High Speed Two Phase 2a: West Midlands to Crewe

Working Draft Environmental Impact Assessment Report

Non-technical summary

September 2016

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Department for Transport

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

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

ARUP ERM

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Foreword

The working draft Environmental Impact Assessment Report

High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. It will be built in phases. Phase One comprises the first section of the HS2 rail network of approximately 230 kilometres (143 miles) between London, Birmingham and the West Midlands that will become operational in 2026. The High Speed Two (London-West Midlands) Bill is currently proceeding through Parliament with the aim of achieving Royal Assent by the end of 2016 and commencing construction in 2017.

Phase Two of HS2 would extend the line to the north-west and north-east, to Manchester with connections to the West Coast Main Line at Crewe and Golborne, and to Leeds with a connection to the East Coast Main Line approaching York, completing what is known as the 'Y network'.

Phase 2a (the Proposed Scheme), the subject of this working draft Environmental Impact Assessment (EIA) Report, comprises the first section of the western leg of Phase Two from the West Midlands to Crewe, approximately 60 kilometres (37 miles) in length. The Government intends to deposit a hybrid Bill in Parliament by the end of 2017, seeking powers to build Phase 2a of HS2. The hybrid Bill to be deposited in Parliament for Phase 2a will be accompanied by a formal EIA Report[1].

The formal EIA Report is being prepared in accordance with UK and European legislation and relevant guidance. Although the UK voted to leave the European Union on 23 June 2016, until exit negotiations are concluded, the UK remains a full member of the European Union and all the rights and obligations of European Union membership apply. A new EU Directive on environmental impact assessment is required to be transposed into national legislation of Member States by 16 May 2017. As this is expected to have taken place by the time the hybrid Bill is deposited, HS2 Ltd has adopted the principles of the new EIA Directive for Phase 2a in advance of new UK regulations and guidance.

The formal EIA Report will identify the likely significant environmental effects of the Proposed Scheme so that they can be properly taken into account by Parliament before it decides whether or not to grant the powers to build the railway. The formal EIA Report will set out:

- a description of the Proposed Scheme and how it was developed;
- the consultation and engagement that has informed the development and assessment of the Proposed Scheme;
- what reasonable alternatives were considered;
- the environmental baseline (i.e. the environmental conditions that currently exist in the vicinity of the Proposed Scheme) and projected future baseline (i.e. future environmental conditions without the Proposed Scheme in place);
- the assessment of the likely significant adverse and beneficial environmental effects of the Proposed Scheme; and
- the proposed mitigation measures to avoid, reduce or manage likely significant adverse effects.

1 Under the EIA Directive 2014/52/EU, the output of the environmental assessment is an Environmental Impact Assessment (EIA) Report (rather than an Environmental Statement). This report uses the term EIA Report where referring to the output of the EIA. The term formal EIA Report is used to refer to the EIA Report that will accompany the Phase 2a hybrid Bill.

The formal EIA Report will accompany the hybrid Bill deposited in Parliament. However, HS2 Ltd is consulting on a working draft to enable interested parties to comment on the current design of the Proposed Scheme, environmental baseline, likely environmental impacts (and, where possible, the likely significant environmental effects) of the construction and operation of the Proposed Scheme, and proposed mitigation measures. The assessment will be updated for the formal EIA Report to reflect further work on the design and assessment between now and when the hybrid Bill is deposited in Parliament.

Consultation on the working draft EIA Report is being carried out early in the development of the Phase 2a proposals. This is to assist the early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. The working draft EIA Report presents preliminary environmental information based on the current stage of design for the Proposed Scheme. As it is a working draft EIA Report, where information is not available at this time, professional judgement and reasonable worst case assumptions have been used to provide an indication of likely impacts to inform consultation.

This consultation

Consultation on the working draft EIA Report is not a statutory requirement. Parliamentary Standing Orders do not require a working draft EIA Report. However, HS2 Ltd recognises the importance of ensuring widespread engagement on the Proposed Scheme and has therefore decided to consult on a working draft EIA Report. Details of the closing date for comments and the address to which comments should be sent are available online at www.gov.uk/hs2.

Stakeholder feedback will be considered in the development of the Proposed Scheme through:

- the ongoing design;
- the collection of relevant baseline environmental information and data;
- the assessment of the likely significant environmental effects arising from construction and operation of the Proposed Scheme;
- the enhancement of the beneficial effects of the Proposed Scheme; and
- the measures identified to avoid, reduce or manage significant adverse effects.

This consultation may identify issues that result in changes being made to the design of the Proposed Scheme or mitigation. Proposed Scheme refinements may also be made as a result of the ongoing design development work. These changes and their effect on the outcome of the environmental assessment will be reflected in the formal EIA Report to be submitted to Parliament with the hybrid Bill. A summary of the consultation responses and how they have been addressed will be provided in a consultation summary report, provided alongside the formal EIA Report.

Following deposit of the hybrid Bill, a public consultation will be undertaken on the formal EIA Report.

Other consultations

Since the Government published the preferred line of route for Phase 2a in November 2015, work has continued to refine the scheme to reduce its environmental effects, to resolve some previously unexplored engineering issues and to improve value for money. This has resulted in some proposed design changes that are being consulted on before deciding whether to incorporate them into the hybrid Bill.

The design refinement consultation is taking place in parallel with consultation on the working draft EIA Report. Each of the proposed changes to the design are described in the Design Refinement Consultation document and in the working draft EIA Report. In the event that following public consultation the Secretary of State decides not to include one or more of the proposed changes in the hybrid Bill, his decision will be reflected in the formal EIA Report.

A consultation is also taking place on a working draft Equality Impact Assessment Report in parallel with the consultations on the working draft EIA Report and design refinement.

Details of the closing date for comments on the Design Refinement Consultation document and working draft Equality Impact Assessment Report, and the address to which comments should be sent are available online at www.gov.uk/hs2.

Contents

1. Introduction

This is the non-technical summary (NTS) of the working draft Environmental Impact Assessment (EIA) Report for Phase 2a of the proposed High Speed Two (HS2) rail network between the West Midlands and Crewe (the Proposed Scheme). The working draft EIA Report sets out the current design of the Proposed Scheme, the environmental baseline (i.e. the environment as it is at the moment), likely environmental impacts (and, where possible, the likely significant environmental effects) of the construction and operation of the Proposed Scheme, and proposed mitigation measures. The assessment will be updated for the formal EIA Report to reflect changes following the consultations and further work on the design and assessment between now and when the hybrid Bill is deposited in Parliament.

1.1 The Proposed Scheme – Phase 2a of HS2

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

In January 2009 the Government established HS2 Ltd to develop proposals for a new high speed railway between London and the West Midlands. HS2 Ltd was also asked to consider the case for high speed services to northern England and Scotland.

In December 2009 HS2 Ltd produced its initial report to the Government - *High Speed Rail - London to the West Midlands and Beyond*. HS2 Ltd recommended a preferred route for between London and Birmingham, including a junction with the West Coast Main Line just north of Lichfield.

In March 2010 the Government presented its response to Parliament in the Command Paper *High Speed Rail*. The Government supported HS2 Ltd's preferred route between London, Birmingham and the West Midlands and the development of a wider, Y-shaped, high speed rail network extending to Leeds and Manchester.

In January 2012, the Government confirmed its commitment to developing a high speed rail network in the Command Paper *Investing in Britain's Future - Decisions and Next Steps*. The 2012 Command Paper published the Government's chosen route to serve London, Birmingham and the West Midlands, as the first phase of the proposed Y network to be operational by 2026. The hybrid Bill for Phase One was deposited in Parliament in 2013. It was the subject of an Environmental Statement, followed by subsequent Environmental Statements deposited with Additional Provisions to that hybrid Bill in 2014 and 2015.

Phase Two of HS2 would extend the line to the north-west and north-east: to Manchester with connections to the West Coast Main Line at Crewe and Golborne; and to Leeds with a connection to the East Coast Main Line approaching York. In January 2013, the Government announced its initially preferred route for Phase Two. Following some minor amendments in July 2013, the proposed route was subject to a seven month public consultation until January 2014.

In 2014, Sir David Higgins recommended (in two reports, *HS2 Plus* and *Rebalancing Britain*) accelerating the section of the Phase Two route from the West Midlands to Crewe to deliver some of the benefits that HS2 would bring to the North sooner. In the November 2015 Command Paper *High Speed Two: East and West, The Next Steps to Crewe and Beyond*, the Government, having considered a number of options for accelerating delivery of part of the Phase Two route, announced its intention to bring forward the route to Crewe, and set out the preferred line of route for what is known as Phase 2a. The preferred line of route included amendments made in response to feedback received during the 2013/2014 consultation, as well as the development of scheme wide design requirements. It is this Phase 2a route (the Proposed Scheme) that forms the basis of the assessment contained in this working draft EIA Report.

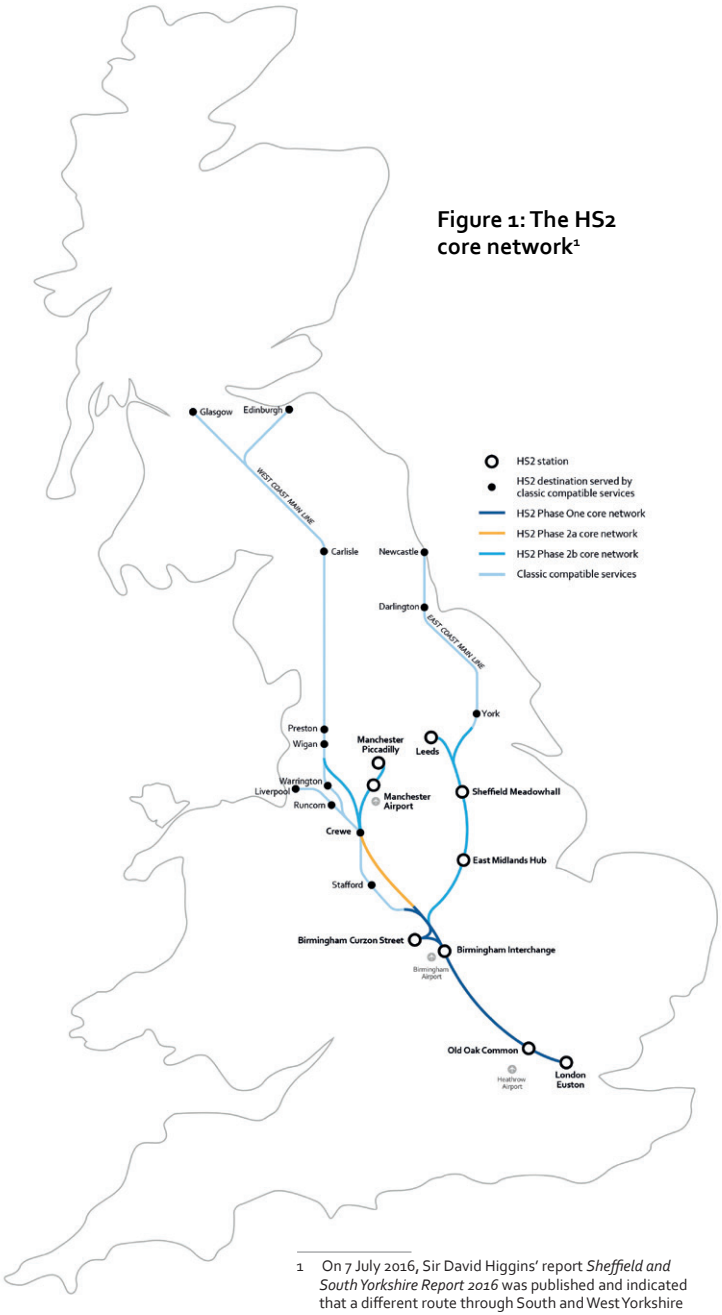
Phase 2a, the first section of the western leg of Phase Two from the West Midlands to Crewe, would be approximately 60 kilometres (37 miles) in length. It would connect with Phase One near Fradley, to the north-east of Lichfield, and connect to the West Coast Main Line south of Crewe, to provide onward services beyond the HS2 network, to the north-west of England and to Scotland. Construction of the Proposed Scheme would commence in 2020, ahead of the rest of Phase Two, with operation planned to start in 2027, one year after the opening of Phase One. This is six years earlier than originally planned, bringing some of the benefits of HS2 to the North sooner.

Phase 2a of HS2 (West Midlands to Crewe) and connections to Phase One and existing railways are shown in Figure 1.

In the future, Phase 2b of HS2 would extend the high speed network from Crewe to Manchester and from the West Midlands to Leeds to complete the Y network. This would be the subject of a separate hybrid Bill deposit (including an EIA Report). An announcement on the preferred line of route for Phase 2b is expected in Autumn 2016. Construction of Phase 2b would commence in approximately 2023, with operation planned to start around 2033.

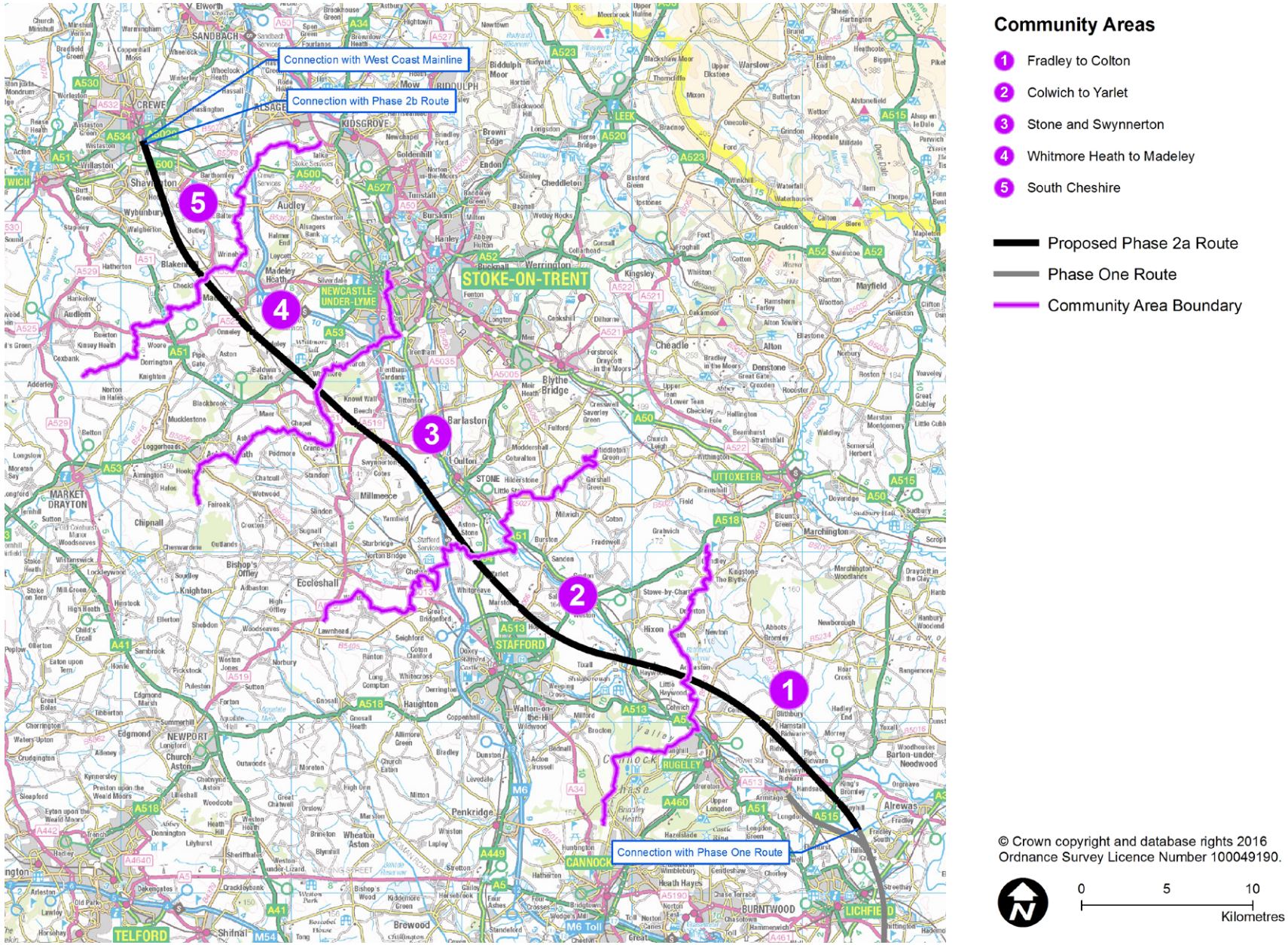
The proposed Phase 2a route has been divided into five community areas, for environmental assessment and community engagement purposes. These are shown in Figure 2.

Figure 1: The HS2 core network[1]



1 On 7 July 2016, Sir David Higgins' report *Sheffield and South Yorkshire Report 2016* was published and indicated that a different route through South and West Yorkshire should be considered, which would remove the previously proposed Meadowhall station. This is currently being considered by the Secretary of State.

Figure 2: The proposed Phase 2a route and five community areas



Development consent for Phase 2a of HS2 – the hybrid Bill

The Government has decided that it should obtain development consent for Phase 2a of HS2 by primary legislation – an Act of Parliament. Use of primary legislation allows the Government to seek the full range of statutory powers and authorisations that a project of this size and complexity requires. This may include revisions to the rail regulatory regime and the planning regime and provisions to enable the making of subsequent orders and regulations by way of statutory instrument. The Government followed the same approach for Phase One of HS2, as well as for the Channel Tunnel Rail Link (now HS1) and Crossrail.

The Government's Bill for Phase 2a of HS2 will be a 'hybrid' Bill. In practice, this means that persons whose specific private or local interests are directly and specially affected by the hybrid Bill are able to petition Parliament and to present their case to a Select Committee of Members of Parliament. Such persons would, for example, include those whose properties are to be compulsorily purchased for the Phase 2a scheme and local authorities situated along the Phase 2a route. The Select Committee then reports to the House of Commons. A similar procedure applies in the House of Lords. In other respects, a hybrid Bill proceeds essentially in the same way as a Government Bill.

Phase 2a of HS2 – working draft Environmental Impact Assessment Report

The working draft EIA Report for Phase 2a describes the Proposed Scheme and its likely environmental impacts based on the current level of information and understanding. The assessment of effects will be updated to reflect further work on the design and assessment between now and when the hybrid Bill is deposited in Parliament. The working draft EIA Report has been prepared by a group of independent environmental consultants on behalf of HS2 Ltd.

The working draft EIA Report includes the following documents:

- **This non-technical summary (NTS).** The NTS provides a summary of the Proposed Scheme and reasonable alternatives considered, the environmental impacts of the Proposed Scheme (and, where possible, the likely significant environmental effects), both beneficial and adverse, and any proposed means of avoiding, reducing or managing the likely significant adverse effects.
- **Volume 1: Introduction and methodology.** Volume 1 provides an overview of HS2, the environmental impact assessment process and the approach to consultation and engagement. It also gives details of the permanent features of the Proposed Scheme and generic construction techniques based on the current level of design, a summary of the scope and methodology for the environmental topics, as well as a summary of the strategic, route-wide and route corridor alternatives to the Proposed Scheme and local alternatives considered prior to November 2015. Volume 1 also includes a glossary of terms and list of abbreviations and two appendices which are listed below.

- **Volume 2: Community area reports and map books.** Volume 2 consists of five reports together with maps, which provide a description of the Proposed Scheme, divided into a series of community areas. For each community area, these reports provide an overview of the area, a description of the construction and operation of the Proposed Scheme within the area based on the current level of design, a summary of the local alternatives considered since November 2015, a description of the environmental baseline, a description of the likely environmental impacts of the Proposed Scheme (and, where possible, the likely significant environmental effects), both beneficial and adverse, and a description of any proposed means of avoiding, reducing or managing the likely significant adverse effects.
- **Volume 3: Route-wide effects.** Volume 3 describes the assessment of the impacts and effects of the Proposed Scheme that are likely to occur at a geographical scale greater than the community areas described in Volume 2.
- **Glossary of terms and list of abbreviations.** This contains terms and abbreviations, including units of measurement used throughout the working draft EIA Report.
- **Appendix: Alternatives report.** This describes the evolution of the Proposed Scheme and the reasonable alternatives considered.
- **Appendix: Draft Code of Construction Practice (CoCP).** This sets out the measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

Effects that may occur at locations remote from the route of the Proposed Scheme (i.e. off-route effects) will be identified in the formal EIA Report.

Development of Phase 2b is continuing and would require a separate hybrid Bill and EIA Report at a later date. The Phase 2a formal EIA Report will consider the cumulative impacts of Phase One, Phase 2a and subsequent Phase 2b development as far as practicable with the information available at the time of the assessment.

Following this consultation and continuing development of the design, the environmental assessment will be further refined and reported in the formal EIA Report that will accompany the hybrid Bill that is due to be deposited in Parliament by the end of 2017.

1.2 Approach to the environment

Environmental considerations have been key to the development of the Proposed Scheme, having been duly considered in route selection, design development and arrangements for construction and operation of the railway. In developing the Proposed Scheme, HS2 Ltd's aim has been twofold: to enable the nation to take full advantage of the opportunities and benefits offered by the Proposed Scheme and to mitigate the adverse environmental effects of the Proposed Scheme as effectively as it reasonably can.

In July 2013 the Government began a seven month consultation during which the public were consulted on the proposed route (at that time) for Phase Two of HS2. This included the *Phase Two Sustainability Statement*, which described the

potential environmental impacts of Phase Two. Following refinements and modifications to the proposals, the Government then announced its preferred scheme for Phase 2a in the November 2015 Command Paper *High Speed Two: East and West, The Next Steps to Crewe and Beyond*. This included a Sustainability Report *(Sustainability Report Phase Two Post-Consultation Update: West Midlands to Crewe)*, which set out the potential environmental impacts of the preferred scheme, in particular describing how the potential impacts compared with the scheme presented at consultation in 2013. HS2 Ltd has continued to develop and refine the design to reduce its environmental effects, to resolve engineering issues and to improve value for money.

The Government recognises that the Proposed Scheme would be likely to have significant effects on those who live close to the route and upon the local environment through which it would pass. HS2 Ltd is, therefore, engaging with local communities along the route of the Proposed Scheme and other stakeholders to identify and seek to resolve issues of concern, as described in Section 1.3.

HS2 Ltd's approach to mitigating adverse effects of the Proposed Scheme on the environment is described in Section 7. HS2 Ltd's aim is to ensure that, during construction and operation of the Proposed Scheme, significant adverse environmental effects would either be avoided or mitigated as far as reasonably practicable.

