dike, Dorts Dike and its tributaries.

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 or the Wharfe and Ouse Lower management catchments of the Humber river basin district (RBD).

15.3.2 The river basin management plan[184] identifies the chemical[185] and ecological[186] status of surface water bodies, and the quantitative[187] and chemical[188] status of groundwater bodies within this RBD.

[184] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[185] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[186] 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.

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 30. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 30: Surface water body receptors

Water body name and location[189]	Designation	Q95 value (m^3/s)[190]	Receptor value	Parent WFD water body name and identification number[191]	Current WFD status/Objective[192]
The Beck WR01-372 D3	Ordinary watercourse	<0.002	High	Lin Dike from Source to River Aire GB10427062810	Moderate/Moderate by 2015
Tributary of The Beck 1 WR01-372 D3	Ordinary watercourse	<0.002	Low		Moderate/Moderate by 2015
Tributary of The Beck 2 WR01-372 D2	Ordinary watercourse	<0.002	Low		Moderate/Moderate by 2015
Tributary of Cock Beck 1 WR01-372 F3	Ordinary watercourse	<0.002	Low	Cock Beck Catchment (Trib of Wharfe) GB10427063940	Bad/Good by 2027
Tributary of Cock Beck 2 WR01-372 F3	Ordinary watercourse	0.003	Moderate		Bad/Good by 2027
Tributary of Cock Beck 3 WR01-372 G4	Ordinary watercourse	<0.002	Moderate		Bad/Good by 2027

[187] 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.
[188] 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.
[189] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA16 Map Book figure (in this case WR-01).
[190] This is the flow within the watercourse that is exceeded for 95% of the time.
[191] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[192] Status and objectives are based on those set out in the 2015 River basin management plan.

Water body name and location[189]	Designation	Q95 value (m^3/s)[190]	Receptor value	Parent WFD water body name and identification number[191]	Current WFD status/Objective[192]
Sturton Dyke WR01-372 H5	Ordinary watercourse	<0.002	High	Mill Dike from Source to Bishop Dike GB10427063640	Moderate/Good by 2027
Weet Wood Drain 1 WR01-372 J7	Ordinary watercourse	<0.002	Low	Bishop Dike (Trib of Ouse) GB10427063660	Poor/Good by 2027
Weet Wood Drain 2 WR01-372 J7	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Tributary of Stream Dike 1 WR01-373 F5	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Stream Dike WR01-373 F5	Ordinary watercourse	0.02	High		Poor/Good by 2027
Tributary of Bishop Dike 1 WR01-373 H4	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Bishop Dike WR01-373 H4	Ordinary watercourse	<0.002	High		Poor/Good by 2027
Tributary of Barkston Drain 1 WR01-373 H3	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Tributary of Barkston Drain 2 WR01-373 H3	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Barkston Moor Drain 1	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Common Lane Drain 1 Wr01-373	Ordinary watercourse	<0.002	Low	Upper Fox Drain Catchment ds of Sherburn STW GB10427063610	Poor /Good by 2027
Common Lane Drain 2 WR01-373 I2	Ordinary watercourse	<0.002	Low		Poor/Good by 2027
Common Lane Drain 3 WR01-	Ordinary watercourse	<0.002	Low	Dorts Dike Catchment (Trib of Wharfe) GB10427063930	Moderate/Good by 2027
Sandwath Lane Drain	Ordinary watercourse	<0.002	Low		Moderate/Good by 2027

Water body name and location[189]	Designation	Q95 value (m^3/s)[190]	Receptor value	Parent WFD water body name and identification number[191]	Current WFD status/Objective[192]
WR01-374 E6					
Tributary of Dorts Dike 1 WR01-374 E6	Ordinary watercourse	<0.002	Low		Moderate/Good by 2027
Tributary of Dorts Dike 2 WR01-374	Ordinary watercourse	<0.002	Low		Moderate/Good by 2027
Tributary of Dorts Dike 3 WR01-374	Ordinary watercourse	<0.002	Low		Moderate/Good by 2027
Dorts Dike WR01-374	Ordinary watercourse	0.009	High		Moderate/Good by 2027
Tributary of Dorts Dike 4 WR01-374 F6	Ordinary watercourse	<0.002	Moderate		Moderate/Good by 2027
Longbridge Dike WR01-374 G5	Ordinary watercourse	0.02	High		Moderate/Good by 2027
River Wharfe WR01-374 H5	Main river	3	High	Wharfe from Tadcaster Weir to River Ouse GB104027064256	Moderate/Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There are six licensed surface water abstractions in the study area. None of these are located within the land required for the construction and operation of the Proposed Scheme. All six abstractions are for non-potable spray irrigation. Five of these have a daily licence quantity of above 100m3 and have therefore been assessed as high value receptors. The remaining abstraction has a daily licence quantity of less than 100m3 and has therefore been assessed as a receptor of moderate value.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than $20m^3$ per day, have been obtained from the local authorities. These data indicate that there 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.

15.3.8 There are 13[193] consented discharges to surface waters within the study area, one of which is within the land required for the construction of the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 31. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 31 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 31: Summary of geology and hydrogeology in the study area

Geology[194]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[195]	WFD status objective[196]	Receptor value
Superficial deposits						
Alluvium	Along the Cock Beck and its tributary Dorts Dike	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Head	Sporadic deposits located across the majority of the study area	Clay, silt, sand and gravel	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Harrogate Till Formation	Sporadic deposits located across the majority of the study area	Sandy clay with local large sandstone boulders	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial deposits	Sporadic deposits in the study area north of Sherburn in Elmet	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Hemingbrough Glaciolacustrine Formation	Around Barkston Ash and Church Fenton	Clay, silt and sand	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

[193] 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.
[194] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[195] As stated in the 2015 River basin management plan.
[196] As stated in the 2015 River basin management plan.

Geology[194]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[195]	WFD status objective[196]	Receptor value
Glaciolacustrine Deposits	Sporadic deposits north of Barkston Ash	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Breighton Sand Formation	Around Ulleskelf	Sand, clayey and silty	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Peat	To the east of the route of the Proposed Scheme around Church Fenton and Ulleskelf	Peat	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Bedrock						
Pennine Lower Coal Measures Formation	Crossed by the southern part of the Proposed Scheme until J47 of the M1	Interbedded mudstone, siltstone and sandstone commonly with coal seams.	Secondary A	Aire and Calder Carb Limestone Millstone Grit Coal Measures (GB40402G700400) Poor	Poor by 2015	Moderate
				Wharfe and Ouse Lower Millstone Grit and Carb Limestone (GB40402G700500) Poor	Good by 2027	Moderate
Yellow Sands Formation	Crossed by the Proposed Scheme near J47 of the M1	Sandstone	Principal	Wharfe and Ouse Lower Millstone Grit and Carb Limestone (GB40402G700500) Poor	Good by 2027	High
Cadeby Formation	Crossed by the route of the Proposed Scheme from	Dolostone	Principal	Wharfe Magnesian Limestone	Good by 2027	High

Geology[194]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[195]	WFD status objective[196]	Receptor value
	J47 of the M1 to Weet Wood			(GB40401G701100) Poor		
Edlington Formation	Crossed by the route of the Proposed Scheme around Weet Wood and Daniel Hartley's Wood	Calcareous mudstone	Secondary B	Wharfe Magnesian Limestone (GB40401G701100) Poor	Good by 2027	Moderate
Brotherton Formation	Crossed by the route of the Proposed Scheme from Weet Wood to Barkston Ash	Dolomitic limestone	Principal	Wharfe Magnesian Limestone (GB40401G701100) Poor	Good by 2027	High
Roxby Formation	Not directly intersected by the route due to overlying superficial deposits, though present at depth around Barkston Ash to Ulleskelf	Calcareous mudstone	Secondary B	Wharfe Magnesian Limestone (GB40401G701100) Poor	Good by 2027	Moderate
Sherwood Sandstone Group	At northern extent of study area, not crossed by Proposed Scheme	Sandstone	Principal	Wharfe & Lower Ouse Sherwood Sandstone (GB40401G702400) Poor	Good by 2021	High

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 31, is outlined briefly as follows:

- alluvium, glaciofluvial deposits, Glaciolacustrine Deposits and the Breighton Sand Formation 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;
- head deposits and the Harrogate Till Formation may supply baseflow to watercourses or store and yield limited amounts of groundwater and so have been classified as moderate value receptors; and

- peat and the Hemingbrough Glaciolacustrine Formation have been classified by the Environment Agency as unproductive in this area and have therefore been assessed as low value receptors.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 31 is outlined briefly as follows:

- the Yellow Sands Formation, Cadeby Formation, Brotherton Formation and Sherwood Sandstone Group have all been classified as Principal aquifers by the Environment Agency. These aquifers may be capable of supporting water supplies at a regional scale and can also provide an important component of baseflow to rivers. They have therefore been assessed as high value receptors;
- the Pennine Lower Coal Measures Formation has been classified as a Secondary A aquifer by the Environment Agency. This aquifer 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. This has therefore been classified as a moderate value receptor; and
- the Edlington Formation and Roxby Formation have been classified as Secondary B aquifers by the Environment Agency. These aquifers may supply baseflow to watercourses or store and yield limited amounts of groundwater and so have been classified as moderate value receptors.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 31. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licenced for public water supply within the study area. One source protection zone (SPZ) three is present within the study area. This is associated with a large commercial water supply outside of the study area. The SPZ3 does not extend into the land required for the construction of the Proposed Scheme.