As with Phase One, it is expected that the Secretary of State will establish a set of controls known as Environmental Minimum Requirements (EMRs) to ensure that the environmental effects of the Proposed Scheme do not significantly exceed those reported in the formal EIA Report. The EMRs are described in Section 6.2.

1.3 Consultation and engagement

Since the consultation on the initial preferred route for Phase Two, consultation and engagement with stakeholders has continued through the development of the design for Phase 2a (the Proposed Scheme). Stakeholders for the Proposed Scheme include:

- technical and specialist groups – engagement has been undertaken with national organisations, such as the Environment Agency, Natural England, Historic England, Department for the Environment, Food and Rural Affairs, Food and Environment Research Agency, Woodland Trust, British Geological Society and Highways England, to provide appropriate specialist input, for example, detailed specialist baseline information. Utility companies have also been engaged with, as have local organisations with a specialist interest in the community (for example, Wildlife Trusts), who have provided information for individual technical assessments, such as the ecological assessment;
- local authorities and councils – county, borough, district and parish councils have been directly engaged to collate appropriate local baseline information, identify and understand issues and concerns, and provide a mechanism for ongoing dialogue and discussion on the emerging assessment;

- communities – community stakeholders along the route include a range of local interests groups, local facility and service providers, schools and educational establishments. These stakeholders have been engaged with to give affected communities the opportunity to raise issues and opportunities in relation to the Proposed Scheme. As part of the consultation process for this working draft EIA Report and scheme design refinement, public events are being held in communities across the route of the Proposed Scheme; and
- directly affected individuals and landowners – engagement is ongoing with farmers and growers and those with residential property potentially affected by the Proposed Scheme. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss potential mitigation in relation to the Proposed Scheme.

A variety of mechanisms have been used to ensure an open and inclusive approach to engagement and consultation, reflecting the differing requirements and expectations of stakeholders. Stakeholders have informed the design and assessment of the Proposed Scheme to date, and this process will continue. Feedback from the consultation on the working draft EIA Report and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal EIA Report.

HS2 Ltd published a draft EIA Scope and Methodology Report (SMR) for consultation in March 2016, outlining the proposed scope and methodology for the EIA of the Proposed Scheme. This provides the framework within which the working draft EIA Report has been prepared. This report was issued to statutory bodies, non-government organisations, local authorities (including parish councils), and was made available on the Government's website, allowing comment by local interest groups and the public. The consultation period ended in May 2016, with the EIA SMR subsequently updated to take into account the comments received where considered appropriate. The revised EIA SMR is published alongside the working draft EIA Report (available on the website www.gov.uk/hs2) and will be used to undertake the assessment reported in the formal EIA Report.

Publication of this working draft EIA Report forms part of the ongoing engagement process, which enables interested parties to comment on the current design of the Proposed Scheme, environmental baseline, the likely environmental effects (both beneficial and adverse) identified to date, and proposed mitigation to avoid, reduce or manage likely significant adverse effects. The assessment will be updated for the formal EIA Report to address comments on the working draft EIA Report and reflect further work and decisions between now and when the hybrid Bill is deposited in Parliament by the end of 2017.

2. The case for Phase 2a of HS2

2.1 The need for high speed rail

The case for high speed rail was set out in the January 2012 document *Investing in Britain's Future - Decisions and Next Steps* and reiterated in the November 2015 Command Paper *High Speed Two: East and West, The Next Steps to Crewe and Beyond*. This identified that over the next 20 to 30 years, additional capacity would be required to cater for inter-city journeys between London and the major conurbations in the Midlands and the North. The Government considers that the rail network will play a key role in delivering this new capacity and that a clear case exists for a new high speed rail network.

The Government's view is that high speed rail will create a better transport experience for passengers, bypassing existing congested railways and delivering extra capacity for people and freight, while improving connectivity that will help unlock growth and regeneration for cities throughout the country. The Government also considers that high speed rail would have greater potential to attract travellers from air and road transport, reducing the environmental impacts of these journeys.

By comparison, upgrading the existing north-south rail network would be insufficient to provide the necessary capacity and improved performance required to meet the country's long term economic needs. It would also cause significant disruption on the existing railway network. There is a need for a better transport system for the 21st century, and incremental upgrades are not enough to meet the long term growth in demand.

2.2 Enhancing capacity and connectivity

Demand for rail travel in Britain is increasing, with the West Coast Main Line expected to be at or near capacity by 2020 (despite a major upgrade between 1999 and 2009). The West Coast Main Line carries passenger services of every type, including long distance intercity, inter-regional and commuter passenger services as well as freight. Congestion on the West Coast Main Line, therefore, has a noticeable detrimental effect on the reliability of intercity and commuter services. A new high speed rail line would provide substantial additional capacity, as well as release capacity on existing routes, which could be redeployed to the benefit of services such as commuters and freight.

Phase One of HS2 will link London, Birmingham and the West Midlands, and through the connection to the West Coast Main Line at Handsacre, destinations in the North West and up to Scotland, greatly improving capacity and connectivity and reducing journey times. The interchange at Old Oak Common will also offer the opportunity to link to Crossrail and the Great Western Main Line. Phase One will resolve some of the most pressing challenges around capacity south of Birmingham, but it will not deliver the transformation in connectivity that is required to meet the objective of supporting economic growth in the North. To do this it will be necessary to continue with Phase Two.

Phase Two of HS2 would extend the high speed railway between Birmingham and Leeds and between Birmingham and Manchester, with connections onto the West Coast Main Line at Crewe and Golborne and to the East Coast Main Line south of York. The Government is committed to completing the full Y network to Manchester and Leeds.

The sooner that HS2 is built, the sooner it will be possible to deliver the improved connectivity and associated economic benefits. This provides the rationale for bringing forward the programme for Phase 2a of HS2 by six years to open in 2027. Phase 2a would deliver faster journey times from London to Manchester, Crewe, Liverpool, Preston, Warrington, Wigan and Glasgow – improving journey times by up to 13 minutes in addition to journey time savings to be delivered by Phase One.

Once completed, Phase 2a would deliver a step change in capacity on the West Coast Main Line. It would relieve pressure on bottlenecks, improving the reliability and performance on the existing main line, and creating extra capacity on the West Coast Main Line and at stations between Handsacre and immediately south of Crewe. In particular, any released capacity could be used to run additional freight services to Basford Hall yard, a major freight interchange immediately south of Crewe. This would unlock some of the substantial freight benefits from HS2 earlier, contributing to economic growth.

2.3 Generating growth

Efficient movement of people and freight is essential for economic growth, as enhanced capacity and good connectivity strengthen the links between businesses, workers and customers and remove geographical barriers to markets. The ability of rail to provide direct connections into urban centres makes it a particularly effective means of moving large numbers of people into and between urban areas. The extension of the high speed rail network to the north of England reflects the Government's intention that the regional benefits of high speed rail travel are distributed as widely as possible.

Phase Two of HS2 would deliver the transformation in connectivity that is required to meet the objective of supporting economic growth in the North. HS2 would drive growth by acting as a catalyst for major regeneration and development schemes (for example, around Crewe), delivering better connectivity and providing opportunities for the UK's businesses and workforce, such as the creation of high skilled construction jobs. It would generate economic opportunities and development beyond the direct impacts of building a new railway.

Accelerating the delivery of Phase 2a means that people would benefit from faster journey times and enhanced connectivity much sooner than the planned opening of the full Phase Two in 2033. As set out in the November 2015 *HS2 West Midlands to Crewe Strategic Outline Business Case: Economic Case*, accelerating the delivery of Phase 2a would also have a positive financial impact.

2.4 Climate change

The Proposed Scheme has been developed against a background of concern and strengthening policy regarding climate change. This includes consideration of both the need to mitigate climate change through reductions in greenhouse gas emissions, and the need for critical infrastructure and environments to be resilient to climate change impacts and risks.

The Climate Change Act 2008 requires at least an 80% reduction in the UK's greenhouse gas emissions as compared to 1990 levels by 2050. To ensure that regular progress is made towards the target, the Climate Change Act 2008 established a system of carbon budgets. *The Carbon Plan* (2011) sets out the Government's plans for achieving the greenhouse gas emissions reductions committed to in the Climate Change Act and the first four legislated carbon budgets. Low carbon transport is an essential part of the Carbon Plan. The Plan states that rail travel will become substantially decarbonised through increasing electrification and the use of more efficient trains and lower carbon fuels. The Plan also mentions that the high speed rail network being developed by HS2 "will transform rail capacity and connectivity to promote long term and sustainable economic growth".

The Government is expected, by the end of 2016, to propose draft legislation for the fifth carbon budget (2028-32) which would reduce UK greenhouse gas emissions in 2030 by 57% relative to 1990 levels. In order to meet this target, key priorities for the transport sector are ensuring that carbon efficiency of conventional road vehicles continues into the 2020s, as well as increasing the deployment of electrical vehicles and encouraging a behavioural change towards 'smarter choices' such as the use of more public transport.

In terms of enhancing inter-urban connectivity, high speed rail is one of the most carbon efficient means of transporting large numbers of people, measured in terms of emissions per passenger kilometre. High speed rail is considered to draw an optimum balance between carbon reduction and economic benefits. Furthermore, the carbon emissions of high speed rail are likely to reduce in future as the energy supply is decarbonised, i.e. as Britain moves away from using gas, oil and coal-fired power stations and towards renewable and low carbon sources of energy. There is a large carbon benefit associated with the operation of Phase One of HS2. There are expected to be further carbon benefits associated with the operation of Phase 2a.

3. Description of the Phase 2a scheme

3.1 The route

The Phase 2a route would comprise a high speed railway line from the end of the Phase One route near Fradley, north-east of Lichfield to Crewe. It would form the southern part of the Manchester leg of the Phase Two network, extending for approximately 60 kilometres (37 miles). The route would pass to the north-east of Stafford and south-west of Stone, crossing a mainly rural area scattered with small settlements. Maps of the route of the Proposed Scheme are included in Section 8.

From the Phase One connection near Fradley, the route would head in a north-westerly direction, crossing the River Trent floodplain on viaducts. Continuing north, the route would run through open countryside before passing between the villages of Stockwell Heath (to the north-east) and Colton (to the south-west) on an embankment. The route would then pass on viaducts firstly over the Moreton Brook, before crossing the Colwich to Macclesfield railway, running adjacent to Great Haywood Marina and crossing the Trent and Mersey Canal and the River Trent.

From Great Haywood, the route would continue north-west, running on an embankment approximately one kilometre to the south of Pasturefields Salt Marsh Special Area of Conservation and Site of Special Scientific Interest. The route would then cross Ingestre Golf Course to the south of Lambert's Coppice Ancient Woodland (partly in cutting, partly at grade), before passing through part of Staffordshire County Showground, crossing the A518 Weston Road. The route would run through Hopton in a cutting (with a retaining wall) before continuing north-west past Marston and Yarlet and across the A34 Stone Road via a mixture of cuttings, embankments and sections at grade.

The route would then broadly follow the M6 corridor to the west of Stone before crossing Filly Brook, the Norton Bridge to Stone Railway and the M6 on viaduct before moving onto embankment near Yarnfield. A construction railhead is proposed to be located adjacent to the M6 to the west of Stone, utilising land both north and south of the Norton Bridge to Stone Railway. The route would then pass to the north of Swynnerton on an embankment before heading into a cutting to the south of Swynnerton Old Park (which includes areas of ancient woodland).

As the route approaches Whitmore, it would cross Meece Brook on viaduct. It would then cut through the hills west of Whitmore until it reaches the A53 Newcastle Road where the route would go into a tunnel for approximately one kilometre under the settlement of Whitmore Heath. On emerging from the tunnel, the route would pass through Whitmore Wood (ancient woodland) in a cutting (with a retaining wall) and then continue north-west, crossing the River Lea, West Coast Main Line and the out of use Silverdale line of the Stoke to Market Drayton Railway on a viaduct. It would descend in height on approach to a tunnel to the west of Madeley close to Barhill Ancient Woodland.

Moving northwards towards Crewe, the route would cross the Checkley Brook and River Lea floodplain on viaduct before running on embankment and in cutting until it joins the West Coast Main Line at a junction south of Crewe.

Provision is made in the design for the HS2 high speed tracks to later continue northwards to Manchester using a tunnel under Crewe, as part of the Phase 2b route. The Phase 2a route would terminate at the southern end of this tunnel.

Permanent maintenance facilities in the form of an infrastructure maintenance depot would be constructed to the west of the route alongside the existing Basford Hall sidings. Refer to section 3.2 - Depots, for further details.

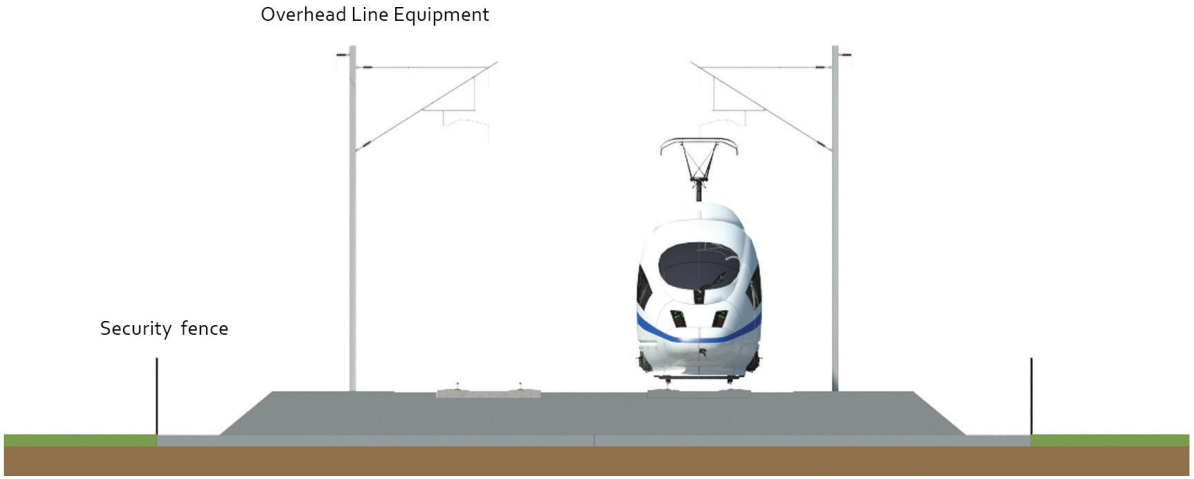
Land required

The land required for the Proposed Scheme would include the operational rail corridor (which includes any land for maintenance loops and maintenance depots, see Section 4.4), and land for mitigation (including earthworks and new ecological habitats). Land would be required to divert or realign some roads, public rights of way, utilities and watercourses. Land would also be required for construction activity, including: site compounds; worker accommodation sites; and temporary diversion of roads, public rights of way, private access routes and for permanent access to the railway for maintenance purposes. Land required only for construction activity would, by agreement with the landowner, ordinarily be restored to its previous ownership and use following completion of the Proposed Scheme construction phase.

Railway corridor

The Proposed Scheme would require a minimum width of 19 metres between boundary fences where the railway is at ground level. This is to accommodate two railway tracks (for northbound and southbound services) and other features including signalling; telecommunication and overhead line equipment; electricity cables; railway drainage; and access tracks. However, the width of the railway corridor would vary along its length in order to accommodate the existing ground, cuttings, embankments and tunnels. An indicative cross-section through a two-track rail corridor at ground level is shown in Figure 3.

Figure 3: Indicative two-track rail corridor



The route would comprise two railway tracks in most locations. However, some sections of the railway corridor would be wider to accommodate four tracks, for example, on the approaches to depots; where maintenance loops are required; or on sections of the route where different railway lines converge.

The railway would be continuously fenced along the length of the rail corridor. The type of fencing used at each location would depend on the functional requirements and its context (e.g. whether in a rural or more built-up setting).

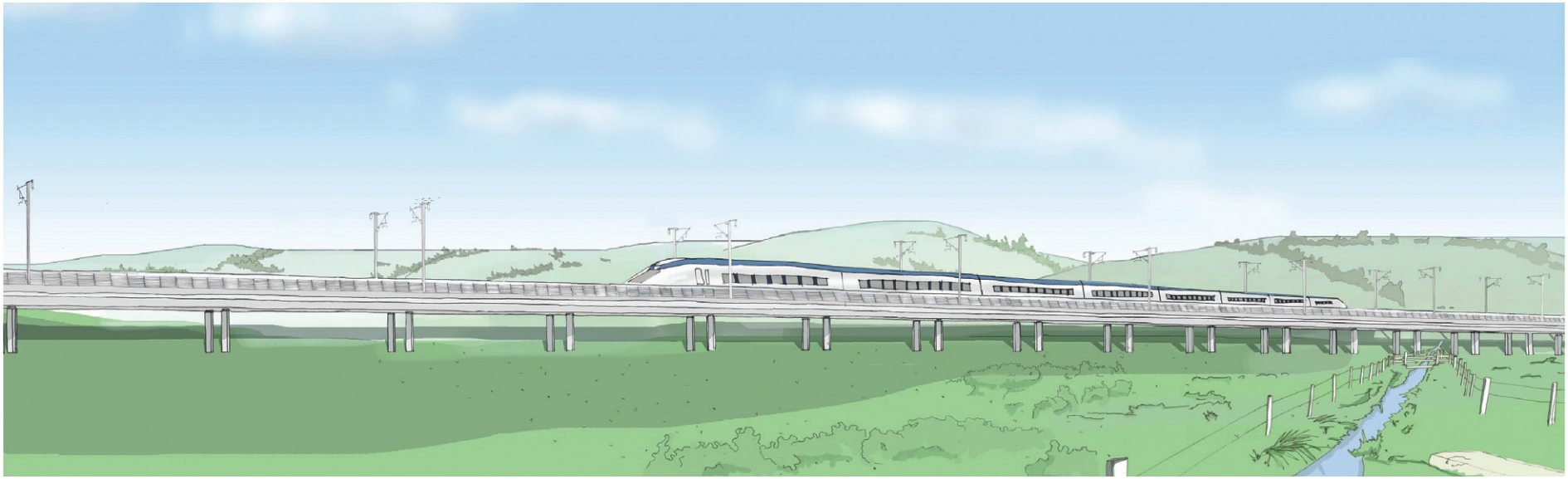
3.2 Other components of the Phase 2a scheme

Bridges and viaducts

Bridges or viaducts would be used where the route crosses a feature, such as a public right of way, road, main river, floodplain or existing railway.

Viaducts are constructed where embankments would not be a practicable or effective solution (an example of a viaduct is shown in Figure 4). The height of the bridges and viaducts is determined by the route alignment, surrounding ground levels and the features being crossed.

Figure 4: Viaduct (generic)



Tunnels

Tunnels would be constructed at a number of locations along the route, using different methods of construction: bored, and cut and cover.

Bored tunnels would comprise two parallel tunnels, each containing a single rail track, and would be created using a tunnel boring machine. However, there is the potential for these tunnels to be constructed by mining. If this option is selected, it will be assessed and reported in the formal EIA Report.

A cut-and-cover tunnel involves excavating downwards, building a structural box and then restoring the land over the top.

Where necessary, tunnel portals have been designed to reduce noise and air pressure effects as trains enter/exit the tunnels. An example of a tunnel portal is shown in Figure 5.