15.3.15 There are a total of six[16] private groundwater abstraction licences registered in the study area, as shown on Map WR-02-201. Three of these have been surveyed and are considered as high value receptors due to the daily licence quantity being above 100m^3. Three have not been surveyed. Of these one is licensed as a potable supply and is therefore assessed as a high value receptor, protected by a nominal SPZ1 and SPZ2 of 50m and 250m radius respectively. One is a non-potable supply with an abstraction quantity of greater than 100m^3/d, and is assessed a high value receptor. The other is a

non-potable supply abstracting less than 100m^3/d and is assessed a moderate value receptor.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. Information obtained from the local authorities indicates that there are three[16] unlicensed private groundwater abstractions registered within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.17 There are two[197] consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors.

Groundwater – surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 11 features within the study area that have potential to be springs. Access was possible to inspect three of these features, of which:

- one was identified as a spring of low value due to it being lost under a housing development;
- one spring at Barrowby Cottage was identified as a moderate value receptor because it provides flow to a moderate value surface watercourse (tributary of Lin Dike); and
- one spring at Carr Wood was identified as a moderate value receptor, because it supplies a licensed abstraction of moderate value. This spring also provides baseflow to a pond in the priority habitat around Barrowby Hall. Further details of the ecology of this feature, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

15.3.19 The remaining eight potential spring features are assumed to be high value receptors on a precautionary basis. None of the potential spring features yet to be inspected are within the land required for the construction of the Proposed Scheme.

15.3.20 There are 16 ponds within the land required for construction of 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.

[197] The number of abstractions and 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.

Water dependent habitats

15.3.21 The following nature conservation site within the study area is potentially dependent on surface water flows, for example periodic flooding from a watercourse. Kirkby Wharfe Site of Special Scientific Interest (SSSI), approximately 700m north of the route of the Proposed Scheme at the northern end of the Garforth and Church Fenton area. This site is an area of floodland/marshland located within the study area and is dependent on periodic inundation from Dorts Dike. It also has the potential to be groundwater dependent. 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.

Existing baseline - flood risk and land drainage

15.3.22 The Environment Agency's Flood map for planning (rivers and sea)[198] 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).

15.3.23 The updated Flood map for surface water[199] 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[200]. The British Geological Survey's (BGS) Groundwater flooding susceptibility data set[201], has been used to assess the future risk of groundwater flooding.

15.3.24 The following reports were used to help determine the baseline flood risk within the study area:

- Leeds Preliminary Flood Risk Assessment (PFRA) (2011)[202];
- Leeds Strategic Flood Risk Assessment (SFRA) (2007)[203];
- Leeds Local Flood Risk Management Strategy (LFRMS) (2014)[204];
- North Yorkshire SFRA (2016)[205]; and
- North Yorkshire LFRMS (2016)[206].

[198] Environment Agency, (2018), Flood Map for Planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[199] 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/
[200] 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/
[201] British Geological Survey (BGS) (2018) BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[202] Leeds Preliminary Flood Risk Assessment (2011) Leeds City Council
[203] Leeds Strategic Flood Risk Assessment (2007) Leeds City Council
[204] Leeds Local Flood Risk Management Strategy (2014) Leeds City Council
[205] North Yorkshire Strategic Flood Risk Assessment (2016) North Yorkshire County Council, City of York, north York Moors National Park
[206] North Yorkshire Local Flood Risk Management Strategy (2016), North Yorkshire County Council

River flooding

15.3.25 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Wharfe and Dorts Dike and their tributaries between Church Fenton and Ulleskelf. Other floodplains that would be crossed by the route of the Proposed Scheme include those associated with Cock Beck, north of East Garforth, and Stream Dike, north-west of Sherburn in Elmet. Table 32 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 32: River flood risk sources and receptors