Figure 5: Tunnel portal (generic) in a rural location

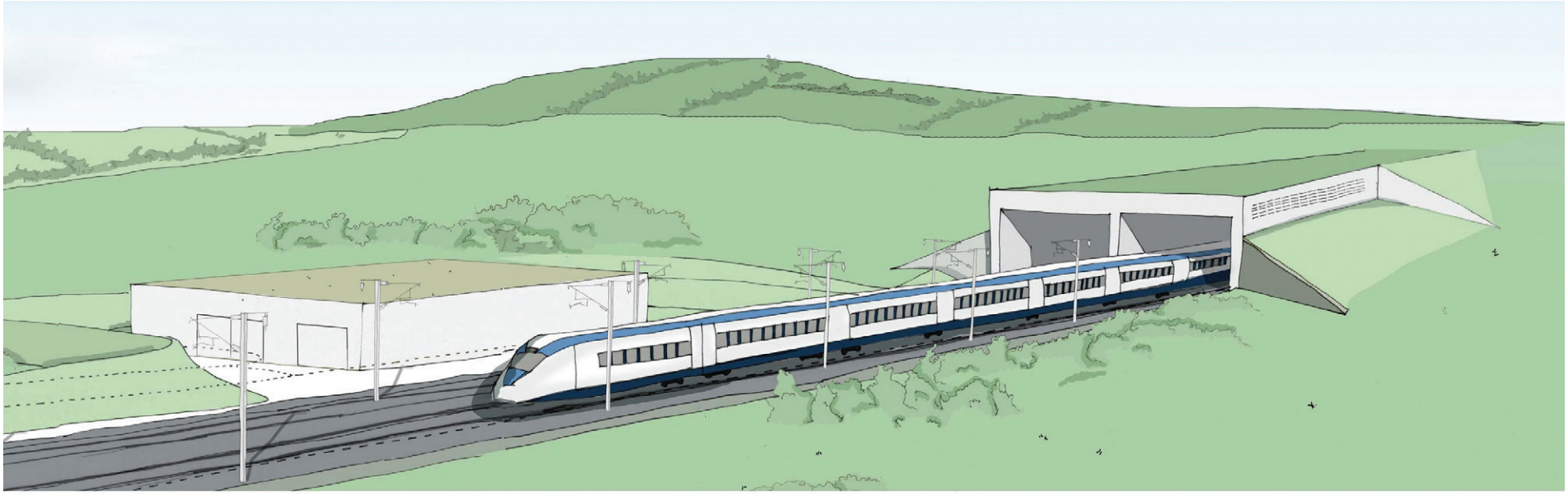
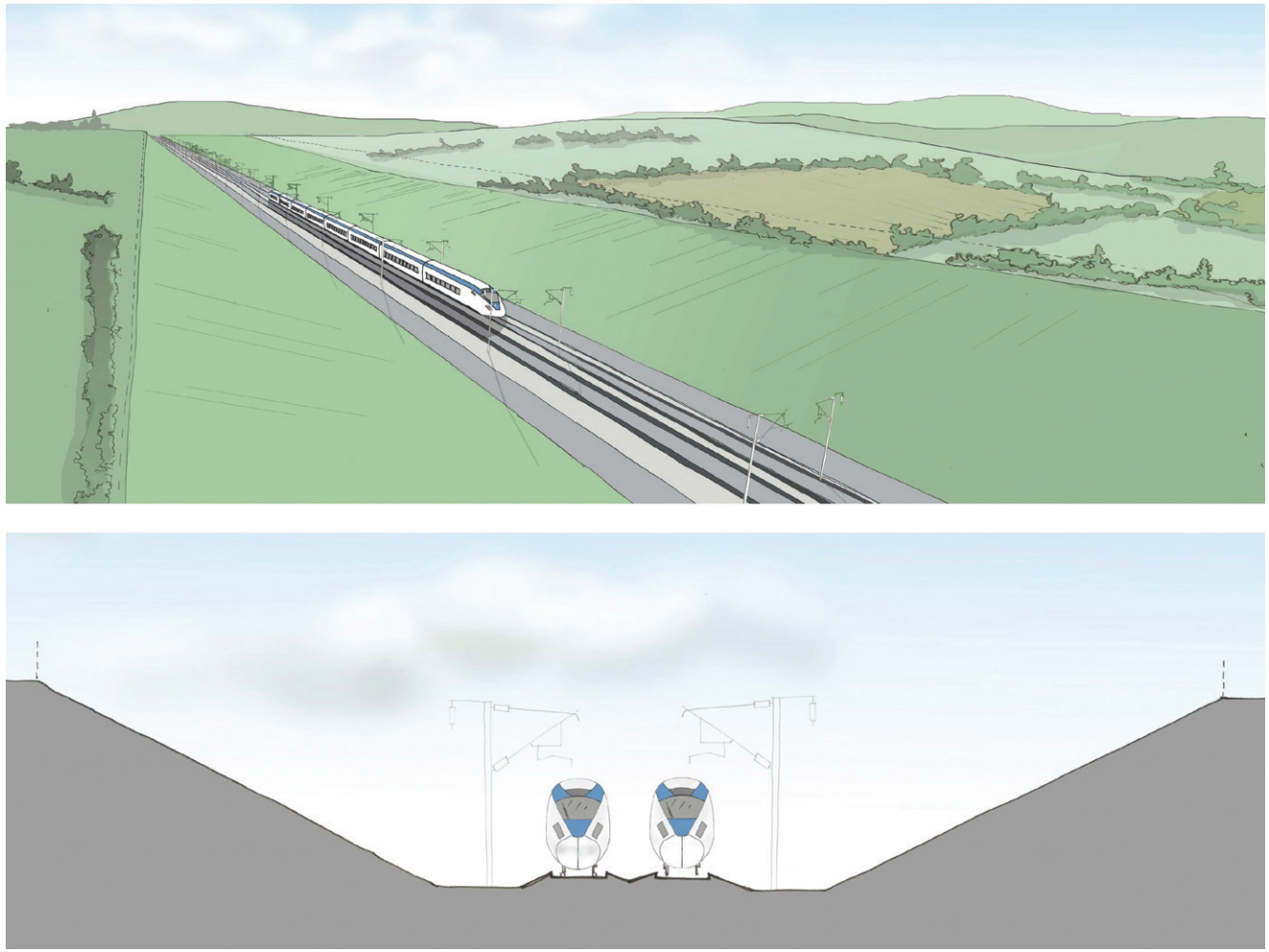


Figure 6: Cutting (generic)

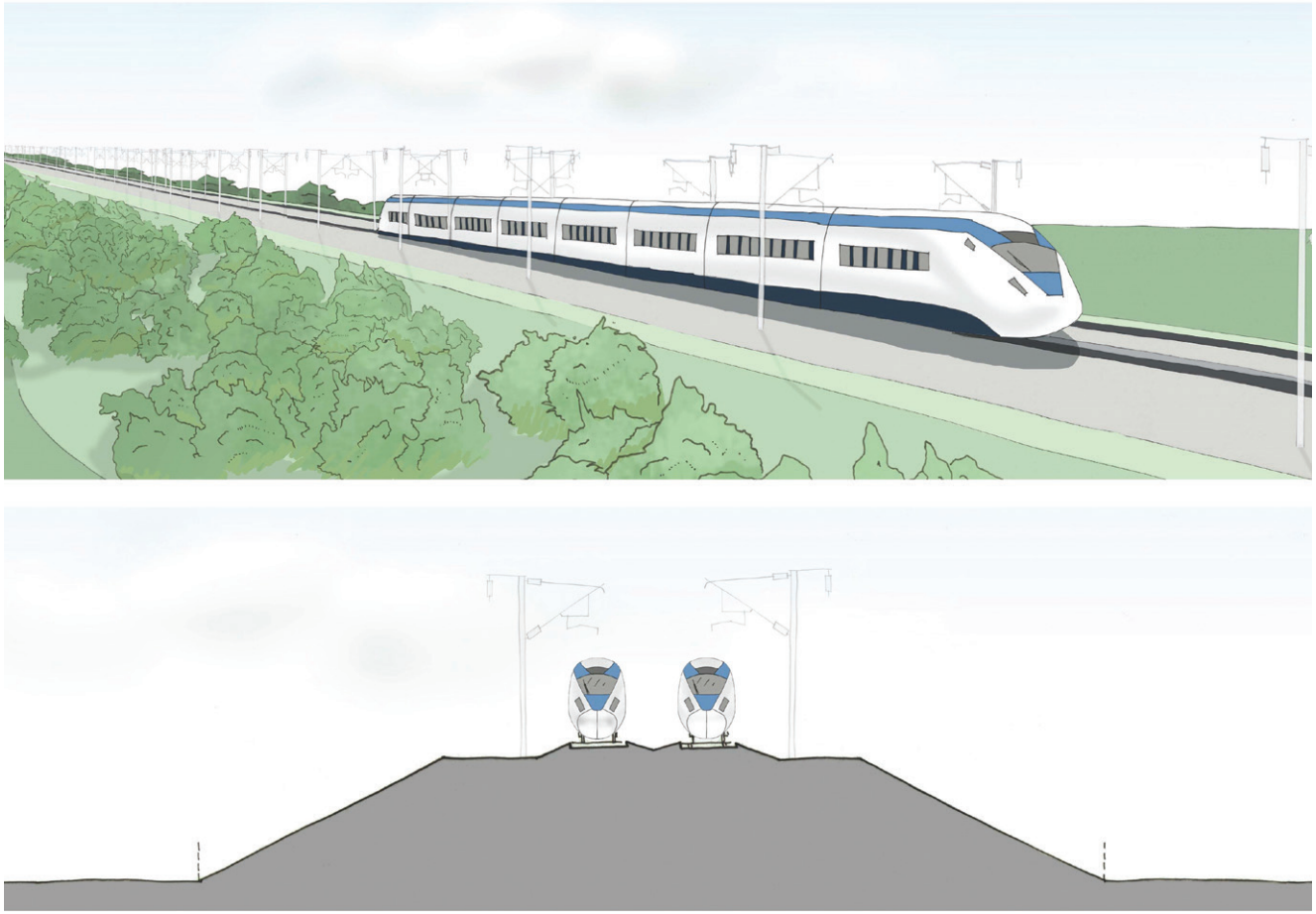


Cuttings and embankments

The route is being designed without tight curves or steep gradients so that the high speeds required can be achieved. Sections of the route would be in cutting or on embankment to facilitate this. Cuttings are sections where material has been excavated to make way for the railway. An example of a cutting is shown in Figure 6. In some locations, retaining walls are proposed on one or both sides of a cutting to reduce the amount of land required for the railway, as shown in Figure 7.

Figure 7: Cutting with retaining walls (generic)

Figure 8: Embankment (generic)



Embankments consist of artificially raised ground, comprising compacted soils or rock fill material, on which the rail track is laid. An example of an embankment is shown in Figure 8.

Priority would be given to re-using the material excavated from cuttings and tunnels locally, where suitable, to form rail or road embankments and mitigation earthworks ('bunds') for noise and visual mitigation.

Depots

The Proposed Scheme includes permanent maintenance facilities in the form of an infrastructure maintenance depot adjacent to the existing Basford Hall railway sidings south of Crewe. The depot, located on an approximately 37 hectare site, would provide a central store and maintain Phase 2a infrastructure, as well as the full western leg of Phase Two (to Manchester) once the full Y network is operational. The infrastructure maintenance depot would be supported by two maintenance loop facilities at Pipe Ridware, further details of which are provided in Section 4.4.

An alternative option to locate a permanent maintenance facility for operation in the Stone and Swynnerton area (community area 3), at the site identified for the Stone railhead main compound, is being considered. Should it be selected as the preferred location for the permanent maintenance facility, the impacts of this would be assessed and reported in the formal EIA Report.

Track

The high speed trains would be operated at up to 360 kilometres per hour (225 miles per hour). However, the railway alignment has been designed to allow for train speeds of up to 400 kilometres per hour (248 miles per hour). Operation at up to 400 kilometres per hour would require demonstration that improved train design enables services to operate at that higher speed without giving rise to additional significant environmental effects.

The track would either be ballasted and/or slab track. Ballasted tracks are fastened to concrete sleepers supported by stone ballast (a form of crushed rock). Slab tracks are supported on a continuous concrete structure.

Train control and telecommunications

The train control and telecommunications system would be operated from a route-wide HS2 network control centre at the Washwood Heath depot in East Birmingham, which forms part of the Phase One route.

The Proposed Scheme would use radio communications as part of its operations and train control system, which would require radio antennae to be mounted on short extension poles fixed to the overhead line equipment masts approximately every two kilometres (1.2 miles).

Power supply

The Proposed Scheme would require power from the national grid and distribution network via connections known as 'feeder stations'. Each feeder station would comprise two separate compounds: a national grid or distribution network sub-station and an HS2 compound, the latter known as an 'auto-transformer feeder station' to supply power to the track. All of these compounds would require road access and fencing; some may require new electricity pylons.

Smaller auto-transformer stations would also be provided along the route at approximately five kilometre (three mile) intervals. These would accommodate electrical switch gear and associated equipment. Power would be transmitted to the trains through overhead line equipment. An example of overhead line equipment is shown in Figure 3.

Grid connections and associated infrastructure that would be required are currently being identified as the Proposed Scheme design develops; they are likely to include grid connections (which would either be via buried or overhead lines, or a combination of both) from sub-stations at Rugeley and Crewe. This will be reported in the formal EIA Report.

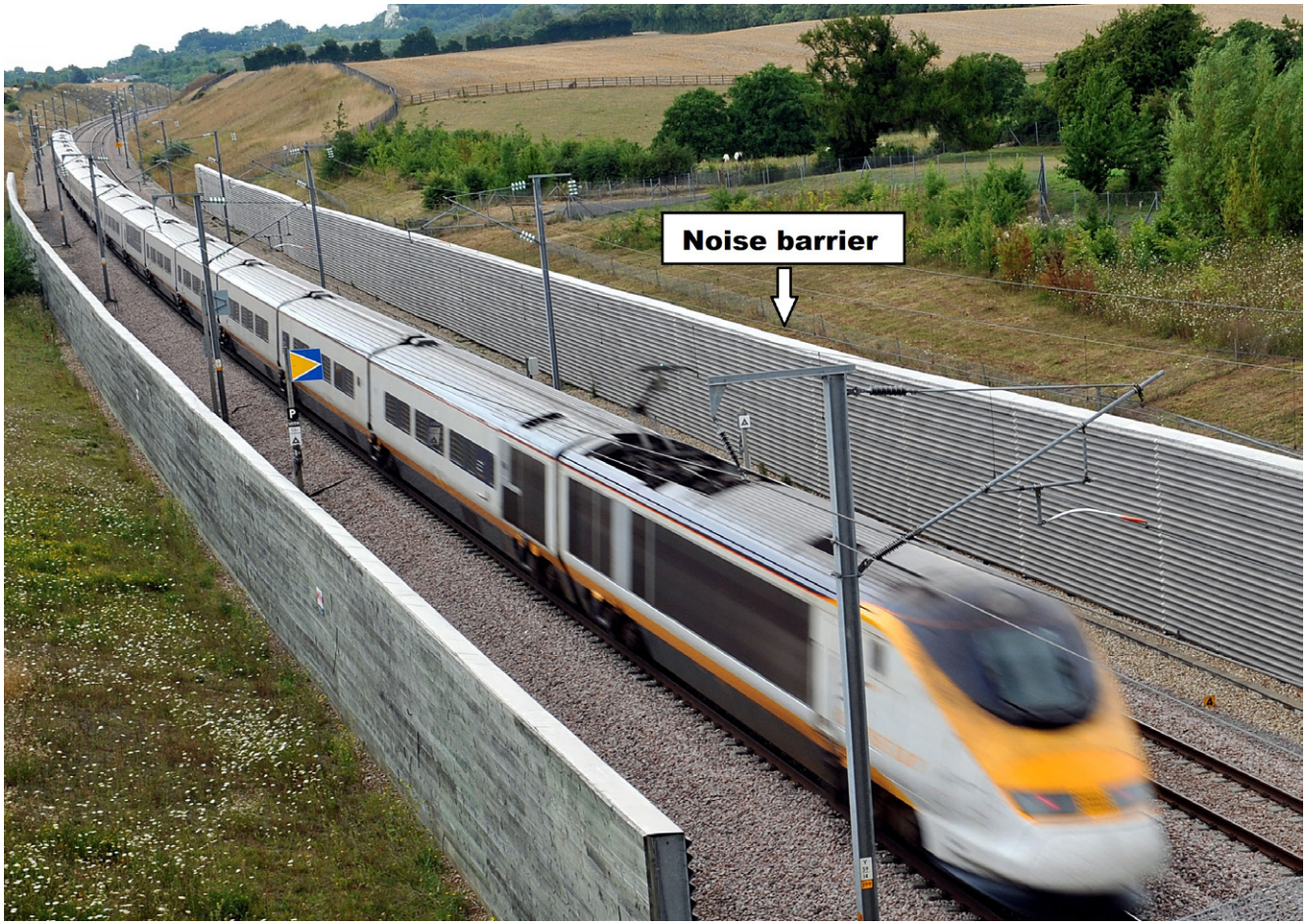
Road, public right of way, utility and watercourse diversions

The nature and timing of any road diversions would be planned in consultation with the relevant highway authority. Roads, public rights of way and utilities that need to be diverted or realigned would normally follow the shortest practicable route, taking into account safety, pedestrian and traffic flows, construction duration and local environmental effects. The channel flow of any watercourse diversions would be designed and maintained in consultation with the relevant regulatory authority.

Noise barriers

The Proposed Scheme would incorporate noise barriers to avoid or reduce potentially significant noise effects. These would generally take the form of landscape earthworks, such as cuttings and embankments, noise fence barriers or parapet barriers on viaducts. An example of a noise fence barrier is shown in Figure 9.

Figure 9: Example of noise fence barrier



3.3 Design development

Design development continues for the Phase 2a route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing stakeholder engagement. Any further changes resulting from this would be reported in the formal EIA Report.

The main areas of design development being considered include:

- refinement of vertical and horizontal route alignment;
- refinement of tunnel options including lengths, design and construction methods and alternative engineering options;
- alternative location for a permanent maintenance facility;
- refinement of connections to the West Coast Main Line and conventional railway;
- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement flood storage areas, following the completion of flood modelling;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and public rights of way crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- additional environmental features required to mitigate likely significant adverse environmental effects;
- accommodation works and crossings of the route for private means of access;
- grid connections from the sub-stations at Rugeley and Crewe and associated infrastructure;
- refinement of construction compound locations and haul roads; and
- refinement of auto-transformer station and auto-transformer feeder station locations.

4. Construction and operation of the Phase 2a scheme

4.1 Construction programme

The Proposed Scheme is expected to be constructed between 2020 and 2027 (including a period of testing and commissioning). The duration, intensity and scale of construction along the route would vary over this period.

Initial works would include the establishment of compounds and worksites, and preliminary activities, such as utility diversions. Preparatory mitigation works would also take place at this time, including, where appropriate, habitat creation and transfer of protected species to suitable alternative locations. This would be followed by the main period of construction activity, to construct the major components of the Proposed Scheme, including cuttings, embankments, bridges and viaducts. Once these major components have been built, activity would focus on the installation of track, overhead line equipment, train control and telecommunications systems. A period of system testing and commissioning would then follow.

4.2 Construction management

Code of Construction Practice and local environmental management plans

Construction works would be undertaken by appropriately experienced construction contractors. The draft CoCP (submitted as part of the working draft EIA Report) sets out the proposed measures to manage and control the effects of construction. At a local level, site-specific control measures would be included within local environmental management plans.

The draft CoCP will be finalised when the hybrid Bill is enacted. HS2 Ltd and its contractors would be required to comply with the CoCP throughout the construction period. HS2 Ltd and its contractors would engage with the community, particularly focusing on those who may be affected by construction, such as local residents, businesses and community facilities. HS2 Ltd or its contractors would notify local communities in advance of any road or public right of way realignments, diversions or closures. HS2 Ltd would appoint appropriately experienced community relations personnel.

The local environmental management plans would build on the project-wide environmental requirements contained within the draft CoCP. The plans would set out how the Proposed Scheme would adapt and deliver the required environmental and community protection measures within each relevant local authority area. The local environmental management plans would be developed by HS2 Ltd in consultation with local communities, local authorities and other stakeholders.

Construction compounds

There would be two types of construction compound along the route: main construction compounds and satellite construction compounds.

It is expected that four main construction compounds would be required. Main construction compounds would act as strategic hubs for core project staff, such as engineering, planning and construction delivery staff. They would include areas for the storage of construction equipment and materials, maintenance and parking facilities, together with the main welfare facilities for staff.

Overnight accommodation for construction staff could be provided at one main compound in the Stone and Swynnerton area to reduce daily travel for those not normally based locally.

Forty-eight satellite construction compounds (including civil engineering and railway installation) would be required. Satellite construction compounds would generally be smaller than main construction compounds. Depending on the nature and extent of works to be managed satellite compounds could include office accommodation for a limited number of staff, local storage for construction equipment and materials, welfare facilities, and limited car parking for staff and site operatives.

Some compounds would be used for major stockpiling of materials such as soil, for transfer nodes (where bulk deliveries or excavated materials leave or enter the construction worksites from public roads), or for railheads (where bulk deliveries or excavated materials leave or enter the construction worksites from the rail network).

The siting of construction compounds has been influenced by a number of factors, including:

- size of the site required;
- proximity to locations of major construction activities;
- proximity to main roads and rail/bus routes;
- accessibility for local workforce and the presence of existing local facilities;
- existing land use and proximity to sensitive features of the environment and communities; and
- ease of establishing and maintaining security.

Security fencing or hoarding would be provided around the perimeter of each construction compound.

Construction worksites

Construction worksites are areas used principally for the purpose of construction works. Construction compounds, both main and satellite, would act as the main points of entry to the construction worksites. Access to the construction worksites would be by road or rail to deliver construction material or machinery.

Working hours

The draft CoCP outlines the proposed working hours for construction. Core working hours would be from 08:00-18:00 on weekdays (excluding bank holidays) and from 08:00-13:00 on Saturdays. HS2 Ltd would require its contractors to adhere to these core working hours for each site, subject to the categories of additional hours described in the following paragraphs.

Guidance on all site-specific variations to core working hours and/or additional hours likely to be required would be included within the local environmental management plans following consultation with the relevant local authority. To maximise productivity within the core working hours, the contractors would require a period of up to one hour before and up to one hour after core working hours for start-up and closedown of activities.

Track-laying activities and works requiring possession of major transport infrastructure may be undertaken during night-time, Saturday afternoons, Sundays and/or bank holidays for reasons of safety or operational necessity. These works would involve consecutive night works over weekends and may on occasion involve longer durations. Activities outside of core working hours that are likely to give rise to disturbance would be kept to a reasonably practicable minimum.

Tunnelling and directly associated activities (such as removal of excavated material from tunnels, supply of materials and maintenance of tunnelling equipment) would be carried out on a 24 hours a day, seven days a week basis. Where reasonably practicable, excavated material would be stored within the site boundary for removal during core working hours.

Certain activities, such as earthworks, are season- and weather-dependent. Contractors may seek to extend the core working hours and/or days for such operations to take advantage of daylight hours and weather conditions, subject to the approval of the relevant local authority. Certain other specific construction activities would require extended working hours for reasons of engineering practicability. Abnormal loads, or those requiring a police escort, may be delivered outside of core working hours subject to the requirements and approval of the relevant authorities.

Site restoration

All temporary plant, materials, equipment, buildings, access roads and vehicles would be removed from the site when construction is complete. This would allow the land used temporarily to be restored.

Where land is required temporarily and can be returned to the landowner once construction works are complete, it would (in agreement with the landowner and the local planning authority) be restored to agriculture or forestry where those were the land uses immediately prior to construction. Some additional areas may also be used to provide ecological habitat for wildlife species and landscape mitigation areas.

System testing and commissioning

The railway would be fully tested to ensure it can operate safely and reliably. Commissioning would allow operational procedures to be tested and refined alongside the training of staff. The testing and commissioning is expected to take place between 2026 and 2027.

4.3 Services and operating characteristics

HS2 trains

Current plans would see two types of trains running on Phase 2a once the full Y network becomes operational: trains that would run only on the high speed network (known as captive trains) and trains which would be able to run on both the high speed network and the existing network (known as classic compatible trains). Depending on demand and the time of day, services would operate as 200m long trains, carrying up to 550 passengers, or as two trains coupled together to form 400m long trains, carrying up to 1,100 passengers.

Trains would travel at speeds of up to 360 kilometres per hour (225 miles per hour). However, the alignment of the route has been designed to allow for train speeds of up to 400 kilometres per hour (248 miles per hour) in the future. Operation at up to 400 kilometres per hour would require demonstration that improved train design enables services to operate at that higher speed without giving rise to additional significant environmental effects.

The operating speeds over each section of the Phase 2a route are anticipated to be as follows:

- up to 360 kilometres per hour on the route of the Proposed Scheme between the interface with Phase One and Crewe; and
- up to 230 kilometres per hour on the spurs that would connect the route of the Proposed Scheme to the West Coast Main Line at Crewe.

HS2 services

Services are expected to operate between 05:00 and 24:00 from Monday to Saturday and between 08:00 and 24:00 on Sunday. Maintenance and engineering works would normally take place outside these operational hours, unless the works can be fully separated to enable them to be undertaken during the day with trains operating at the same time.

The assumed initial service pattern (in the year of opening) for Phase 2a is for up to six trains per hour in each direction. Based on the current business case assumptions this could increase up to 12 trains per hour in each direction once the full Phase Two scheme is open.

The forecast minimum journey times from London with Phase 2a are set out in Table 1.