Source	Location description and figure/coordinate[207]	Receptor potentially affected	Receptor value/sensitivity to flooding
Cock Beck – upstream of the Barwick Road realignment.	Flood Zone 2 WR-01-370b I8 - J10	Multiple residential and commercial properties at Willow Park Farm	High
Stream Dike – upstream and downstream of Stream Dike viaduct.	Flood Zone 2 Wr-01-373 E4 – H6	Multiple residential properties on Cold Lane and Chapel Bridge	High
River Wharfe, Longbridge Dike, Dorts Dike and associated tributaries[208]	Flood Zone 2 Wr-01-374 D5, D6, E5, E6, E7, F4, F6, F7, G5, G6.	Multiple residential and commercial properties at Sandwath Lane, Sandwath Drive, Common Lane, North Milford Grange, The Hall, Little Ings Close, Trans Walk, Ulla Green, Dorts Crescent, Skelf Street, Cawood Crescent, Mires Lane, Inngs Road, Main Street, Church Fenton Lane, and West End Approach	High

Surface water flooding

15.3.26 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 33. The value of these receptors, based on Table 57 of the SMR, is also indicated.

[207] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA16 Map Book figure (in this case WR-01).
[208] The mechanism of flooding associated with these watercourses is characterised by complex fluvial and tidal interactions, which prevent the identification of a single source of flooding too many properties in the Ulleskelf area. Hydraulic modelling is currently being undertaken to more accurately define the baseline flood extent and determine the mechanism of flooding based on a combination of fluvial and tidal (storm surge) events. The results of this modelling work will be used to refine the assessment in the final Environmental Statement.

Table 33: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[209]	Receptor potentially affected	Receptor value
Surface water flow path at Carr Wood (south) culvert	Carr Wood WR-01-370b H8	Agricultural land	Moderate
Surface water flow path at Barnbow Common drop inlet culvert, Hawk's Nest Wood drop inlet culvert, and Barwick Road	North of Garforth WR-01-372 F3 – G4	Residential and commercial property at Lotherton Court Agricultural land	High
Surface water flow path upstream of Bishops Dike culvert	Barkston Ash WR-01-373 H3 – H4	Multiple residential properties along Back Lane, Church Street Saw Well Lane, and Ivy Hall Farm Agricultural land	High
Surface water ponding at Church Fenton viaduct	Church Fenton WR-01-373 I2	Agricultural land	Moderate
Surface water ponding at Ulleskelf Mires South Culvert and Ulleskelf Mires north inverted siphon	Ulleskelf WR-01-374 E5, E6, F5, F6	Agricultural land	Moderate

Artificial water bodies

15.3.27 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies within the study area. There are a number of reservoirs located outside of the study area to the north-west of the Proposed Scheme with potential implications for flood risk within the study area. The closest of these is Eccup reservoir, which is 20km to the north-west of the route. However, as these are large raised reservoirs, subject to the requirements of reservoir safety legislation[210], the inundation risk posed by these reservoirs is considered negligible.

Groundwater flooding

15.3.28 Information related to historical incidents of groundwater flooding in the Garforth and Church Fenton area is contained in the Leeds and North Yorkshire SFRAs. Both state that the risk of groundwater flooding is highly variable within the district. It is heavily dependent upon local ground conditions at any particular time, and the structures that have been constructed on them.

15.3.29 The BGS's Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at the southern end of the study area, at

[209] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA16 Map Book figure (in this case WR-01).
[210] Department for Communities and Local Government (DCLG), (2014), Reservoirs: Owners and Operator Requirements (Updated 2016). Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements

Carr Wood (near Garforth), and also towards the northern end of the study area, where the Proposed Scheme is underlain by the Breighton Sand Formation.

Land drainage

15.3.30 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 Construction Practice (CoCP)[211] 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 Cock Beck, Stream Dike and Dorts Dike 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.

[211] Supporting document: Draft Code of Construction Practice.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: LA16 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 Cock Beck 2; and
- tributary of Cock Beck 3.

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[212].

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 five diversions proposed within this study area. These are located at:

- tributary of Stream Dike 1, which will be diverted for a short distance along the toe of the Stream Dike south embankment, and will then discharge into Stream Dike approximately 100m further downstream;
- tributary of Bishops Dike 1, which will be diverted for a short distance along the toe of the Barkston Ash embankment, and will then pass under the embankment through the Bishop Dike culvert;
- tributary of Barkston Drain 1, which will be diverted for a short distance along the toe of the Barkston Ash embankment, then pass under the embankment through the Barkston Moor culvert; and
- tributary of Barkston Drain 2, which will be diverted for a short distance along the toe of the Barkston Ash embankment, then pass under the embankment through the Barkston Moor culvert.

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 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

[212] '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.

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;
  - 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 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.