Table 1: Forecast minimum journey times with Phase 2a[2]

Destination from London Euston	Journey time (hours: minutes)
Crewe	0:55
Manchester Piccadilly	1:27
Preston	1:28
Liverpool	1:32
Glasgow	3:43

4.4 Maintenance of operational infrastructure

The intention is that inspections of the route would take place on a regular basis, at night when the railway is not operating. There would be routine preventative maintenance to keep the track and other equipment (e.g. electrical and mechanical equipment) in good condition, and more periodic heavy maintenance as necessary.

2 As defined in the November 2015 Command Paper *High Speed Two: East and West, The Next Steps to Crewe and Beyond*.

Permanent maintenance facilities for the Proposed Scheme would be managed and resourced from the infrastructure maintenance depot. The permanent maintenance facilities would provide the base for infrastructure maintenance work for the full western leg of the Phase Two railway (to Manchester) such as track and overhead line inspections, maintenance and renewal, ballast cleaning and replacement of mechanical and electrical equipment. The Proposed Scheme is estimated to directly create approximately 300 new jobs at the infrastructure maintenance depot.

Maintenance loops would also be provided, to enable railway maintenance trains to be temporarily parked overnight (known as stabling) without returning to the infrastructure maintenance depot at Crewe. Maintenance loop sidings would be located near Pipe Ridware comprising two additional sections of track, one either side of the main line, each approximately 1.25 kilometres (0.75 miles) long.

5. Strategic, route-wide and local alternatives

5.1 Introduction

The Government and HS2 Ltd considered four categories of alternatives:

- strategic alternatives: those that do not involve high speed rail, including a 'do nothing' scenario;
- route-wide rail alternatives: those involving different layouts or operational characteristics for a high speed railway between London, the Midlands and the North;
- route corridor alternatives: those involving different route corridors between the Midlands and the North; and
- local alternatives: those which consider different design, construction and mitigation arrangements for the route at a community area level.

At the various levels, alternatives have been evaluated on a comparative basis considering benefits, costs, engineering design and environmental impact.

5.2 Strategic alternatives to high speed rail

Do nothing

The 'do nothing' scenario would involve no further investment in transport infrastructure beyond the projects that are already planned or committed. Successive governments have concluded that such an approach is incapable of meeting the future travel needs of Britain (without unacceptable overcrowding on transport infrastructure) and would come at a significant economic cost. The Government does not, therefore, believe that it is tenable to do nothing as stated in the November 2015 Command Paper.

Other modes

Before deciding to proceed with HS2, a wide range of options to address Britain's inter-urban transport challenges were reviewed. These included domestic aviation, new motorways, a new classic speed rail line as well as upgrades to existing roads and railways.

The carbon emissions from air travel are significantly greater than those from high speed rail. The capacity of London's airports is limited and providing for future growth in international travel would be a significant challenge without also serving additional demand from domestic air services. The Government, therefore, intends for more people to take the train instead of air for domestic journeys and short-haul journeys to mainland Europe, both in order to achieve environmental benefits and to release capacity at airports for longer journeys.

The Government also decided not to give further consideration to major new motorways as an alternative to HS2. This is because high speed rail is preferable in terms of both capacity and journey times (particularly in urban areas) and has lower carbon emissions per passenger kilometre and the local environmental effects of new roads would generally be greater than a new railway.

The Government nevertheless intends to increase the capacity of strategic roads through the 'smart motorways' initiative (including variable speed limits and the use of motorway hard shoulders). However, these measures are planned for rural motorways and ring-roads, and do not offer the same opportunity to transform journeys between the centres of the UK's biggest cities.

Although a new classic rail line could address the long term capacity constraints on the existing rail network, the costs would be almost as high as those of high speed rail without delivering the reduced journey times and having only marginal environmental benefits. For these reasons, the new classic rail line option was rejected.

5.3 Strategic high speed rail route options

Several options for the configuration of the high speed network were evaluated in 2009, including the 'Inverse A', 'Reverse E' and 'Reverse S' options shown in Figure 10. The 'Inverse A' option was found to perform best in terms of providing a balance between journey times and capacity. It was refined to produce the current Y network, and based on a comparative assessment of the cost, environmental impacts and engineering complexities of each option, it was decided the Y network (see Figure 1) was most appropriate.

5.4 Route-wide rail alternatives

Alternative train speeds

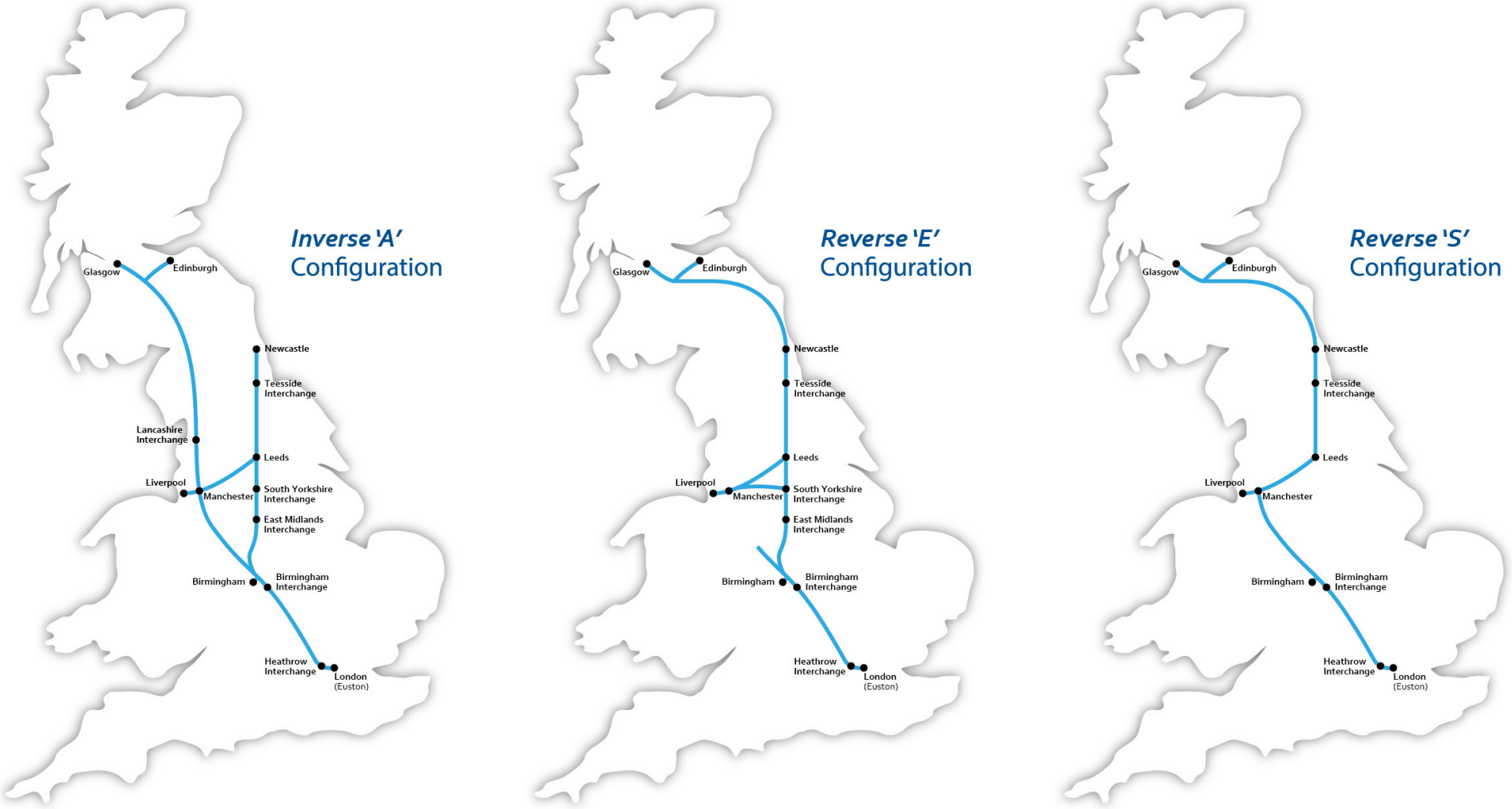
Three options were considered for the maximum design speed of the high speed network: 300 kilometres per hour (186 miles per hour); 360 kilometres per hour (225 miles per hour); and 400 kilometres per hour (248 miles per hour). Whilst lower operating speeds would allow some flexibility in the alignment of the route to avoid environmentally sensitive areas, operating at a maximum speed of 300 kilometres per hour, as compared with 360 kilometres per hour, would increase journey times between London and Birmingham and destinations in the north of England and Scotland. This increased journey time would reduce the economic and connectivity benefits of high speed rail with relatively little environmental gain. The 300kph maximum speed was, therefore, considered unacceptable.

While the Proposed Scheme would operate at 360 kilometres per hour, the route alignment has been designed to allow for train speeds of up to 400 kilometres per hour in the future as high speed technology develops. HS2 Ltd explored the options of a higher design speed which concluded that a higher speed would save little time because of the distance taken to accelerate between stations and the effect of features that permanently restrict speed. It concluded that 400 kilometres per hour represents a reasonable maximum design speed, given likely technology development over the coming decades.

Options for upgrading existing main lines

The existing main rail network, including lines between London, the Midlands and the North, has undergone, or is undergoing, successive major upgrade programmes. The potential for capacity upgrades has been explored as an alternative to HS2. The Government concluded that further upgrades would not provide the scale of capacity increase and connectivity benefits that are needed to fulfil the Government's objectives. Rail upgrades would not meet the Government's

Figure 10: Alternative configurations considered for the high speed rail network



objectives for future performance of the rail network and would cause considerable disruption to existing train services during construction. On this basis the Government decided, in 2010, to continue to prepare proposals for a new high speed line. This decision was reconfirmed in 2012 following a further study of upgrade options, which again concluded that an extensive upgrade of existing lines would not address demand, capacity and crowding in the long term.

In May 2015 the Government commissioned a study to consider the potential rail alternatives to building HS2 Phase 2a using the existing West Coast Main Line (November 2015 *Rail Alternatives to HS2 Phase 2a*). This began with a long list of options that were sifted to a shortlist of three options for further development and analysis.

Alternative option 1 – this route would use roughly two-thirds (43 kilometres) of the Phase 2a high speed alignment up until a point near the village of Baldwin's Gate, where a short additional length of high speed alignment would link the Phase 2a route to the West Coast Main Line fast lines.

Alternative option 2 – this route would run on the existing West Coast Main Line but would upgrade 18 kilometres of the route to operate at a conventional speed of 140 miles per hour.

Alternative option 3 – this route would run on 15 kilometres of the Phase 2a high speed alignment up until Great Haywood where an additional length of high speed alignment would link the Phase 2a route to the existing Stone railway line and then onto the West Coast Main Line. Sections of the Stone line and West Coast Main Line (11 kilometres total) would be upgraded to operate at a conventional speed of 140 miles per hour.

An appraisal was undertaken for each of the alternative options, from which options 2 and 3 were rejected for a range of reasons including the high environmental risks associated with Pasturefields Salt Marsh Special Area of Conservation and Site of Special Scientific Interest. In terms of cost, the comparison concluded that while the alternative options could save between £1.1 billion and £1.8 billion (2011, present value) in their capital costs of construction compared with Phase 2a, they did not provide the same overall capacity or level of journey time improvements. This means that their economic benefits and revenues are lower than that of the Phase 2a scheme. When assessed as part of the full Y network, the alternative options have between £1.5 billion and £3.3 billion less benefits than Phase 2a.

5.5 Route corridor alternatives

An HS2 route corridor via Crewe was established as the proposed western leg in 2013, and was subject to consultation between July 2013 and January 2014. Alternatives to this, including other routes via Crewe, as well as routes via Stoke-on-Trent and to the east of Stoke-on-Trent, were considered during earlier scheme development and were consulted upon as part of the 2013/2014 consultation.

The easterly corridors (those via Stoke-on-Trent and to the east of Stoke-on-Trent) were discounted due to environmental, engineering and cost considerations, resulting in the selection of a corridor via Crewe as the preferred route to serve Manchester and provide wider connectivity to the North.

Of the preferred corridor via Crewe, a route that passed to the south of Pasturefields Salt Marsh Special Area of Conservation and Site of Special Scientific Interest was selected as the preferred route. This route was assessed as having a negligible risk of impact on the Pasturefields Salt Marsh, as well as having other engineering and environmental advantages (including reduced community impacts).

Following consultation on the proposed route via Crewe in 2013/2014, another alternative corridor via Stoke-on-Trent was considered in response to representations by the Stoke-on-Trent City Council. This alternative was considered against the post consultation refined route via Crewe. This concluded that the route via Crewe generally performed better as it would:

- require fewer property demolitions;
- affect fewer people in terms of potential annoyance from noise;
- have less impact on cultural heritage assets (e.g. listed features and buildings);
- affect fewer areas designated for biodiversity and wildlife protection;
- affect fewer watercourses (but more groundwater resources);
- impact on fewer active and disused landfills;
- result in journey time savings; and
- improve regional connectivity.

This led to the decision to adopt the route via Crewe as the preferred route.

5.6 Local alternatives

In response to the 2013/2014 public consultation on the Phase Two route, a number of local options were examined to address potential environmental impacts of the Phase 2a route at specific sensitive locations, such as making changes to the alignment of the route or a change to the way the route runs through an area (e.g. place in a deeper cutting). The environmental benefits were assessed against factors such as cost, engineering feasibility and impact on journey time. In some locations it was concluded that the alternatives proposed did not offer any net benefit and the alignment used for the consultation scheme was retained. In other locations the route was amended. The 2015 Command Paper summarised the changes made to the proposed Phase 2a route as a result of this process.

Since November 2015, as part of the design development process, a series of potentially feasible local alternatives has been reviewed by engineering, planning and environmental specialists. Alternatives were developed to individual areas of the route, which can be broadly categorised as follows:

- route alignment: for example moving the route further away from residential areas and other sensitive areas, or raising or lowering the route in places to reduce the area of land required for construction, or to mitigate landscape and visual impacts;
- how the route passes through an area: for example, having the route run on embankment instead of viaduct;

- location and/or design of Proposed Scheme features: including viaducts, embankments, tunnels, tunnel portals, maintenance loops and the Stone railhead main compound; and
- design and/or location of diversions for utilities, watercourses, public rights of way and roads.

These alternatives were assessed against the Phase 2a route, published in November 2015, based on the following criteria:

- potential environmental impact: whether the alternative would have more or less environmental impact for each environmental topic area (e.g. sound, noise and vibration and landscape and visual);
- cost: whether the alternatives would be more cost effective, or incur additional costs;
- engineering requirements: the degree of design complexity and the impact this would have on construction durations, environmental impacts and construction and operational costs; and
- journey time impacts, where relevant.

Based on this assessment, some alternatives were taken forward and amendments were made to the November 2015 route. For example, in the Colwich to Yarlet community area, further consideration was given to the route between Staffordshire County Showground and Yarlet. The November 2015 route ran adjacent to the settlements of Marston and Yarlet and through Staffordshire County Showground. Five alternative options were identified, analysed and impacts assessed, with one of these alternative options selected to form part of the Proposed Scheme. The selected option moves the route further away from Marston and Yarlet, resulting in a minor reduction in noise and community impacts as well as reducing the area of land to be lost from Staffordshire County Showground, including the businesses located within it.

Local alternatives continue to be considered through the design development process, which will be reported in the formal EIA Report.

6. Preparation of the Environmental Impact Assessment Report

6.1 Introduction

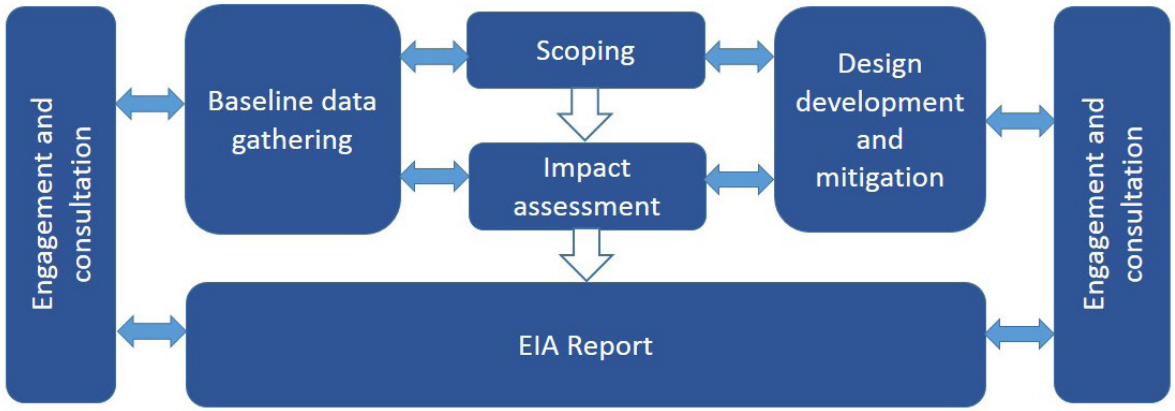
The main steps in the preparation of the EIA Report for the Proposed Scheme are shown in Figure 11 and are outlined in this section. The formal EIA Report is being prepared in accordance with UK and European legislation on environmental impact assessment, and relevant guidance.

On 23 June 2016, the UK voted to leave the European Union. The Department for Exiting the European Union will now lead work across Government on the process that will make that happen and consider what it will mean for the UK. In due course the Government will need to take initial decisions on how to proceed with the UK's withdrawal from the European Union and on the negotiation for the UK's future relationship with the European Union. Until exit negotiations are concluded, the UK remains a full member of the European Union and all the rights and obligations of European Union membership apply.

A new EU Directive (2014/52/EU) on environmental impact assessment is required to be transposed into national legislation of Member States by 16 May 2017. This is expected to have taken place by the time the hybrid Bill is deposited. HS2 Ltd has therefore adopted the principles of the new EIA Directive for Phase 2a in advance of new UK regulations and guidance, liaising with the Department for Transport and the Department for Communities and Local Government on the implications for the EIA of Phase 2a, where possible.

The new EIA Directive introduces health and major accidents and natural disasters as new topics for assessment in the EIA. Additionally, it places increased emphasis on the assessment of biodiversity as well as climate change, with a requirement to consider the impact of the Proposed Scheme on climate change, the in-combination effects of the Proposed Scheme and climate change on receptors, and the resilience of the Proposed Scheme to climate change. These new/amended topics are included in the EIA for the Proposed Scheme.

Figure 11: Environmental impact assessment process



The formal EIA Report will provide detailed information on the likely significant effects of the Proposed Scheme on the environment. The formal EIA Report will also set out mitigation to avoid, reduce or manage the likely significant adverse environmental effects that are identified.

The EIA process for the Proposed Scheme comprises the following related activities:

- preparation of EIA SMR ('scoping') to determine the scope of the assessment, including the range of environmental topics to be addressed. The SMR has been revised (available on the website www.gov.uk/hs2) following consultation with the public, local authorities and a wide range of environmental organisations;
- collection of information about current environmental conditions ('the baseline') in the vicinity of the Proposed Scheme;
- prediction of future environmental conditions without the Proposed Scheme ('the future baseline');
- environmental input to design development including consideration of reasonable alternatives;
- assessment of the likely beneficial and adverse significant environmental effects of the Proposed Scheme in accordance with the SMR;
- development and assessment of proposed mitigation for identified likely significant adverse environmental effects;
- assessment of the remaining significant adverse environmental effects of the Proposed Scheme assuming the proposed mitigation is in place (referred to as 'residual effects');
- engagement and consultation with stakeholders to help inform the design and assessment of the Proposed Scheme;
- further environmental assessment and refinement of the Proposed Scheme design, including consideration of comments received on the working draft EIA Report;
- finalisation and submission of the formal EIA Report with the hybrid Bill for the Proposed Scheme; and
- following deposit of the hybrid Bill and the formal EIA Report, there is public consultation on the formal EIA Report during the Parliamentary process. Consultation responses will be summarised by an independent assessor to inform the Second Reading of the hybrid Bill.

The working draft EIA Report presents preliminary environmental information in the form of baseline data gathered to date, likely environmental impacts (and, where practicable, likely significant environmental effects) and any proposed mitigation measures that have been identified to avoid, reduce or manage the likely significant adverse effects. The working draft EIA Report takes account of relevant policies, guidance, legislation and industry accepted practice for each environmental topic. It has been prepared by experienced topic specialists, using their professional judgement as required. The assessment of effects presented in the formal EIA Report, and the mitigation provided, may change from that presented in the working draft EIA Report, given the preliminary nature of the environmental assessment at the current time.

6.2 Meeting environmental requirements

As stated in Section 1.2, it is expected that the Secretary of State will establish a set of Environmental Minimum Requirements (EMRs) to ensure that the environmental effects of the Proposed Scheme do not exceed those assessed in the formal EIA Report. The EMRs would sit alongside the statutory environmental controls included in the hybrid Bill. HS2 Ltd and its contractors would be required to comply with both the EMRs and those statutory environmental controls throughout construction and operation of the Proposed Scheme.

The EMRs would also require HS2 Ltd and its contractors to use reasonable endeavours to adopt measures to further reduce the adverse environmental effects reported in the formal EIA Report, provided that such measures are reasonably practicable and do not add unreasonable cost or delay to the construction or operation of the Proposed Scheme.

The EMRs will be set out in the formal EIA Report and are expected to include:

- general principles, by which the Secretary of State commits that the environmental effects reported in the formal EIA Report are not exceeded, through application of the environmental mitigation assessed in the formal EIA Report;
- the draft CoCP;
- an Environmental Memorandum; which is a framework for HS2 Ltd and its contractors and stakeholders, such as the Environment Agency, Natural England and Historic England, to work together to ensure that the design and construction of the Proposed Scheme is carried out with due regard for environmental considerations;
- a Planning Memorandum, which will set out an agreement between the Government and the local planning authorities relating to the processing of detailed planning approvals under the provisions of the hybrid Bill, including the design and appearance of bridges, viaducts, tunnel portals, noise barriers and earthworks;
- a Heritage Memorandum, which will set out a commitment to limit the impact on the historic environment and will address the elements of the design and construction works that have a direct impact on heritage assets; and
- undertakings and assurances given during the passage of the hybrid Bill through Parliament.

7. Approach to environmental mitigation

7.1 Introduction

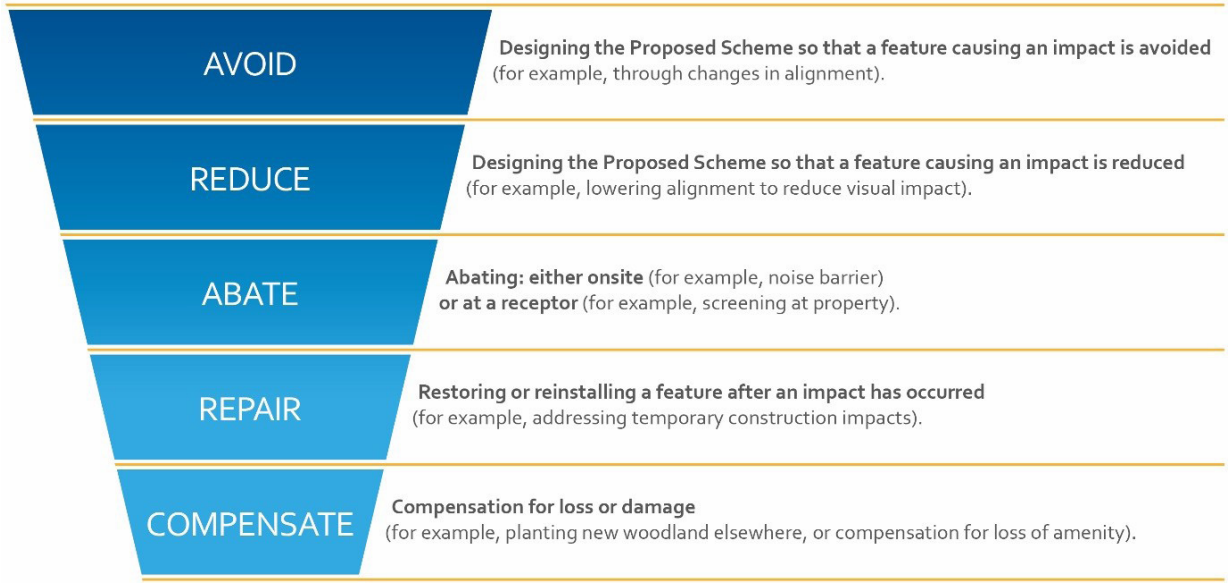
Environmental legislation requires the EIA Report to include a description of the measures envisaged in order to avoid, reduce and, if possible, remedy the significant adverse effects of the Proposed Scheme. Such measures are described as 'mitigation measures'.

HS2 Ltd's approach to mitigating significant adverse effects on the environment of the Proposed Scheme is shown in Figure 12. HS2 Ltd's aim is to avoid adverse environmental effects, where reasonably practicable, through the design. Where this is not achievable, HS2 Ltd considers measures to reduce or abate such effects. Where, despite efforts to avoid and reduce them, significant adverse environmental effects are predicted to occur, HS2 Ltd seeks to propose restoration and compensation measures. In some cases, such measures may actually lead in the longer term to an overall improvement in the environment.

HS2 Ltd is developing the mitigation incorporated into the Proposed Scheme through:

- the *HS2 Sustainability Policy* – to set environmental standards that the Proposed Scheme should aim to achieve, thereby structuring and guiding the design;
- collaborative working between environmental and engineering design teams – to achieve improved design outcomes;
- community engagement and consultation – to allow local people, environmental organisations and responsible authorities to raise issues and propose design and mitigation changes to be considered within the Proposed Scheme;
- recording proposed mitigation to gauge the consistency of approach applied along the route; and

Figure 12: Mitigation hierarchy



- draft Code of Construction Practice (CoCP) – an HS2 Ltd document, which describes the approach to be taken during construction to reduce adverse effects on communities and the environment, including through the use of local environmental management plans. The draft CoCP for the Proposed Scheme forms part of the working draft EIA Report. The draft CoCP will be kept under review as the design of the Proposed Scheme develops.

The measures to avoid, reduce or manage environmental effects will depend on the nature and severity of the adverse environmental effect and of the effectiveness and value for money of the mitigation measures under consideration. Mitigation applied in the design of the Proposed Scheme to date includes:

- developing the route to avoid where possible likely adverse environmental effects, including on residential properties, community facilities, public open space, businesses, farm buildings, sites of ecological and/or heritage importance and the wider landscape;
- using mitigation earthworks and planting to screen views and integrate the Proposed Scheme into the local landscape;
- providing noise barriers (fence barriers or earthworks) to reduce effects on communities;
- providing links under or over the Proposed Scheme to maintain access for roads, public rights of way and properties and allow safe passage of wildlife;
- creating new habitats and other features of ecological value to compensate for unavoidable losses;
- limiting, as far as reasonably practicable, the amount of land required for the construction and operation of the Proposed Scheme;
- where suitable, using excavated materials produced by the Proposed Scheme for construction, primarily of embankments and environmental mitigation earthworks, so as to reduce the number of large lorries on local roads;
- avoiding or reducing impacts on floodplains and floodplain storage areas; and
- providing balancing ponds to control surface water runoff.

The EIA process is iterative and mitigation will be reviewed and developed during the assessment process and will be informed by this consultation. Mitigation opportunities will, therefore, continue to be identified during development of the Proposed Scheme prior to submission of the hybrid Bill.

The remainder of this section provides a preliminary description of the range of measures and policies that have either already been adopted or will be considered as the assessment proceeds. Mitigation measures will continue to emerge during the course of the assessment, as well as in response to consultation on the working draft EIA Report.

7.2 Agriculture, forestry and soils

In rural areas, agriculture is the most common land use. In developing the Phase 2a route, HS2 Ltd is working to limit the adverse impacts on agricultural land and farm holdings as far as is reasonably practicable.

In designing the Proposed Scheme, HS2 Ltd's aim has been to avoid the highest quality agricultural land, insofar as this can be reconciled with the need to satisfy or balance a number of other important environmental and engineering considerations.

Where the Proposed Scheme would affect agricultural land, a range of measures would be put in place to help reduce impacts. Displaced soil would be stripped prior to construction and stored appropriately to enable agricultural land to be restored and reused after the completion of construction. HS2 Ltd would follow good practice for soil handling and land restoration, which has been successfully applied to other large infrastructure projects. This includes an aftercare period during which the land would be managed to achieve the appropriate level of agricultural productivity.

Work is also being undertaken to assist in mitigating the effects of the Proposed Scheme on businesses where reasonably practicable. Measures would be put in place to maintain access for land management, and owners and operators of affected agricultural holdings would be entitled to receive compensation under existing statutory compensation arrangements.

7.3 Air quality

Emissions associated with activities on the construction sites would be controlled by measures within the draft CoCP. No further air quality mitigation measures beyond those contained in the draft CoCP are, therefore, proposed.

7.4 Climate change

The *HS2 Sustainability Policy* seeks to minimise the carbon footprint of the Proposed Scheme as far as reasonably practicable and deliver low carbon long distance journeys that are supported by low carbon energy. The carbon footprint will be used to assess the potential to reduce greenhouse gas emissions across the design, construction and operation phases and, where practicable, a hierarchy of actions, in accordance with the *HS2 Carbon Minimisation Policy*, will be applied.

The assessment also considers the Proposed Scheme's approach to climate change to "build a network which is resilient for the long term and seek to minimise the combined effect of the Proposed Scheme and climate change on the environment". To address part of this objective, the in-combination climate change impacts assessment considers how climate change impacts, in combination with the impacts of the Proposed Scheme, may affect the receiving environment, in order to identify appropriate mitigation. To address the other part of the objective, a climate change resilience assessment considers how climate change impacts may affect the resilience of infrastructure and assets associated with the Proposed Scheme. Measures are being incorporated into the Proposed Scheme to ensure it is resilient to climate change impacts, for example, it is being designed to accommodate rainfall and flooding levels that include an allowance for climate change.

7.5 Community

The assessment of community effects takes into account a range of impacts, including demolition or partial loss of dwellings, community facilities and public open space, and road closures and diversions. The formal EIA Report will also consider in-combination effects of traffic, noise and visual impacts.

The draft CoCP includes measures to reduce noise, air quality, visual and construction traffic effects on local communities during construction. Proposed measures include the appointment of community relations personnel, the sensitive laying out of construction sites to reduce nuisance and maintaining public roads and rights of way around construction sites wherever reasonably practicable.

HS2 Ltd is developing the design of the Proposed Scheme with the aim of minimising demolitions of residential properties and loss of community facilities so far as reasonably practicable.

Where it has not proved possible to avoid adverse impacts resulting from the temporary or permanent loss of public open space, HS2 Ltd would seek to engage with the local authorities in order to identify and put in place appropriate further mitigation measures. Such measures could include improvements to public open spaces in the local area or the provision of new open space to replace that lost to the Proposed Scheme.

Where private businesses that provide community facilities are displaced by the Proposed Scheme they would be entitled to receive compensation under existing statutory compensation arrangements.

7.6 Cultural heritage

In designing the Proposed Scheme, HS2 Ltd's aim has been to avoid or reduce direct adverse impacts on heritage assets. Where this has not been possible, a range of measures would be implemented to mitigate the impact on such assets.

The Proposed Scheme would not have a direct physical effect on any World Heritage Sites, scheduled monuments, registered parks and gardens or registered battlefields and would not require the demolition of any Grade I or Grade II* listed buildings. However, the Proposed Scheme would physically impact a Grade II listed milepost and two conservation areas (Ingestre and Swynnerton).

Mitigation of the effects of the Proposed Scheme on cultural heritage would include a programme of historic environment investigation, recording, analysis reporting and archiving guided by an historic environment research and delivery strategy.

Provision is being made in the design for appropriate measures to mitigate the impact of the Proposed Scheme on the setting of heritage assets. For example, landscape planting and noise mitigation measures would be used to help preserve rural setting and character.

7.7 Ecology and biodiversity

HS2 Ltd is designing the Proposed Scheme to avoid or reduce adverse impacts on habitats, protected species and other features of ecological value, where reasonably practicable. For example, viaducts have been selected at a number of locations (for example, Pyford Brook viaduct) in preference over embankments to reduce impacts on birds, bats and river-based fauna, and allow water-margin habitat to remain in place.

Where adverse impacts cannot be avoided, HS2 Ltd are including mitigation and compensation measures to reduce effects on species and habitats. Measures would include, where appropriate, translocation or relocation of protected species, provision of replacement habitat and provision of special measures such as underpasses and green bridges to facilitate the movement of species across the route. Such measures would be used to limit the effects of loss and/or fragmentation of habitat to a level where the loss is no longer assessed to be significant adverse.

The Proposed Scheme is being designed to seek to achieve no net loss in biodiversity at a route-wide level as far as reasonably practicable.

7.8 Electromagnetic interference

The generation of electromagnetic fields would be managed during construction and operation of the Proposed Scheme to ensure that electrical equipment and human health are not adversely affected. Electromagnetic interference would be managed during construction in line with British and European standards and industry good practice. The main source of electromagnetic fields from operation of the Proposed Scheme would be the power supply system along the railway. The voltage and current generated by the power supply system would not be high enough to cause significant electromagnetic fields outside the railway boundary.

7.9 Health

HS2 Ltd is managing adverse health effects of the Proposed Scheme by integrating health mitigation into planning and design. For example, the route of the Proposed Scheme has been selected to avoid (where reasonably practicable) residential properties and other sensitive receptors, and bunds and other measures have been incorporated to reduce visual intrusion and noise. Mitigation measures would also be implemented during construction and through ongoing management and delivery of the Proposed Scheme. These are incorporated into the draft CoCP and other HS2 strategies and policies as appropriate.

7.10 Land quality

The draft CoCP contains measures to mitigate the effects of any land contamination, to ensure no significant adverse effects would arise. Pre-existing contaminated soils or groundwater may be treated. If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination.

The Proposed Scheme crosses a number of mineral safeguarding areas for sand and gravel extraction. Where construction occurs within a mineral safeguarding area, pre-extraction would be discussed with the mineral/land owner, the Mineral Planning Authority and other relevant stakeholders to assist in achieving effective management of minerals.

7.11 Landscape and visual

HS2 Ltd is designing the Proposed Scheme to avoid or reduce landscape and visual impacts and integrate the railway into the landscape. Where appropriate, landscape earthworks, native trees, woodland and hedgerow planting would be added to integrate the Proposed Scheme into the local topography and landscape character. This would also provide visual screening for residents and other sensitive receptors (users of recreational sites and public rights of way). Landscape mitigation would create new ecological habitats and features, help attenuate noise and create appropriate settings for heritage assets.

HS2 Ltd and its contractors would maintain and monitor newly planted and landscaped areas. This would ensure that the planting successfully establishes and develops so that it achieves its mitigation objective and remains effective thereafter.

Individual elements of the Proposed Scheme, such as bridges and viaducts, would be designed to seek to ensure they are in keeping with the local landscape character. Detailed design, materials and finishes would be subject to approval by the local planning authority under the provisions of the hybrid Bill.

The draft CoCP includes measures to limit landscape and visual impacts during construction. These include protecting existing trees, use of well-maintained fencing around construction areas and designing lighting to avoid intrusion on any adjacent residential properties.

7.12 Major accidents and natural disasters

The Proposed Scheme, as a modern, high-speed railway, is being designed and will be built and operated in line with best international current practice and, as such, major accidents would be very unlikely.

The Proposed Scheme is being designed and its implementation guided by legal requirements, and numerous industry standards and codes, many of which are mandatory. These require risks associated with major accidents and disasters to be identified, assessed and reduced during the design, construction, operation and maintenance of the Proposed Scheme. Infrastructure and systems must also be designed in accordance with the latest safety standards and codes so that risks to people and the environment are either eliminated or reduced to levels that are considered legally acceptable.

In addition, during construction, the draft CoCP includes the requirement for construction contractors and suppliers to prepare plans and protocols that address accident and disaster risk issues. This includes the preparation of community emergency plans (where relevant), traffic management plans, measures to control pollution risks, and plans to prevent fires and deal with the impacts of extreme weather events.

7.13 Socio-economics

In order to construct the Proposed Scheme, it is expected that some businesses would be required to move to alternative premises. Displaced businesses would be entitled to receive compensation where required to relocate to alternative premises, under existing statutory compensation arrangements. HS2 Ltd would also provide, where appropriate, additional support to help businesses relocate to alternative premises.

7.14 Sound, noise and vibration

HS2 Ltd is designing the Proposed Scheme with the aim of minimising significant adverse noise and vibration impacts as far as reasonably practicable. The route has been aligned to avoid many noise-sensitive locations and keep the route as low as reasonably practicable and away from main communities. Operational noise would be reduced at source through the effective design and specification of the trains and track, as well as by noise barriers. Noise barriers would take the form of landscape earthworks, noise fence barriers and/or parapet barriers on viaducts. Tunnel portals would also be designed to avoid significant noise effects caused by trains entering the tunnel. Noise insulation would be offered to avoid significant adverse effects on individual qualifying properties close to the Proposed Scheme.

The draft CoCP sets out measures to control noise and vibration during construction; the primary measure being that best practicable means would be applied to minimise noise (including vibration) at neighbouring properties. The draft CoCP also sets out the order in which, as part of the application of best practicable means, mitigation measures should be applied. Firstly mitigation to control noise at source should be applied, for example, the use of quiet and/or low-vibration equipment and restricted working hours. Secondly screening would be provided, for example local screening of equipment, as well as screening along the edge of the construction worksites. Lastly, where required, HS2 Ltd would offer noise insulation and/or temporary rehousing to dwellings which satisfy the applicable qualifying criteria, which, if accepted, would avoid significant adverse effects at individual properties from the construction of the railway.

7.15 Traffic and transport

The draft CoCP includes mitigation measures to reduce and manage traffic and transport impacts during construction of the Proposed Scheme. Construction would lead to increased vehicular traffic and have the potential to cause increased congestion and journey times at a number of locations. In order to keep disruption and congestion resulting from construction traffic to a reasonable minimum, HS2 Ltd would put in place measures to reduce the impact of construction

vehicles using the public road network, especially local roads. Travel plans would be implemented to help mitigate transport-related effects during construction (such as through the promotion of public transport, car sharing and, where appropriate, works buses).

It would be necessary to close, realign or divert certain local roads and public rights of way along the Proposed Scheme, both during construction and, in some cases, permanently. In all such cases, alternative routes would be available. There may, however, be some limited effects on non-motorised users (i.e. pedestrians, cyclists and horse riders) due to increased journey distances and times. Where a new bridge across the route is required, it would, where reasonably practicable, be constructed offline so as to enable the existing route to continue in use until its replacement is ready to be brought into public use.

7.16 Waste and material resources

During the construction and operation of the Proposed Scheme, HS2 Ltd's objective is to limit the use of materials and generation of waste. Sustainable materials would be sourced and made efficient use of for construction of the Proposed Scheme.

The principles of the waste hierarchy would be followed, with priority given to the prevention of waste generation, followed (where this is not possible) by reuse, recycling and recovery of waste respectively, with disposal to landfill adopted only as a last resort.

The majority of excavated material that would be generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, either with or without treatment (as appropriate).

7.17 Water resources and flood risk

HS2 Ltd is designing the Proposed Scheme to avoid or reduce adverse impacts on water resources and flood risk as far as is reasonably practicable.

The Proposed Scheme would cross watercourses either by viaduct, bridge or culvert. Minor realignments or short diversions of watercourses are proposed in some locations to minimise the number of crossings. The approach is to ensure the quality of watercourses is not significantly adversely affected.

Cuttings and embankments are being designed to take into account the potential impact on surface waters and groundwater. A limited number of springs would be affected, for which mitigation options are currently being investigated. The Proposed Scheme design aims to avoid public and private water supplies where reasonably

practicable, but a number of supplies would be affected and mitigation options are currently being investigated.

Measures set out in the draft CoCP would reduce effects during construction as far as is reasonably practicable, including effects on local groundwater levels during excavation works. Where a potential risk to groundwater abstractions is identified, HS2 Ltd would agree a management strategy with the Environment Agency in consultation with the relevant water company to effectively manage this risk.

The Proposed Scheme aims to avoid an increase in the risk of flooding from all sources, taking into account the projected impact of climate change. Where required, the Proposed Scheme would mitigate loss of floodplain by creating replacement floodplain storage areas. Sustainable drainage is also being incorporated into the design, where reasonably practicable, to control the rate, volume and quality of runoff.

8. Summary of environmental effects by community area

8.1 Introduction

The following section provides a summary of the assessment of the likely environmental impacts (and, where practicable, the likely significant environmental effects) of the construction and operation of the Proposed Scheme on an environmental topic basis at a local level. Effects of the Proposed Scheme that are likely to occur at a geographical scale greater than the community areas are reported in Section 9. This section provides the following for each of the five community areas:

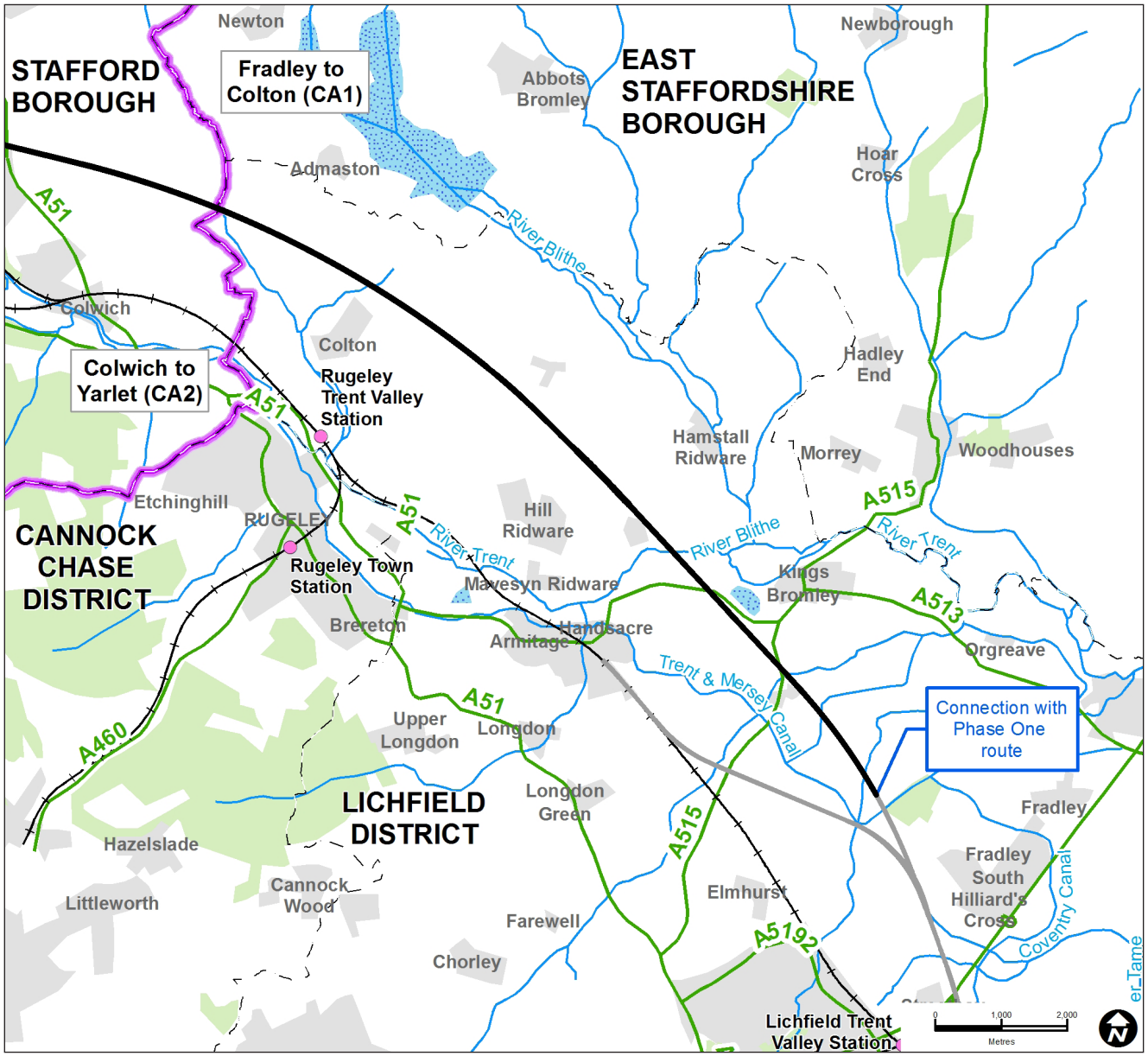
- a summary of the existing environment within the area;
- a brief description of the Proposed Scheme in the area;
- a description of the likely environmental impacts (and, where practicable, likely significant environmental effects) in the area for the following environmental topics:
  - agriculture, forestry and soils;
  - air quality;
  - community;
  - cultural heritage;
  - ecology and biodiversity;
  - health;
  - land quality;
  - landscape and visual;
  - socio-economics;
  - sound, noise and vibration;
  - traffic and transport; and
  - water resources and flood risk;
- a description of proposed mitigation measures that have been identified to avoid, reduce or manage the likely significant adverse effects.