15.4.12 Permanent culverts proposed on the smaller watercourse crossings within this study area include: Carr Wood south culvert, Barnbow Common drop inlet culvert; Hawk's Nest Wood drop inlet culvert; Sturton Dyke drop inlet culvert; Weet Wood Culvert; Bishop Dike culvert; Barkston Moor culvert; Barkston Ash culvert; and Ulleskelf Mires North inverted siphon. 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.

15.4.13 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.

15.4.14 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.

15.4.15 Measures would be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[213] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.16 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

15.4.17 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 Stream Dyke and Church Fenton viaducts, the embankment crossing the Dorts Dike floodplain and the Common Lane realignment, Sandwath Lane diversion and the York to Church Fenton Line railway realignment, all of which are located in the Dorts Dike floodplain. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers, embankments and highway realignments;
- the temporary works shown in the Volume 2: LA16 Map Book have been informed by a detailed consideration of the flood risk constraints and have

[213] Impermeable barrier preventing water flow

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;
- 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[214];
- 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.

15.4.18 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,

[214] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;

- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.19 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

15.4.20 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

15.4.21 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

15.4.22 The proposed cuttings and tunnels in the study area would intersect the Pennine Lower Coal Measures Formation Secondary A aquifer, the Yellow Sands Formation Principal aquifer, the Cadeby Formation Principal aquifer, the Brotherton Formation Principal aquifer, alluvium Secondary A aquifer, and the Harrogate Till Formation Secondary Undifferentiated aquifer. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to mean that any impacts on the overall status of these aquifers would not be significant.

15.4.23 Where cuttings and tunnels could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.24 There is one licensed private groundwater abstraction at Barrowby Hall with the potential to be affected. The construction of the Proposed Scheme would result in the permanent loss of the confirmed spring feature at Carr Wood. This spring feeds the licensed abstraction at Barrowby Hall, and its loss has the potential to adversely affect this feature. However, as set out in the draft CoCP this risk will be assessed by the contractor. If required, a suitable replacement water supply would be provided.

Groundwater - surface water interactions

15.4.25 The spring at Carr Wood provides baseflow to a pond at Barrowby Hall priority habitat. The loss of this spring feature under the West Garforth embankment may result in a potential reduction of flow to the spring-fed pond, which results in a moderate hydrological impact. The assessment of effects and associated other mitigation for Barrowby Hall priority habitat are provided in Section 7, Ecology and biodiversity.

Water dependent habitats

15.4.26 The assessment has not identified any temporary significant effects on water dependent habitats.

Temporary effects - Flood risk and land drainage

15.4.27 Construction of the Stream Dike viaduct, Dorts Dike viaduct, and embankments 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, LLFA and IDB's. 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

15.4.28 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

15.4.29 The construction of the Carr Wood south culvert on The Beck has potential to result in a moderate impact on channel hydromorphology, on this high value receptor. This would result in a moderate adverse effect, which is significant.

15.4.30 The realignment of Bishop Dike through Bishop Dyke culvert has potential to result in a minor impact on channel hydromorphology, on this high value receptor. This would result in a moderate adverse effect, which is significant.

15.4.31 The construction of the Sturton Dyke drop inlet culvert on Sturton Dyke has potential to result in a moderate impact on channel hydromorphology, on this high value receptor. This would result in a moderate adverse effect, which is significant.

15.4.32 The construction of the Ulleskelf Mires north inverted siphon on tributary of Dorts Dike 4 has potential to result in a moderate impact on channel hydromorphology, on this moderate value receptor. This would result in a moderate adverse effect, which is significant.

Groundwater

Aquifers

15.4.33 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings and tunnels on water levels and quality in the aquifers intercepted by the Proposed Scheme.

15.4.34 Where the impacts of the cuttings and tunnels on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

15.4.35 There is one licenced private groundwater abstraction that could be impacted by the construction of below ground scheme elements. This abstraction is located at Coldhill Farm (1) and is licensed for spray irrigation. The excavation proposed could result in a reduction of recharge to this abstraction. However, as set out in the draft CoCP this risk will be assessed by the contractor. If required, a suitable replacement water supply would be provided.

Groundwater - surface water interactions

15.4.36 There remains the potential for baseflows in the tributary of Cock Beck 2, a moderate value receptor, to be impacted by permanent lowering of groundwater due to excavation of Micklefield cutting and Weet Wood cut and cover tunnel. Until this can be confirmed by site investigation the assessment currently identifies this as a permanent moderate adverse effect, which is significant.

15.4.37 There remains the potential for baseflows in the tributary of Sturton Dyke, a high value receptor, to be impacted by permanent lowering of groundwater due to excavation of Weet Wood cut and cover tunnel and Weet Wood cutting. Until this can be confirmed by site investigation the assessment currently identifies this as a permanent major adverse effect, which is significant.