Those topics not listed above (climate change, major accidents and natural disasters, and waste and material resources) are not considered to experience local level impacts. The route-wide impacts for these topics are described in Section 9.

The formal EIA Report will identify the likely significant residual environmental effects once the design and environmental assessment have been progressed and mitigation measures have been included in the design. Residual effects are the effects likely to remain after the range of mitigation measures contained within the Proposed Scheme design and draft CoCP have been implemented.

Figures 13, 15, 17, 19 and 21 show the route of the Proposed Scheme within each community area. The legend is common to each figure:

Figure 13: Fradley to Colton (community area 1) route and context map



8.2 Fradley to Colton

Overview

The Fradley to Colton area is approximately 14 kilometres in length, extending from near Fradley, approximately three kilometres north-east of Lichfield, where the Phase 2a route would join the HS2 Phase One route, in a north-westerly direction past Kings Bromley to Colton (see Figure 13).

The area is predominantly rural in character, with agriculture being the main land use. The first half of the area includes extensive floodplains associated with the River Trent. Small settlements are located near the route at Fradley, Kings Bromley, Handsacre, Pipe Ridware, Hill Ridware, Blithbury, Stockwell Heath and Colton.

The Proposed Scheme

The route would alternate between embankment, viaduct and cutting through the Fradley to Colton area. From the connection with HS2 Phase One, approximately three kilometres north-east of Lichfield, the route would initially run through farmland on embankment in a north-westerly direction. The route would cross the Pyford Brook floodplain on viaduct before returning to embankment until it crosses the Bourne Brook on a viaduct. The route would transition back to embankment and cross the River Trent on viaduct. The route would move onto embankment near the village of Pipe Ridware, where maintenance loops would be located. Maintenance loops would comprise two additional sections of track, one on either side of the high speed line, each approximately 1.25 kilometres (0.75 miles) long.

The route would descend into cutting from Blithbury West before returning to embankment to pass between the villages of Stockwell Heath and Colton. Approaching the B5013 Uttoxeter Road overbridge, the route would move into cutting before transitioning to embankment and crossing the Moreton Brook on viaduct. It would return to embankment north-west of Moreton Brook, where it would continue into the Colwich to Yarlet area (community area 2).

In this area the Proposed Scheme would require the demolition of six residential properties. There would be the closure, permanent realignment or diversion of 12 roads. The Proposed Scheme would result in the permanent realignment or diversion of 11 public rights of way. Ten watercourses would be permanently diverted and there would be realignment of an overhead power line and diversion of a high pressure gas main. Ten satellite construction compounds would be required.

Environmental effects

This section provides a summary of the likely environmental impacts (and, where practicable, likely significant environmental effects) identified for the Fradley to Colton area.

Agriculture, forestry and soils

It is currently expected that approximately 310 hectares of agricultural land within the Fradley to Colton area would be required for construction of the Proposed Scheme, of which approximately 48% is thought to be high quality land. This will be confirmed in the formal EIA Report once agricultural land surveys are complete, as will the extent of land required permanently for the Proposed Scheme. To avoid or reduce environmental impacts, the soils 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.

Construction of the Proposed Scheme could result in significant adverse effects at 12 farm holdings in this area due to the land permanently required for operation. Two of these holdings (Hamley

House Farm and Manor Farm) are anticipated to experience significant adverse severance impacts, where the Proposed Scheme causes areas of land to become 'cut off' from the rest of the farm. Land required temporarily would, in agreement with the landowner, be returned to the farm holding following the completion of construction. However, due to the high level of impact during construction at some locations (for example, severance of land), this may result in temporary significant adverse effects at some farm holdings. This assessment of temporary effects is currently being undertaken and will be reported in the formal EIA Report.

The operation of the Proposed Scheme may also result in potentially significant adverse effects on livestock sensitive to noise at Barn Farm, Woodhouse Farm and Hamley House Farm, all of which lie within 100m of the Proposed Scheme. Further work is being undertaken to identify whether any significant adverse effects on these farms are anticipated, the findings from which will be reported in the formal EIA Report.

Air quality

Measures in the draft CoCP would be implemented to manage dust, air pollution and odour during construction. The main impacts to local air quality during construction would arise from construction activities, demolition, site preparation works, the use of haul routes and additional traffic on local roads. With the implementation of the measures set out in the draft CoCP, no significant adverse effects are considered likely from on-site emissions (e.g. dust emissions) during construction of the Proposed Scheme. An assessment of the air quality effects of increased traffic flows on local roads as a result of Proposed Scheme construction traffic travelling to and from the construction sites is currently being undertaken and will be reported in the formal EIA Report.

No local air quality impacts are anticipated due to changes in road traffic flows during the operation of the Proposed Scheme. An air quality assessment is being undertaken, with conclusions to be provided in the formal EIA Report.

Community

Six residential properties would be permanently lost in this area: three properties off Shaw Lane and three properties on Hadley Gate Lane. There would be a permanent adverse significant isolation effect on the residential properties in Stockwell Heath due to the presence of the Proposed Scheme between Stockwell Heath and Colton, and the reduction of access from two routes between the villages to a single route.

Potentially significant adverse effects are also identified in relation to the permanent loss of public open space at Tomlinson's Spinney woodland area and temporary loss of public open space at Trentside Meadows and Hurst Wood.

Construction and operation of the Proposed Scheme could lead to in-combination effects on the community in this area (for example, from noise and visual effects), which will be assessed and reported in the formal EIA Report.

Cultural heritage

The Proposed Scheme is being designed to reduce impacts on heritage assets as far as reasonably practicable. However, construction works are likely to require the permanent removal of some heritage assets. These include remains of prehistoric to medieval date across the sand and gravel terraces flanking the River Trent, as well as on the slopes overlooking the valley to the north. A programme of archaeological investigation and recording would be undertaken prior to or during construction works affecting these assets.

Construction and operation of the Proposed Scheme may lead to permanent impacts on the setting of heritage assets including the Grade II listed Woodhouse Farmhouse, Grade II listed Bentley Hall Farmhouse and non-designated Church of St James in Pipe Ridware, all of which may experience significant adverse visual and/or noise impacts.

Additionally, the Church of St James, Woodhouse Farmhouse and Bentley Hall Farmhouse, along with Hamley House (Grade II listed), may experience temporary significant adverse effects on setting during construction works associated with the Proposed Scheme.

Effects would be reduced through landscape planting and noise mitigation measures incorporated into the design.

Ecology and biodiversity

Ecology survey and assessment work is ongoing and baseline information regarding ecological features is limited at this stage. The assessment for this working draft EIA Report is therefore provisional and has been undertaken based on a precautionary approach. A fuller assessment of significant effects will be included in the formal EIA Report.

Construction of the Proposed Scheme would result in a permanent loss of habitat (grassland, hedgerows and lowland meadows) at three local wildlife sites: Trentside Meadows, Newlands Lane and Lount Farm. Despite limiting the footprint of earthworks to reduce habitat loss, the Proposed Scheme would significantly adversely affect the integrity of these sites. In addition there would be a loss of approximately 7 hectares of broadleaved woodland, 16 ponds, 33 kilometres of hedgerows and 6.5 hectares of grazing marshland, the removal and fragmentation of which would impact the conservation status of these habitat types as well as potentially significantly affecting bat, hazel dormouse, polecat, great crested newt, terrestrial invertebrate, reptile and bird populations.

Significant adverse effects may be experienced by otter and water vole in watercourses affected by the Proposed Scheme, as a result of the loss of water-margin habitat. Similarly, fish and aquatic invertebrates may be affected as a result of construction disturbance.

During operation of the Proposed Scheme, bats and barn owls would be at risk of mortality from passing trains, particularly near Pyford Brook, Moreton Brook and the River Trent.

Mitigation measures to limit disturbance to habitat and species during construction are contained in

the draft CoCP which includes the translocation of protected species where appropriate. Measures to further reduce the effects identified will also be considered and reported in the formal EIA Report.

Some areas of habitat creation have been identified in the working draft EIA Report. Further habitat creation opportunities are currently being explored and will be reported in the formal EIA Report.

Health

The Proposed Scheme would impact on a range of environmental and social factors that have the potential to affect health.

Construction of the Proposed Scheme and associated traffic, road closures and diversions may lead to a reduction in community connectivity. There would be temporary effects on access to properties on Common Lane and A515 Lichfield Road; a property close to Bourne Brook satellite compound; and properties on Blithbury Road at the junction with Stonyford Lane. There would be a permanent reduction in access between the remaining residential properties at Stockwell Heath and the nearby community of Colton, due to the construction of the Stockwell Heath embankment. This could result in feelings of isolation and a reduction in the beneficial health effects that are gained through access to community facilities, social contact and support.

The temporary construction workforce could comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial impacts will be undertaken and reported in the formal EIA Report.

Reduced access to areas of green space, including Trentside Meadows, Hurst Wood and Tomlinson's Spinney, could result in a reduction in the mental and physical wellbeing benefits afforded by these spaces. Additionally, levels of physical activity could potentially be affected by disruption to roads and public rights of way that may be used as active travel routes.

Land quality

The application of measures within the draft CoCP would ensure no significant adverse effects with respect to land contamination. If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination.

One mineral safeguarding area for sand and gravel extraction covers the majority of the route in this community area. In addition, there is an area of search for sand and gravel extractions at Kings Bromley. Potential adverse effects may occur on parts of these mineral resources if they are not exploited before or during construction, but the impact would be limited in extent. This would be discussed with the land/mineral owners and Minerals Planning Authority at Staffordshire County Council to avoid significant adverse effects. There are no national or local geological sites within the community area.

Landscape and visual

Construction of the Proposed Scheme and changes to the existing landform and vegetation patterns would permanently affect the character and appearance of the local landscape. Significant adverse effects would be reduced by the measures incorporated into the design to reduce the visibility of the Proposed Scheme (for example, tree planting to provide screening along the route), land shaping to link earthworks into their wider landscape context, compensatory woodland planting, hedgerow replacement and restoration, and new wetland features to compensate for the loss of ponds.

The effect of the Proposed Scheme on the character and appearance of the local landscape would reduce over time as mitigation planting matures. Despite these measures, significant adverse effects would, however, potentially remain in some parts of the local landscape due to the presence of the Proposed Scheme infrastructure in this area, principally the viaducts across the Pyford Brook, Bourne Brook and River Trent (with adjoining embankments), Stockwell Heath embankment, and cuttings at Blithbury and Stockwell Heath.

Figure 14: View over Trent Riparian Alluvial Lowlands landscape character area

The presence of construction works may significantly adversely affect the following landscape character areas: Curborough and Fradley Settled Heathlands; Kings Bromley Terrace Alluvial Lowlands; Trent Riparian Alluvial Lowlands (see Figure 14); and Colton and Stockwell Heath Settled Farmlands. These landscape character areas are also expected to potentially experience significant adverse effects during operation of the Proposed Scheme.

Construction works and activities may have significant adverse effects on residents and others experiencing views in a number of locations in the area, including: from the Trent and Mersey Canal towpath looking north; residents to the south of Kings Bromley looking west; residents and users of public rights of way at Rileyhill and Bromley Hayes; residents at Kings Bromley and east of Handsacre; users of public rights of way around Handsacre and Kings Bromley looking east; users of the Way for Millennium route looking south and adjacent residents at Nethertown and Pipe Ridware; residents to the east of Hamstall Ridware looking west; residents and users of public rights of way to the east of Hill Ridware and around Blithbury and Stockwell Heath; residents at Colton and surrounding public rights of way looking east; users of public rights of way around Hamley Heath looking east; and residents to the south and west of Admaston.

These receptors, together with users of the Trent and Mersey Canal towpath to the west of Rileyhill, would also potentially continue to experience significant adverse visual effects during operation of the Proposed Scheme.

Socio-economics

It is estimated that the Proposed Scheme would result in the displacement or possible loss of approximately five jobs within this area. Taking into account the availability of alternative premises and the total number of people employed within the district (approximately 45,000), the displacement or possible loss of jobs is considered to be modest compared to the scale of economic activity and opportunity in the area. The business potentially displaced by the Proposed Scheme would be compensated in accordance with the National Compensation Code.

The Proposed Scheme would result in the creation of construction and operational employment opportunities within the community area, the effects of which are reported on a route-wide basis in Section 9.12.

Sound, noise and vibration

A comprehensive set of mitigation measures, including those in the draft CoCP, would be implemented to control noise and vibration throughout the construction works.

Noise from construction could result in adverse effects on dwellings closest to the construction works at: Rileyhill; Kings Bromley; Pipe Ridware; Blithbury; Blithbury Road/Hadley Gate Lane; Stockwell Heath; Colton; and Hamley Heath. Additionally adverse effects could occur at dwellings along construction routes: on Wood End Lane between the A38 Lichfield Road and the A515 Lichfield Road; in Rileyhill adjacent to the B5014

Uttoxeter Road; and in Stockwell Heath/Colton at properties adjacent to the B5013 Uttoxeter Road. Further work is being undertaken to confirm the likely significant construction noise and vibration effects, including any temporary effects from construction traffic. This assessment will be reported in the formal EIA Report.

Operational noise would be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Operation of the railway would potentially result in adverse noise effects, due to potential noise increases and hence adverse change in the existing acoustic character around those parts of the following communities where they are closest to the route: Rileyhill, Pipe Ridware, Blithbury Road/ Hadley Gate Lane, Stockwell Heath, Colton and Hamley Heath.

For dwellings which satisfy the applicable qualifying criteria, noise insulation would be offered to avoid significant adverse effects – at this early stage this is anticipated to be near Rileyhill and Blithbury. Ridware Theatre in Pipe Ridware may also be affected. Assessment is being undertaken to confirm the likely significant effects due to operational noise and vibration, especially at non-residential locations and quiet areas and in terms of establishing existing baseline conditions. This will be reported in the formal EIA Report.

Traffic and transport

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 A38 Lichfield Road, A51 Stafford Road, A515 Lichfield Road, A513 Rugeley Road, A5192 Eastern Avenue, Wood End Lane, B5014 Uttoxeter Road and B5013 Uttoxeter Road. Increases in traffic could also affect non-motorised users (i.e. pedestrians, cyclists and horse riders) in terms of the ease with which they can cross these routes.

Twelve public rights of way would be affected during construction with users temporarily diverted at different times during the construction period. This could result in significant adverse effects on users.

Effects during construction would be reduced by the creation of a haul route adjacent to the route of the Proposed Scheme, which would be used to transport materials and equipment, thereby reducing heavy goods vehicle movements on the local road network. The majority of roads crossing the route would be kept open during construction. Road closures would be restricted to overnight and weekend works where reasonably practicable. Routeing heavy goods vehicles along the strategic and/or primary road network (as far as reasonably practicable), the provision of temporary alternative routes for public rights of way, and provision of on-site welfare facilities to reduce daily travel by site workers would further reduce impacts during construction. Implementation of the draft CoCP would further mitigate transport-related effects during construction.

The permanent closure of Common Lane and Shaw Lane would increase journey distance and time for users of these roads, the effects of which may be significant adverse for non-motorised users. The permanent realignment or diversion of 11 public rights of way may also potentially result in significant adverse effects.

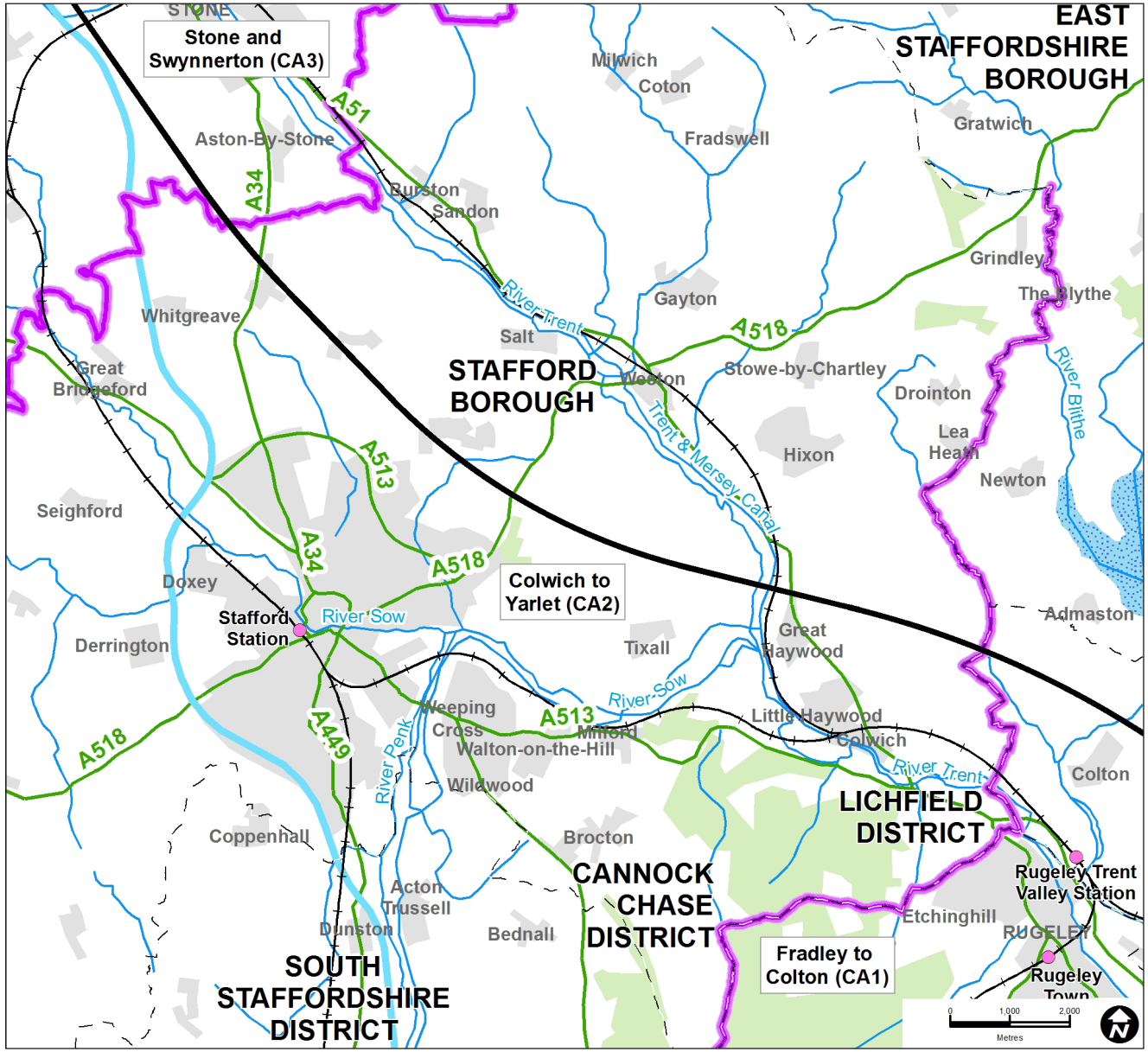
Water resources and flood risk

Construction works would result in the loss of two potential spring features at Quintons Orchard and Blithbury West (as identified on Ordnance Survey Maps), both of which have been assessed as high value resources pending the results of field survey. This effect is therefore considered to be potentially significant adverse. Surveys are currently being undertaken to confirm the presence and value of these features and to enable the development of an approach to mitigate the effects of removing the springs and replacing them nearby. This mitigation, which would reduce any significant adverse effects to temporary in nature, will be described in the formal EIA Report.

The proposed culverts on Ashby Stitch, Finners Hill, Stockwell Heath, Sherracop and Hamley (south and north) and two proposed inverted siphons at Blithbury and Blithbury West would potentially result in significant effects on the natural form of watercourses beneath the Proposed Scheme. Suitable measures are currently being considered to mitigate these effects, details of which will be provided in the formal EIA Report.

It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual effects of significance to the water environment in the Fradley to Colton area.

Figure 15: Colwich to Yarlet (community area 2) route and context map



8.3 Colwich to Yarlet

Overview

The Colwich to Yarlet area is approximately 15 kilometres in length, extending from west of Moreton in a northerly direction past Hopton and on to Yarlet (see Figure 15). The area is mainly rural, with scattered residential settlements and limited community facilities.

The Proposed Scheme

The route would enter the area west of Moreton House (Grade II listed, which contains Mayfield Children's Home, a specialist residential home for students at Rugeley School) on embankment before transitioning to cutting with a retaining wall at Moreton. Where the Colwich Footpath 54 crosses over the route it would revert to embankment before crossing over the A51 Lichfield Road and then the Colwich to Macclesfield railway line (adjacent to Great Haywood Marina), the Trent and Mersey Canal and the River Trent on viaduct. The route would return to embankment before varying between lengths at-grade, in cutting and on embankment, passing through Ingestre Park Golf Course and the southern edge of Staffordshire County Showground, until it reaches Hopton. At the southern end of Hopton the route would be on embankment before moving into cutting (with a retaining wall) which would continue for approximately one kilometre. Past Marston, the route would then be on embankment before moving into a shallow cutting past Yarlet. At the A34 Stone Road the route would move into a deep cutting, which would transition into a shallow cutting before continuing into the Stone and Swynnerton area (community area 3).

In this area the Proposed Scheme would require the demolition of 13 residential properties. There would be one permanent road closure, permanent realignment of three roads, and permanent diversion of five roads. The Proposed Scheme would result in the permanent realignment or diversion of 13 public rights of way and the closure of one public right of way. Nine watercourses would be permanently diverted and there would be a high pressure gas diversion and diversion of another gas pipeline. The route would also require land at Ingestre Golf Course and Staffordshire County Showground. One main compound and seven satellite construction compounds would be required.

Environmental effects

This section provides a summary of the likely environmental impacts (and, where practicable, likely significant environmental effects) identified for the Colwich to Yarlet area.

Agriculture, forestry and soils

It is currently expected that approximately 320 hectares of agricultural land within the Colwich to Yarlet area would be required for construction of the Proposed Scheme, of which approximately 80% is thought to be high quality land. This will be confirmed in the formal EIA Report once agricultural land surveys are complete, as will the extent of land required permanently for the Proposed Scheme. To avoid or reduce environmental impacts, the soils 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.

Construction of the Proposed Scheme may result in significant adverse effects at 17 farm holdings in this area due to the land permanently required for operation. Seven holdings could incur demolition of buildings, three of which may lose residential premises (Tithe Barn Farm, Upper Hanyards Farm

and Lower Bridge Farm). Other farm holdings may experience high impacts due to the proportion of land required, the effects on farm infrastructure and/or the effects of severance (where the Proposed Scheme causes areas of land to become 'cut off' from the rest of the farm).