15.4.38 The potential spring feature near Well House Farm could be permanently impacted due to removal of upgradient material, which could result in a reduction in recharge to the spring. The nature of this feature has not been confirmed by a site survey and, taking a precautionary approach, it has been assessed as a high value receptor. The potential effects to this feature could therefore result in a permanent moderate adverse effect, which is significant.

Water dependent habitats

15.4.39 This assessment has not identified any permanent significant effects on water dependent habitats.

Permanent effects - Flood risk and land drainage

15.4.40 The earthworks required to construct the Barwick Road and Church Fenton embankments will be located within areas of flood zone 2 associated with Cock Beck and Dorts Dike and its tributaries. The Proposed Scheme currently makes provision for a replacement floodplain storage area to mitigate the loss of flood storage caused by the construction of the Church Fenton embankment. There are approximately 360 residential properties within the floodzone across which the Church Fenton embankment would be constructed and three residential properties immediately to the west of the proposed Barwick Road embankment. Until hydraulic modelling has been undertaken to verify the effectiveness of this proposed replacement floodplain storage area, and determine whether any additional provision is required to offset the loss of flood storage associated with the Barwick Road embankment earthworks, 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

15.4.41 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.

Flood risk and land drainage

15.4.42 Detailed hydraulic analysis will be undertaken to verify baseline flood extents and quantify the change in flood level, if any, caused by the encroachment of the Barwick Road and Church Fenton embankments into the floodplains of Cock Beck at Garforth and Dorts Dike and its associated tributaries at Ulleskelf.

Groundwater-surface water interactions

15.4.43 Additional mitigation measures may be required for the management of groundwater baseflows to the tributary of Cock Beck 2 and Sturton Dyke during excavation and dewatering of Micklefield cutting, Weet Wood cut and cover tunnel and Weet Wood cutting. Mitigation measures will 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 channel on tributary of Cock Beck 2 and Sturton Dyke; and
- recirculation of treated water to tributary of Cock Beck 2 and Sturton Dyke at an appropriate rate and location.

15.4.44 A survey of the potential spring feature near Well House Farm will be undertaken to determine its value and to identify whether further mitigation is required. If it is confirmed to be a spring, it would be re-established nearby to prevent any adverse permanent impacts.

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

Summary of likely residual significant effects

15.4.46 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a permanent moderate adverse effect on flood risk related to the encroachment of the Church Fenton embankment into the floodplain of Dorts Dike, which is significant;
- a permanent moderate adverse effect on flood risk related to the encroachment of the Barwick Road embankment into the floodplain of Cock Beck, which is significant;
- the permanent moderate adverse effects on channel hydromorphology of The Beck, Bishops Dike, Sturton Dyke and tributary of Dorts Dike 4, all of which are significant;
- a permanent moderate adverse effect related to the potential loss of baseflow within tributary of Cock Beck 2 due to permanent lowering of groundwater levels in the vicinity of Micklefield cutting and Weet Wood cut and cover tunnel, which is significant;
- a permanent major adverse effect related to the potential loss of baseflow within Sturton Dyke due to permanent lowering of groundwater levels in the vicinity of Weet Wood cut and cover tunnel and Weet Wood cutting, which is significant; and
- a permanent moderate adverse effect related to the potential effect on the spring feature near Well House Farm due to the reduction in recharge area, which is significant.

15.4.47 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 shows 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.

16 References

ADAS, (1992), Agricultural Land Classification, Barrowby Hall and Swillington Common Farms, Garforth, West Yorkshire – Proposed Golf Course Development, Job No 32/02

ADAS, (1992), Agricultural Land Classification, Leeds UDP Topic 442, Micklefield Enlarged Settlement, West Yorkshire. Job No 21/92

ADAS, (1992), Agricultural Land Classification, Parlington Estate, Garforth, Leeds – Proposed Inclusion in Local UDP, Project No 20/92.

Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk

APHA Foot and Mouth County Series Maps. Available online at: https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001

Battlefields Trust, (2018), UK Battlefields Resource Centre: Battle of Towton. Available online at: http://www.battlefieldstrust.com/resource-centre/warsoftheroses/battleview.asp?BattleFieldId=46

BBC, (2018), Domesday Reloaded Entry D-block GB-440000-432000 History of Garforth. Available online at: http://webarchive.nationalarchives.gov.uk/20120220220702/http://www.bbc.co.uk/history/domesday/dblock/GB-440000-432000/page/14

British Geological Survey, BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.htmL

British Geological Survey, (2018), Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

British Geological Survey, (2014), Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01. Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904

British Geological Survey, Radon data: radon potential dataset. Available online at: https://www.bgs.ac.uk/radon/hpa-bgs.html

British Standard, (2011), BS10175+A1:2013 Investigation of Potentially Contaminated Sites.