Land required temporarily would, in agreement with the landowner, be returned to the farm holding following the completion of construction. However, due to the high level of impact during construction in some locations (for example, severance of land), this may result in temporary significant adverse effects at some farm holdings. This assessment of temporary effects is currently being undertaken and will be reported in the formal EIA Report.

The operation of the Proposed Scheme may also potentially result in significant adverse effects on livestock sensitive to noise at four farms at Great Haywood and Marston, which lie within 100m of the Proposed Scheme. Further work is being undertaken to identify whether any significant adverse effects on these farms are anticipated, the findings from which will be reported in the formal EIA Report.

Air quality

Measures in the draft CoCP would be implemented to manage dust, air pollution and odour during construction. The main impacts to local air quality during construction would arise from construction activities, demolition, site preparation works, the use of haul routes and additional traffic on local roads. With the implementation of the measures set out in the draft CoCP, no significant adverse effects are considered likely from on-site emissions (e.g. dust emissions) during construction of the Proposed Scheme. An assessment of the air quality effects of increased traffic flows on local roads as a result of Proposed Scheme construction traffic travelling to and from the construction sites is currently being undertaken and will be reported in the formal EIA Report.

No local air quality impacts are anticipated due to changes in road traffic flows during the operation of the Proposed Scheme. An air quality assessment is being undertaken, with conclusions to be provided in the formal EIA Report.

Community

Construction of the Proposed Scheme would lead to the loss of 13 residential properties in this area, seven of which are in Hopton which represents a significant adverse community effect. The village of Hopton would also be subject to a significant adverse isolation effect due to the presence of the Proposed Scheme between two parts of the village.

During construction of the Proposed Scheme likely significant adverse effects are expected to also occur at Ingestre Golf Club and Staffordshire County Showground. While much of the land required at Ingestre Golf Club would be returned at the end of construction of the Proposed Scheme, it is not considered likely that the club would be able to function in its current arrangement. Access to the Staffordshire County Showground would be disrupted during construction. While this would cause a temporary significant adverse effect in reducing access to the showground, the works would be managed to ensure access is maintained during the construction period.

Temporary significant adverse effects are identified at 11 residential properties to the north and north-west of Great Haywood, five properties at Park Farm and five properties on Marston Lane, all of which may experience isolation effects with reduced accessibility for the duration of construction works.

Construction and operation of the Proposed Scheme could lead to in-combination effects on the community in this area (for example, from noise and visual effects), which will be assessed and reported in the formal EIA Report.

Cultural heritage

The Proposed Scheme is being designed to reduce impacts on heritage assets as far as reasonably practicable. However, there are a number of heritage assets that are likely to be permanently lost. These include archaeological remains at several locations including those of prehistoric and Roman date on the River Trent gravels at Tixall and Ingestre. The Proposed Scheme would also result in the demolition of buildings at two historic farmsteads in Hopton and partial removal of Lionlodge Covert within Ingestre Conservation Area. A programme of archaeological and built heritage investigation and recording would be undertaken prior to or during construction works affecting these assets.

The setting of several historic landscapes may be permanently affected by the Proposed Scheme. These include Moreton House (Grade II listed), Moreton Grange, Lowerhouse Farm, the Trent and Mersey Canal Conservation Area and Ingestre Conservation Area, which may experience significant adverse effects on their setting that would continue during operation of the Proposed Scheme. Adverse effects would be reduced as landscape planting matures and through noise mitigation measures incorporated into the design. These heritage assets may also experience temporary significant adverse effects as a result of construction works introducing noise and visual impacts to their setting. Additionally, the setting of the Church of St Leonard in Marston may be temporarily significantly adversely affected during construction of the Proposed Scheme.

Ecology and biodiversity

Ecology survey and assessment work is ongoing and baseline information regarding ecological features is limited at this stage. The assessment for this working draft EIA Report is therefore provisional and has been undertaken based on a precautionary approach. A fuller assessment of significant effects will be included in the formal EIA Report.

Construction of the Proposed Scheme would result in the permanent loss of habitat at two local wildlife sites (Lount Farm and Lionlodge Covert) and at five woodland sites (Hoo Mill, Flushing Covert, Town Field Plantation, Ingestre Wood and Yarlet Wood) that potentially contain ancient woodland[3]. Despite limiting the footprint of earthworks to minimise habitat loss, this would significantly adversely affect the integrity of these sites. In addition there would be a loss of approximately 18.5 hectares of other broadleaved woodland, 7 hectares of grazing marshland, 17 ponds and 17 kilometres of hedgerows, the

3 These five sites have been identified from a review by HS2 Ltd of woodlands not currently listed on the Ancient Woodland Inventory, but that are either within the land that would be required for construction of the Proposed Scheme, or within 500m of it, based on historical mapping.

removal and fragmentation of which would impact the conservation status of these habitat types as well as potentially significantly affecting bat, hazel dormouse, polecat, great crested newt, terrestrial invertebrate, reptile and bird populations.

Significant adverse effects may be experienced by otter and water vole in watercourses affected by the Proposed Scheme, as a result of the loss of water-margin habitat. Similarly, fish and aquatic invertebrates may be affected as a result of construction disturbance.

During operation of the Proposed Scheme, bats and barn owls would be at risk of mortality from passing trains.

Mitigation measures to limit disturbance to habitat and species during construction are contained in the draft CoCP which includes the translocation of protected species where appropriate. Measures to further reduce the effects identified will also be considered and reported in the formal EIA Report.

Some areas of habitat creation have been identified in the working draft EIA Report. Further habitat creation opportunities are currently being explored and will be reported in the formal EIA Report.

Health

The Proposed Scheme would impact on a range of environmental and social factors that have the potential to affect health.

The proposed demolition of seven residential properties in Hopton may reduce the levels of social contact and support within this community. Construction of the Proposed Scheme and associated traffic, road closures and diversions may also lead to a reduction in community connectivity, particularly for residences to the north of Great Haywood, properties at Park Farm and residential properties to the south-west of Marston, where the location of the Proposed Scheme, road closures and realignments may increase journey times between rural communities. There would be a permanent reduction in access between the south and north residential areas of Hopton due to the Hopton North cutting, although a permanent diversion would be in place. The reduction in access could result in increased isolation and a reduction in the beneficial health effects that are gained through access to community facilities, health and social care, social contact and support. Additionally, levels of physical activity could potentially be affected by disruption to roads and public rights of way that may be used as active travel routes.

The temporary construction workforce could comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial impacts will be undertaken and reported in the formal EIA Report.

Land quality

The application of measures within the draft CoCP would ensure no significant adverse effects with respect to land contamination.

If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination. There would be a significant beneficial effect associated with the remediation of the Elmstar Plant landfill at Staffordshire County Showground.

The Proposed Scheme crosses two mineral safeguarding areas; one for sand and gravel extraction and one for bedrock sand extraction. Potential adverse effects may occur on parts of these mineral resources if they are not exploited before or during construction, but the impact would be limited in extent. This would be discussed with the land/mineral owners and Minerals Planning Authority at Staffordshire County Council to avoid significant adverse effects. There are no national or local geological sites within this community area.

Landscape and visual

Construction of the Proposed Scheme and changes to the existing landform and vegetation patterns would permanently affect the character and appearance of the local landscape. Significant adverse effects would be reduced by the measures incorporated into the design to reduce the visibility of the Proposed Scheme (for example, tree planting to provide screening along the route), land shaping to link earthworks into their wider landscape context, compensatory woodland planting, hedgerow replacement and restoration, and new wetland features to compensate for the loss of ponds.

The effect of the Proposed Scheme on the character and appearance of the local landscape would reduce over time as mitigation planting matures. Despite these measures, significant adverse effects would, however, potentially remain in some parts of the local landscape due to the presence of the Proposed Scheme infrastructure in this area, principally the viaduct over Moreton Brook, the viaduct over the River Trent, Great Haywood Marina and the Trent and Mersey Canal and the associated road realignment, plus the cutting at Ingestre Park and Tixall Park.

The presence of the construction works and then the Proposed Scheme during operation may have potentially significant adverse effects on the Ingestre Riparian Alluvial Lowlands, Ingestre Park Sandstone Estatelands and Hopton Sandstone Estatelands landscape character areas (see Figure 16).

In addition, potentially significant adverse visual effects may be experienced by the following during construction: residents at Moreton Farm looking south and Upper Morton looking north; users of the Trent and Mersey Canal towpath looking north and south; users of Ingestre Park looking south; residents and users of public rights of way at Hopton looking south; users of the Stone Circles Challenge long distance path; and residents at Marston and Yarlet looking north. These viewpoints may continue to experience significant adverse visual effects during operation of the Proposed Scheme, particularly in the early years of the Proposed Scheme operating.

Figure 16: View over Hopton Sandstone Estatelands landscape character area

Socio-economics

Construction of the Proposed Scheme would require land acquisition at four employment areas; an area between Moreton Lane and Bishton Lane, at Great Haywood Marina, at Ingestre Park Golf Club, and within the Yarlet area. Of these, effects on employment (non-agricultural) are potentially significant at Great Haywood Marina (leisure/recreational and tourism services) and at Ingestre Park Golf Club. Businesses displaced by the Proposed Scheme would be compensated in accordance with the National Compensation Code.

It is estimated that the Proposed Scheme would result in the displacement or possible loss of approximately 35 jobs within this area. Taking into account the availability of alternative premises and the total number of people employed within the district (approximately 58,000), the displacement or possible loss of jobs is considered to be modest compared to the scale of economic activity and opportunity in the area.

The Proposed Scheme would result in construction and operational employment opportunities being created within the community area, the effects of which are reported on a route-wide basis in Section 9.12.

Sound, noise and vibration

A comprehensive set of mitigation measures, including those in the draft CoCP, would be implemented to control noise and vibration throughout the construction works.

Noise from construction could potentially result in adverse effects on dwellings closest to the construction works including: Moreton; Great Haywood; Ingestre Park Road/Hoo Mill Lane; Park Farm near Stafford; Hopton; Marston; Yarlet; and Pirehill Grange Farm near Whitgreave. Additionally adverse effects could occur at dwellings along construction routes at B5066 Sandon Road, between Hopton and the A513 Beaconside. Further work is currently being undertaken to confirm the likely significant construction noise and vibration effects, including any temporary effects from construction traffic. This assessment will be reported in the formal EIA Report.

Operational noise would be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Operation of the railway could potentially result in adverse noise increases and hence adverse change in the existing acoustic character around the parts of the following communities that are closest to the route: Moreton, Great Haywood (Tolldish Lane), Ingestre (Ingestre Park Road/Hoo Mill Lane), Park Farm near Stafford, Hopton, Marston and Pirehill Grange Farm near Whitgreave. Operation of the railway would also potentially result in combined adverse noise and ground-borne vibration effects at Park Farm, south of Hopton.

For dwellings which satisfy the applicable qualifying criteria, noise insulation would be offered to avoid significant adverse effects – at this early stage this is anticipated to be near Hopton and Marston. Yarlet School, Mayfield Children's Home (specialist residential home for students at Rugeley School that is located within Moreton House), Staffordshire County Showground, St Leonard's Church (Marston) and St Peter's Church (Hopton) may also be affected. Assessment is currently being undertaken to confirm the likely significant effects due to operational noise and vibration, especially in non-residential locations and quiet areas and in terms of establishing existing baseline conditions. This will be reported in the formal EIA Report.

Traffic and transport

Construction of the Proposed Scheme has the potential to lead to additional congestion and/or increase delays for road users on a number of routes including the M6, A34 Stone Road, A51 Lichfield Road, A518 Weston Road, A513 Beaconside and B5066 Sandon Road. Increases in traffic could also affect non-motorised users (i.e. pedestrians, cyclists and horse riders) in terms of the ease with which they can cross these routes.

Fourteen public rights of way would be temporarily affected during construction with users diverted at different times during the construction period. This could result in significant adverse effects on users.

Effects during construction would be reduced by the creation of a haul route adjacent to the route of the Proposed Scheme, which would be used to transport materials and equipment, thereby reducing heavy goods vehicle movements on the local road network. The majority of roads crossing the route would be kept open during construction. Road closures would be restricted to overnight and weekend works where reasonably practicable. Routeing heavy goods vehicles along the strategic and/or primary road network (as far as reasonably practicable), the provision of temporary alternative routes for public rights of way, and provision of on-site welfare facilities to reduce daily travel by site workers would further reduce impacts during construction. Implementation of the draft CoCP would further mitigate transport-related effects during construction.

The permanent realignment, diversion or closure of 14 public rights of way may also result in significant adverse effects for non-motorised users.

Water resources and flood risk

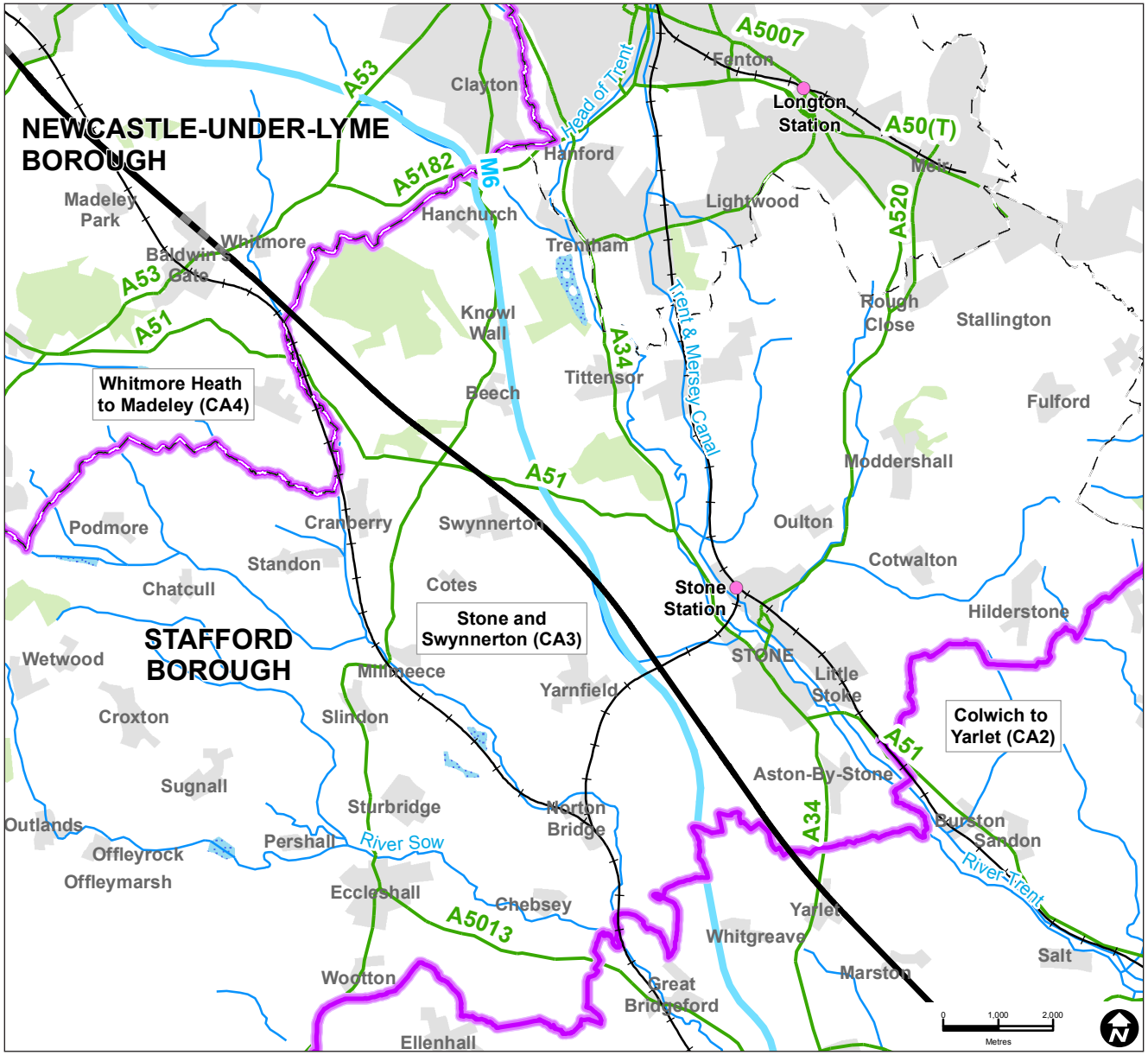
Construction of Tolldish culvert, Lionlodge culvert, Berryhill (south) culvert, Hopton culvert, Marston culvert and Yarlet drop inlet culvert are assessed as having potential to result in significant adverse effects on the natural form of these watercourses. Suitable measures are currently being considered to mitigate these effects, details of which will be provided in the formal EIA Report.

The Proposed Scheme would require diversion of a minor tributary watercourse of the River Trent near to Tolldish. This would result in a reduction in flow along a 1.6 kilometre section of the watercourse, which is assessed as a potentially significant adverse effect given it is a high value receptor. Additionally, there is a potential significant adverse effect at a high value spring at Lower Bridge Farm that would experience a reduction in flow due to the construction of the cutting at Hopton.

Significant adverse impacts are considered likely on licensed private abstractions at Ingestre Park Golf Club and Moreton Grange, and on unlicensed private water supplies at Staffordshire County Showground and Upper Hanyards Farm. There is also the potential for a significant adverse impact to occur from a breach in the existing embankments at Hopton Ponds.

Mitigation is currently being developed to address these adverse effects, which will be described in the formal EIA Report. It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual effects of significance.

Figure 17: Stone and Swynnerton (community area 3) route and context map



8.4 Stone and Swynnerton

Overview

The Stone and Swynnerton area is approximately 14 kilometres in length, extending from south-west of Aston-by-Stone in a north-west direction, passing south of Stone, north of Swynnerton and to the south of Swynnerton Old Park; see Figure 17. The area is predominantly rural in character with agricultural land use interspersed with villages and isolated dwellings and farmsteads.

The Proposed Scheme

The route would enter the area and run in cutting, continuing onto embankment until reaching the Stone Rural Bridleway 0.1135 realignment. The route would then run in cutting adjacent to the M6 up to the B5026 Eccleshall Road realignment.

Continuing from the B5026 Eccleshall Road overbridge in cutting, the route would cross the Norton Bridge to Stone Railway and Filly Brook on viaduct before transitioning back to embankment across the realigned Yarnfield Lane. After entering a cutting, the route would cross the M6 on viaduct, following which the route would remain on embankment until north-east of Swynnerton, where it would move into cutting. The route would continue in cutting beneath the A51 Stone Road, Tittensor Road, the A519 Newcastle Road and Clifford's Wood underbridge before moving onto a short stretch of embankment. It would then revert back into cutting before continuing into the Whitmore Heath to Madeley area (community area 4) on embankment south-west of Shelton under Harley.

In this area the Proposed Scheme would require the demolition of six residential properties. There would be permanent realignment of seven roads and permanent diversion of three roads. The Proposed Scheme would also result in the permanent realignment or diversion of nine public rights of way, the permanent diversion of 10 watercourses, a high pressure gas diversion and temporary realignment of two overhead power lines.

Two main compounds and eight satellite construction compounds would be required in this area. The Stone railhead main compound would be used to import bulk materials (for example, track ballast, rail and sleepers) via the Norton Bridge to Stone Railway, whilst the A519 Newcastle Road main compound would help manage works in the adjoining Whitmore Heath to Madeley area. The Stone railhead main compound would be positioned in the Stone and Swynnerton area as this is a mid-way point along the Proposed Scheme and the compound would, therefore, be able to support construction activities for the full length of the Proposed Scheme. The identified location for the compound would also allow access via the existing rail network and the strategic road network (M6).

As noted in Section 3.2, the Stone railhead main compound is being considered as a potential alternative location for the permanent maintenance facility in place of the infrastructure maintenance depot that is currently proposed to be located south of Crewe. Should this be selected as the preferred location for the permanent maintenance facility, the impacts of this would be assessed and reported in the formal EIA Report.

Environmental effects

This section provides a summary of the likely environmental impacts (and, where practicable, likely significant environmental effects) identified for the Stone and Swynnerton area.

Agriculture, forestry and soils

It is currently expected that approximately 380 hectares of agricultural land would be required

for construction of the Proposed Scheme in this area, of which approximately 95% is thought to be high quality land. This will be confirmed in the formal EIA Report once agricultural land surveys are complete, as will the extent of land required permanently for the Proposed Scheme. To avoid or reduce environmental impacts, the soils 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.

Construction of the Proposed Scheme may result in significant adverse effects at 13 farm holdings in this area due to the land being permanently required for operation. Six dairy units, which are generally more susceptible to the effects of severance (where the Proposed Scheme causes areas of land to become 'cut off' from the rest of the farm) than other farm holdings, are likely to be particularly affected: New House Farm, Aston Pool Farm, Walton Heath Farm, Sandyford Farm, Rowe Farm and Shelton under Harley Farm. Of these, the greatest permanent adverse effects are likely to occur at Shelton under Harley Farm due to the area of land required. Land required temporarily during construction would, in agreement with the landowner, be returned to farm holdings following the completion of construction works. However, due to the level of impact during construction (for example, severance of land), this may result in temporary significant adverse effects at some farm holdings. This assessment of temporary effects is currently being undertaken and will be reported in the formal EIA Report.

The operation of the Proposed Scheme may also result in potentially significant adverse effects on livestock sensitive to noise at six farm holdings (Walton House Farm, Pool House Farm, Sandyford Farm, Shelton under Harley Farm, Micklow House Farm and Swynnerton Heath Farm) which lie close to the Proposed Scheme (within 100m). Further work is being undertaken to identify whether any significant adverse effects on these farms are anticipated, the findings from which will be reported in the formal EIA Report.

Air quality

Measures in the draft CoCP would be implemented to manage dust, air pollution and odour during construction. The main impacts to local air quality would arise from construction activities, demolition, site preparation works, the use of haul routes and additional traffic on local roads. With the implementation of the measures set out in the draft CoCP, no significant adverse effects are considered likely from on-site emissions (e.g. dust emissions) during construction of the Proposed Scheme. An assessment of the air quality effects of increased traffic flows on local roads as a result of Proposed Scheme construction traffic travelling to and from the construction sites is currently being undertaken and will be reported in the formal EIA Report.

No local air quality impacts are anticipated due to changes in road traffic flows during the operation of the Proposed Scheme. An air quality assessment is being undertaken, with conclusions to be provided in the formal EIA Report.