British Standard, (2012), BS 5837:2012 Trees in relation to design, demolition and construction.

British Standard, (2013) BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

Cranfield University, (2001), The National Soil Map of England and Wales 1:250,000 scale. Cranfield University: National Soil Resources Institute.

Crashmap. Available online at: www.crashmap.co.uk

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

Department for Communities and Local Government (DCLG), (2015), National Planning Policy Framework.

Department for Communities and Local Government (DCLG), (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2

Department for Communities and Local Government (DCLG), (2014), Reservoirs: Owners and Operator Requirements (Updated 2016). Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements

Department for Environment, Food and Rural Affairs (Defra), (2009), Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.

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

Department for Environment, Food and Rural Affairs (Defra), (2005), Likelihood of Best and Most Versatile Agricultural Land.

Department for Environment, Food & Rural Affairs (Defra), (2014), Noise Action Plan: Agglomerations (large urban areas)

Department for Environment, Food & Rural Affairs (Defra), (2014), Noise Action Plan: Roads (including major roads)

Department for Environment, Food & Rural Affairs (Defra), (2014), Noise Action Plan: Railways (including major railways)

Department for Environment, Food & Rural Affairs (Defra), (2015), Noise Policy Statement for England.

Department for Environment, Food and Rural Affairs (Defra), (2009), Soil Strategy for England.

Environment Agency, (2016), Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities.

Environment Agency, (2004), CLR11 Model Procedures for the Management of Land Contamination.

Environment Agency, (2018), Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/

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/

Environment Agency, (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.

EU Commission Regulation No 1304/2014. Technical Specification for Interoperability (TSI) Noise, (2014). Available online at: http://www.era.europa.eu/Document-Register/Pages/Noise-NOI-TSI.aspx

EU Water Framework Directive. Available online at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

Gelling, M, (1992), The West Midlands in the Early Middle Ages, Leicester University Press, 185.

Historic England, (2018), National Heritage List Record for Asset: Battle of Towton, 1461 (NHLE 1000040). Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1000040

Historic England, (2018), National Heritage List Record for Asset: Castle Hills prehistoric settlement, field system and medieval wood banks (NHLE 1019403). Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1019403

Historic England, (2018), National Heritage List Record for Asset: Iron Age and Romano-British Settlement south of Hungerhills Plantation, Parlington (NHLE 1433523). Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1433523

Historic England, (2018), National Heritage List Record for Asset: Temple Newsam (NHLE Ref. 1001356). Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1001356

Historic England, (2018), National Heritage List Record for Asset: World War II airfield defences at RAF Church Fenton (1021191). Available online at: https://historicengland.org.uk/listing/the-list/list-entry/1021191

Historic England, (2018), Site of First World War Munitions Factory Where 35 Women Died in Explosion Given Heritage Protection. Available online at: https://historicengland.org.uk/whats-new/news/fww-munitions-factory-given-heritage-protection

HM Government, (2016), HS2 information for farmers and growers. Available online at: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers

HM Government, (2011), The Natural Choice: securing the value of nature.

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

Leeds Biodiversity Action Plan (BAP)

Leeds City Council, (2013), Adopted Natural Resources and Waste Local Plan - Leeds Local Development Framework. Available online at: http://www.leeds.gov.uk/docs/Adopted%20Consolidated%20NRWLP%20Inc%20Policies%20Mins%2013-14.pdf

Leeds City Council, (2016), Authority Monitoring Report 2016: Local Development Framework, p12. Available online at: http://www.leeds.gov.uk/docs/2016%20AMR%20Final%20vash.pdf

Leeds City Council, (2011), Landscape Character Review. Available online at: http://www.leeds.gov.uk/docs/CD11-14%20Leeds%20Landscape%20Review%20Maps%202011.pdf

Leeds City Council, (2011), Leeds Employment Land Review, 2010 Update. Available online at: https://www.leeds.gov.uk/SiteAllocationMaps/Evidence%20Base%20Documents/Employment%20Land%20Review%20%202010%20Update.pdf

Leeds City Council, (1994), Leeds Landscape Assessment. Available online at: http://www.leeds.gov.uk/docs/CD11-15%20LA%20Composite%20version.pdf

Leeds City Council, (2014), Leeds Local Flood Risk Management Strategy.

Leeds City Council, (2011), Leeds Preliminary Flood Risk Assessment.

Leeds City Council, (2007), Leeds Strategic Flood Risk Assessment.

Leeds City Council, (2017), Lotherton: Things to do and see. Available online at: https://www.leeds.gov.uk/museumsandgalleries/lothertonhall/things-to-do-and-see

Leeds City Region Local Enterprise Partnership, (2016), Strategic Economic Plan 2016-2036. Available online at: http://www.the-lep.com/LEP/media/New/SEP%20documents/SEP-2016-2036-FINAL.pdf

McDonagh, B A K, (2007), Manor Houses, Churches and Settlements: Historical Geographies of the Yorkshire Wolds Before 1600, unpublished PhD thesis, University of Nottingham, 32

Meteorological Office, (1989), Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations.

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.

Ministry of Housing, Communities & Local Government (2012), Planning practice guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance

National Environment and Rural Communities Act 2006, Section 41

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

North Yorkshire County Council, (2016), North Yorkshire Local Flood Risk Management Strategy.

North Yorkshire County Council, (2016), North Yorkshire Strategic Flood Risk Assessment.

Office for National Statistics (ONS), (2016), Annual Population Survey. Available online at: http://www.nomisweb.co.uk

Office for National Statistics (ONS), Business Register and Employment Survey 2016. Available online at: http://www.nomisweb.co.uk

Office for National Statistics (ONS), (2014), Measuring Social Capital. Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

Office for National Statistics (ONS), UK Business count – Local Units 2017. Available online at: https://www.nomisweb.co.uk

Oil and Gas Authority, Onshore Oil and Gas Authority. Available online at: https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa

Pastscape, (2015), Record for Asset: Calcaria Roman Town (Monument Number Ref. 54930). Available online at: http://www.pastscape.org.uk/hob.aspx?hob_id=54930

Pastscape, Record for Asset: Earthworks, Sheep Dike, Old Micklefield (Monument Number Ref. 2838). Available online at: http://www.heritagegateway.org.uk/Gateway/Results_Single.aspx?resourceID=105&uid=2838

Public Health England (PHE), (2018), Health Profiles. Available online at: https://fingertips.phe.org.uk/profile/health-profiles

Public Health England (PHE), Public Health Observatories (PHOs). Available online at: https://fingertips.phe.org.uk/

Public Health England (PHE), UK maps of radon. Available online at: www.ukradon.org/information/ukmaps

Selby Biodiversity Action Plan (BAP)

Selby District Council, (2010), Employment Land Refresh 2010: Appendix 6. Available online at: http://www.selby.gov.uk/sites/default/files/Documents/ELR10_Jan2011_Appendix_6_Site_Assessments.pdf

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.

Staffordshire Biodiversity Action Plan (BAP)

Sustainable Remediation Forum UK, (2010), A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.

The Domesday Book Online, (1999-2017), Yorkshire: West Riding C-G Church Fenton. Available online at: http://www.domesdaybook.co.uk/westriding2.html

The Environmental Noise (Identification of Noise Sources) (England) (Amendment) Regulations 2007

The Hedgerow Regulations, (1997), Statutory Instrument 1997 No. 1160. Her Majesty's Stationary Office.

The Minerals and Waste Joint Plan, (2016). Available online at: https://www.northyorks.gov.uk/minerals-and-waste-joint-plan

Weldrake, D, (2011), Aberford Dykes: A tourist's guide to interesting archaeological sites in West Yorkshire, West Yorkshire Archaeology Advisory Service Guide. Available online at: http://www.wyjs.org.uk/media/1362/aberford-dykes.pdf

West Yorkshire Archive Service, (no date), Gascoigne of Parlington, Family and Estate Records (WYL115). Available online at: https://archiveshub.jisc.ac.uk/search/archives/953423ea-a506-33fc-9860-564439b285a1

Woolerton Dodwell Associates on behalf of Selby District Council, (1999), Landscape Assessment of Selby District. Available online at: http://www.selby.gov.uk/sites/default/files/Documents/Landscape_Assessment_of_Selby_District_Jan_99.pdf

World Health Organization (WHO), (2010), Night time Noise Guidelines for Europe.

York, North Yorkshire and East Riding Local Enterprise Partnership, (2016), Strategic Economic Plan Update 2016. Available online at: https://www.businessinspiredgrowth.com/wp-content/uploads/2016/07/SEP-Update-2016.pdf

HS2

www.hs2.org.uk

High Speed Two (HS2) Limited
Two Snowhill,
Snow Hill Queensway,
Birmingham B4 6GA
Freephone: 08081 434 434
Minicom: 08081 456 472
Email: HS2enquiries@hs2.org.uk