Community

Six residential properties are likely to be permanently lost in this area: five properties east of the M6 and one property in the hamlet of Shelton under Harley.

Construction and operation of the Proposed Scheme could lead to in-combination effects on the community in this area (for example, from noise and visual effects) which will be assessed and reported in the formal EIA Report.

Cultural heritage

The Proposed Scheme is being designed to reduce impacts on heritage assets as far as reasonably practicable. However, construction works are likely to physically affect some heritage assets. Swynnerton Conservation Area, a designated asset, would be directly affected by the Proposed Scheme. Other assets that would be directly affected include those at Darlaston Pool (medieval manorial fish pond or mill complex), a medieval enclosure south-west of Swynnerton Grange, the historic farmstead at Shelton under Harley and the Common Lane Cold War bunker complex at Hatton Rough. A programme of archaeological and built heritage investigation and recording would be undertaken prior to or during construction works affecting these assets.

Blakelow Farm, Shelton under Harley Farm and two Grade II listed buildings (the Grade II listed Water Tower on Stab Lane north of Swynnerton and the Grade II listed Swynnerton Heath Farmhouse) would experience permanent significant adverse impacts on setting due to the Proposed Scheme. The majority of these assets would also experience noise and visual impacts on their setting during operation of the Proposed Scheme. Visual effects would reduce over time as landscape planting matures.

Ecology and biodiversity

Ecology survey and assessment work is ongoing and baseline information regarding ecological features is limited at this stage. The assessment for this working draft EIA Report is therefore provisional and has been undertaken based on a precautionary approach. A fuller assessment of significant effects will be included in the formal EIA Report.

Construction of the Proposed Scheme would result in the permanent loss of habitat at three local wildlife sites: Poolhouse Wood, Clifford's Wood (which potentially contains ancient woodland) and Highlow Meadows. There would also be the permanent loss of habitat at two other woodland sites that potentially contain ancient woodland (Closepit Plantation and Birchwood)[4]. Despite limiting the footprint of earthworks to minimise habitat loss, this would significantly adversely affect the integrity of the sites. In addition there would be a loss of approximately 7 hectares of other broadleaved woodland, 44 ponds, 0.2 hectares of grazing marshland and 28 kilometres of hedgerows, the removal and fragmentation of which would impact the conservation status of these habitat types as well as potentially significantly affecting bat, hazel dormouse, polecat, great crested newt, terrestrial invertebrate, reptile and bird populations.

4 These three ancient woodland sites have been identified from a review by HS2 Ltd of woodlands not currently listed on the Ancient Woodland Inventory, but that are either within the land that would be required for construction of the Proposed Scheme, or within 500m of it, based on historical mapping.

Significant adverse effects may be experienced by otter and water vole in watercourses affected by the Proposed Scheme, as a result of the loss of water-margin habitat. Similarly, fish and aquatic invertebrates may be affected as a result of construction disturbance.

During operation of the Proposed Scheme, bats and barn owls would be at risk of mortality from passing trains.

Mitigation measures to limit disturbance to habitat and species during construction are contained in the draft CoCP which includes the translocation of protected species where appropriate. Measures to further reduce the effects identified will also be considered and reported in the formal EIA Report.

Some areas of habitat creation have been identified in the working draft EIA Report. Further habitat creation opportunities are currently being explored and will be reported in the formal EIA Report.

Health

The Proposed Scheme would impact on a range of environmental and social factors that have the potential to affect health.

The proposed demolition of residential properties for the construction of the Yarnfield North embankment, east of the M6, and the Hatton North cutting in Shelton under Harley would result in the loss of households from within these small communities. This has the potential to reduce beneficial health effects that are gained through social contact and support. No specific properties are considered to be affected by reduced connectivity resulting from construction traffic, road closures and diversions.

The temporary construction workforce could comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial impacts will be undertaken and reported in the formal EIA Report.

Levels of physical activity could potentially be affected by disruption to roads and public rights of way that may be used as active travel routes. There would be temporary alternative routes for 10 rural footpaths and bridleways during construction in the Stone and Swynnerton area.

Land quality

The application of measures within the draft CoCP would ensure no significant adverse effects with respect to land contamination. If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination.

The Proposed Scheme would cross or pass alongside the boundary of three mineral safeguarding areas for sand and gravel extraction. Potential adverse effects may occur on parts of these mineral resources if they are not exploited before or during construction, but the impact would be limited in extent. This would be discussed with land/mineral owners and the Mineral Planning Authority at Staffordshire County Council, to avoid significant adverse effects.

In addition, the Proposed Scheme crosses an area underlain by coal resources and a gas exploration area. This has the potential to affect future coal mining and gas exploration or production activities. Construction activities may also impact a local geological site on the lower southern slopes of Hanchurch Hills, north of Swynnerton.

Landscape and visual

Construction of the Proposed Scheme and changes to the existing landform and vegetation patterns would permanently affect the character of the local landscape. Significant adverse effects would be reduced by the measures incorporated into the design to reduce the visibility of the Proposed Scheme (for example, tree planting to provide screening along the route), land shaping to link earthworks into their wider landscape context, compensatory woodland planting, hedgerow replacement and restoration, and new wetland features to compensate for the loss of ponds.

The effect of the Proposed Scheme on the character and appearance of the local landscape would reduce over time as mitigation planting matures. Despite these measures, significant

Figure 18: View over Swynnerton Park Sandstone Hills and Heaths landscape character area

adverse effects would, however, potentially remain in some parts of the local landscape due to the presence of the Proposed Scheme infrastructure in this area, principally the viaducts over Filly Brook and the M6, and embankments at Yarlet, Yarnfield, Meaford, Swynnerton, Hatton and Stableford.

The presence of construction works is likely to temporarily significantly affect the following landscape character areas: Yarnfield Settled Farmlands, Swynnerton Park Sandstone Hills and Heaths (see Figure 18), Swynnerton Village Sandstone Hills and Heaths, and Meece Brook Valley Sandstone Hills and Heaths. These landscape character areas would also experience permanent significant adverse effects during operation of the Proposed Scheme.

Construction works may result in temporary significant adverse effects on residents in a number of locations in the area, including at: Pirehill and on the A34 Stafford Road/The Fillybrooks looking west; Pirehill Grange Farm looking east; west of Walton and Darlaston Grange looking west; Whitemoor Farm and Moss House looking east; The Highlows looking east; Blakelow looking south-west; Grange Cottage looking east; Chase Lane and Sanford Cottage (A51 Stone Road) looking north-west; Cumberstone Wood Farm looking west; Swynnerton looking north-east; north of Swynnerton looking east; Cranberry and Beech (north of Swynnerton) looking west and east; and Dog Lane looking west. In addition, users of a number of footpaths would be affected during construction. These receptors may continue to experience permanent significant adverse visual effects during operation of the Proposed Scheme.

Socio-economics

The Proposed Scheme is not anticipated to result in the displacement or possible loss of jobs within this area. The Proposed Scheme would result in the creation of construction and operational employment opportunities within the community area, the effects of which are reported on a route-wide basis in Section 9.12.

Sound, noise and vibration

A comprehensive set of mitigation measures, including those in the draft CoCP, would be implemented to control noise and vibration throughout the construction works.

Noise from construction could result in adverse effects on dwellings closest to the construction works at North Pirehill, Walton Heath, Swynnerton and Stableford. Further work is currently being undertaken to confirm the likely significant construction noise and vibration effects, including any temporary effects from construction traffic. This assessment will be reported in the formal EIA Report.

Operational noise would be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

During operation of the railway, for dwellings which satisfy the applicable qualifying criteria, noise insulation would be offered to avoid significant adverse effects – at this early stage this is anticipated to be near Walton and Swynnerton. Assessment is currently being undertaken to confirm the likely significant effects due to operational noise and vibration, especially at non-residential locations and quiet areas and in terms of establishing existing baseline conditions. This will be reported in the formal EIA Report.

Traffic and transport

Construction of the Proposed Scheme has the potential to lead to additional congestion and/or increased delays for road users on a number of routes including the M6, A51 Stone Road, A34 Stafford Road/The Fillybrooks, A519 Newcastle Road, B5026 Eccleshall Road, Yarnfield Lane, Meece Road, Tittensor Road and Bent Lane. Increases in traffic could also affect non-motorised users (i.e. pedestrians, cyclists and horse riders) in terms of the ease with which they can cross these routes. Additionally, the temporary closure of Yarnfield Lane is likely to increase traffic flows and delays on alternative routes including B5026 Eccleshall Road and Meece Road and impact non-motorised users of Yarnfield Lane.

Ten public rights of way would be temporarily affected during construction with users diverted at different times during the construction period. This could result in significant adverse effects on users.

Effects during construction would be reduced by the creation of a haul route adjacent to the route of the Proposed Scheme, which would be used to transport materials and equipment, thereby reducing heavy goods vehicle movements on the local road network. The majority of roads crossing the route would be kept open during construction. Road closures would be restricted to overnight and weekend works. Routeing heavy goods vehicles along the strategic and/or primary road network (as far as reasonably practicable), the provision of temporary alternative routes for public rights of way, and provision of on-site welfare facilities to reduce daily travel by site workers would further reduce impacts during construction. Implementation of the draft CoCP in combination with a construction workforce travel plan would further mitigate transport-related effects during construction.

During operation of the Proposed Scheme, nine public rights of way would be permanently realigned or diverted, which may potentially result in significant adverse effects for non-motorised users.

Water resources and flood risk

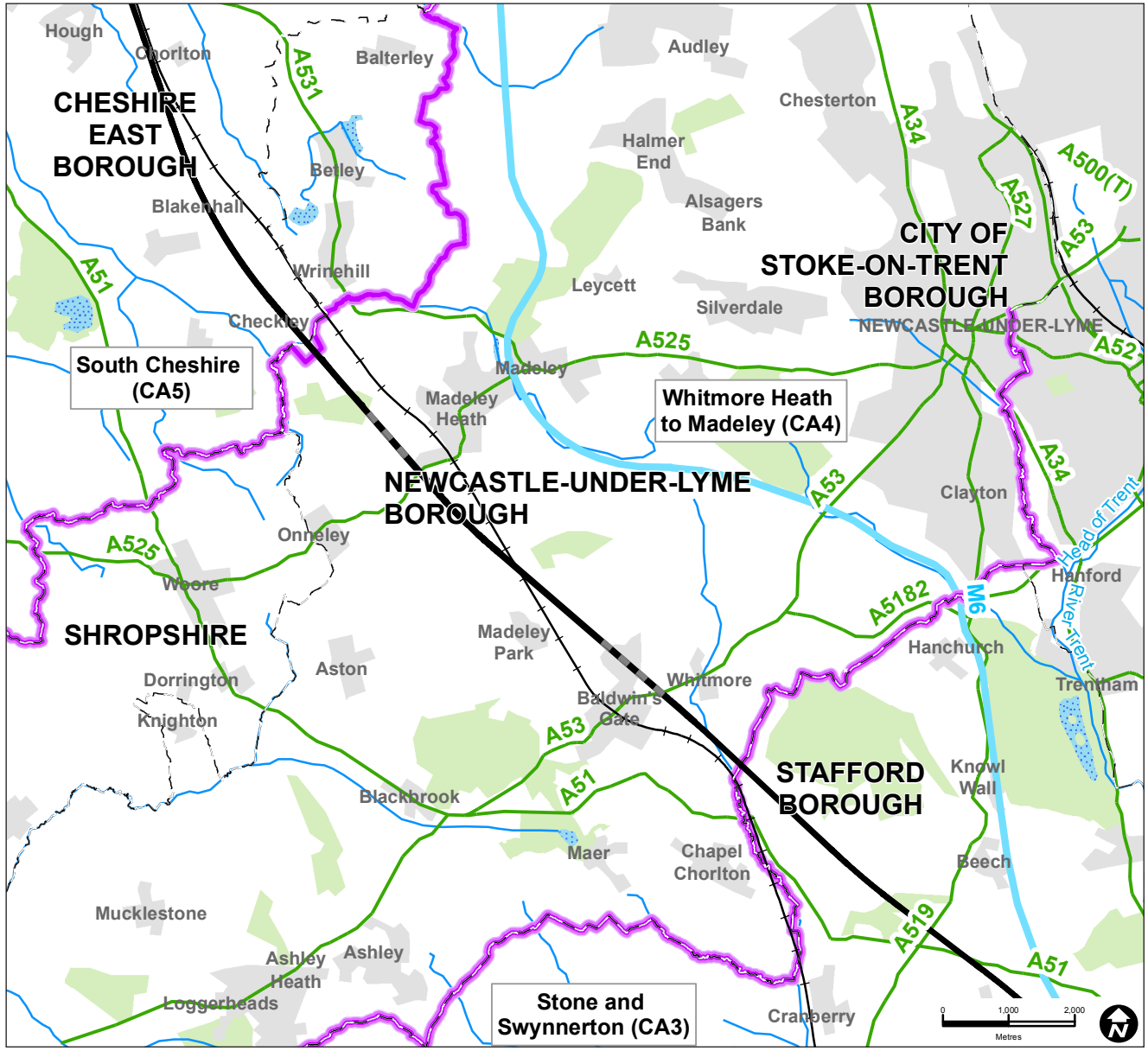
The Stone railhead has potential to have a significant adverse effect on flood risk because it is within the floodplain of Filly Brook. This will be investigated so that the means of avoiding significant increases in flood risk can be incorporated into the Proposed Scheme and reported in the formal EIA Report.

Construction of the culvert beneath the Proposed Scheme on the unnamed watercourse at Pirehill would have a significant adverse impact on the natural form of this watercourse. There may also be a significant adverse impact on the natural form of the Filly Brook associated with the proposed Stone railhead. Surveys will be undertaken so that mitigation measures can be identified which will be reported in the formal EIA Report.

The Proposed Scheme would have a significant adverse effect on a private licensed groundwater abstraction near Stone during construction. It would also have a significant adverse effect related to the spring on the footprint of the Stone railhead and associated compound during construction and permanently. Additionally, the Proposed Scheme has potential to have a significant adverse effect on six private unlicensed groundwater abstractions and on the public water abstraction in the neighbouring Whitmore Heath to Madeley area during construction. Suitable measures are currently being considered to mitigate these effects, details of which will be included in the formal EIA Report.

It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual effects of significance.

Figure 19: Whitmore Heath to Madeley area (community area 4) route and context map



8.5 Whitmore Heath to Madeley

Overview

The Whitmore Heath to Madeley area is approximately nine kilometres in length, extending from Meece Brook Valley in the south to the west of Madeley (see Figure 19).

The area is predominantly rural in character with agricultural land use interspersed with ancient woodland, small villages and isolated dwellings. Through this area the route would run broadly parallel with the M6, which at the nearest point is approximately 1.8 kilometres east of the route. Within this area the route would cross the A53 Newcastle Road, West Coast Main Line, River Lea, the out-of-use Silverdale line of the Stoke to Market Drayton railway and the A525 Bar Hill Road.

The Proposed Scheme

On entering the area, the Proposed Scheme would pass through the Meece Brook valley on viaduct. The route would then transition to embankment followed by cutting before entering a tunnel under the A53 Newcastle Road and Whitmore Heath. On exiting the tunnel, the route would pass through a section of Whitmore Wood Ancient Woodland in a cutting with a retaining wall on the north-east side, before crossing the River Lea valley, West Coast Main Line and out of use Silverdale line of the Stoke to Market Drayton railway on embankment and viaduct. The route would then continue on embankment and pass under the proposed Manor Road overbridge where it would move into cutting. The route would continue in cutting under the proposed A525 Bar Hill overbridge before entering a bored tunnel to the west of Madeley, adjacent to Barhill Ancient Woodland. The tunnel would emerge in cutting before transferring to embankment and continuing into the South Cheshire area (community area 5).

In this area the Proposed Scheme would require the demolition of three residential properties. There would be one road closure, permanent realignment of three roads and permanent diversion of one road. The Proposed Scheme would result in the permanent diversion or realignment of three public rights of way and the closure of one. Ten watercourses would be permanently diverted. Nine temporary satellite construction compounds would be required.

Environmental effects

This section provides a summary of the likely environmental impacts (and, where practicable, likely significant environmental effects) identified for the Whitmore Heath to Madeley area.

Agriculture, forestry and soils

It is currently expected that approximately 220 hectares of agricultural land within the Whitmore Heath to Madeley area would be required for construction of the Proposed Scheme, of which approximately 23% is thought to be high quality land. This will be confirmed in the formal EIA Report once agricultural land surveys are complete, as will the extent of land required permanently for the Proposed Scheme. To avoid or reduce environmental impacts, the soils 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.

Construction of the Proposed Scheme may result in significant adverse effects at eight farm holdings in this area due to the land being permanently required for operation. Five dairy units, which are generally more susceptible to the effects of severance (where the Proposed Scheme causes areas of land to become 'cut off' from the rest of the farm) than other farm holdings, are likely to be significantly adversely affected: Whitmore Hall, Snape Hall Farm, Manor Farm, Netherset Hey Farm and Wrinehill Hall Farm. The greatest permanent adverse effects are likely to occur at Snape Hall Farm and Manor Farm. Land

required temporarily during construction would, in agreement with the landowner, be returned to the farm holding following the completion of construction. However, due to the level of impact during construction (for example, severance of land), temporary significant adverse effects may occur at some farm holdings. This assessment of temporary effects is currently being undertaken and will be reported in the formal EIA Report.

The operation of the Proposed Scheme may also result in potentially significant adverse effects on livestock sensitive to noise at Snape Hall Farm, Bower End Farm and Wrinehill Hall Farm. Further work is being undertaken to identify whether any significant adverse effects on these farms are anticipated, the findings of which will be reported in the formal EIA Report.

Air quality

Measures in the draft CoCP would be implemented to manage dust, air pollution and odour during construction. The main impacts to local air quality would arise from construction activities, demolition, site preparation works, the use of haul routes and additional traffic on local roads. With the implementation of the measures set out in the draft CoCP, no significant adverse effects are considered likely from on-site emissions (e.g. dust emissions) during construction of the Proposed Scheme. An assessment of the air quality effects of increased traffic flows on local roads as a result of Proposed Scheme construction traffic travelling to and from the construction sites is currently being undertaken and will be reported in the formal EIA Report.

No local air quality impacts are anticipated due to changes in road traffic flows during the operation of the Proposed Scheme. An air quality assessment is being undertaken, with conclusions to be provided in the formal EIA Report.

Community

Construction of the Proposed Scheme would lead to the permanent loss of three residential properties; one on Manor Road and two on the A525 Bar Hill. Additionally, there would be a temporary significant adverse isolation effect on six properties to the west of Madeley during construction works associated with the Madeley cutting, Madeley tunnel southern portal and realignment of the A525 Bar Hill Road.

Construction and operation of the Proposed Scheme could lead to in-combination effects on the community in this area (for example, from noise and visual effects), which will be assessed and reported in the formal EIA Report.

Cultural heritage

The Proposed Scheme is being designed to reduce impacts on heritage assets as far as reasonably practicable. However, construction works are likely to require the permanent removal of some heritage assets. Archaeological remains including medieval and post-medieval landscape features east of Beechfield would be partially removed. A Grade II listed milepost located on Bar Road would be permanently lost. A programme of archaeological and built heritage investigation and recording would be undertaken prior to or during construction works affecting these assets.

The setting of Grade II listed Hey House would experience permanent significant adverse impacts due to the presence of the Proposed Scheme. Adverse effects would be reduced through landscape planting and noise mitigation measures incorporated into the design.

Ecology and biodiversity

Ecology survey and assessment work is ongoing and baseline information regarding ecological features is limited at this stage. The assessment for this working draft EIA Report is therefore provisional and has been undertaken based on a precautionary approach. A fuller assessment of significant effects will be included in the formal EIA Report.

Construction of the Proposed Scheme would result in the permanent loss of approximately 6 hectares (33%) of the Whitmore Wood local wildlife site/Ancient Woodland Inventory Site, around 0.5 hectares (8%) of Barhill Wood Ancient Woodland Inventory Site, and approximately 0.05 hectares (5%) of two unnamed woodland areas that are potentially ancient, one between Whitmore Wood and Hey Sprink and one around Wrinehill Wood. Despite limiting the footprint of earthworks to minimise habitat loss, this would significantly adversely affect the integrity of these sites. In addition there would be a loss of approximately 0.1 hectares of other broadleaved woodland, 2 hectares of grazing marshland, 12 ponds and 13 kilometres of hedgerows, the removal and fragmentation of which would impact the conservation status of these habitat types as well as potentially significantly affecting bat, hazel dormouse, polecat, great crested newt, terrestrial invertebrate, reptile and bird populations.

Significant adverse effects may be experienced by otter and water vole in watercourses affected by the Proposed Scheme, as a result of the loss of water-margin habitat. Similarly, fish and aquatic invertebrates may be affected as a result of construction disturbance.

During operation of the Proposed Scheme, bats and barn owls would be at risk of mortality from passing trains.

Mitigation measures to limit disturbance to habitat and species during construction are contained in the draft CoCP which includes the translocation of protected species where appropriate. Measures to further reduce the effects identified will also be considered and reported in the formal EIA Report.

Some areas of habitat creation have been identified in the working draft EIA Report. Further habitat creation opportunities are currently being explored and will be reported in the formal EIA Report.

Health

The Proposed Scheme would impact on a range of environmental and social factors that have the potential to affect health.

Construction of the Proposed Scheme and associated traffic, road closures and diversions may lead to a reduction in community connectivity, particularly for properties located to the west of Madeley. Snape Hall Road would be permanently closed, causing a permanent reduction in accessibility to two properties

immediately west of the Proposed Scheme. This could result in increased isolation and a reduction in the beneficial health effects that are gained through access to community facilities, health and social care, social contact and support.

The temporary construction workforce could comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial impacts will be undertaken and reported in the formal EIA Report.

Levels of physical activity could potentially be affected by disruption to roads and public rights of way that may be used as active travel routes. There would be temporary alternative routes for a number of public rights of way, and the Newcastle Way promoted public right of way[5] (Madeley Footpaths 33 and 10) would require permanent diversion to follow the realigned Manor Road, which is likely to reduce its appeal as a recreational walking route.

Land quality

The application of the measures set out within the draft CoCP would ensure no significant adverse effects with respect to land contamination. If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination.

The Proposed Scheme would cross a mineral safeguarding area for sand and gravel extraction. Potential adverse effects may occur on parts of this mineral resource if it is not exploited before or during construction, but the impact would be limited in extent. This would be discussed with land/mineral owners and the Mineral Planning Authority at Staffordshire County Council to avoid significant adverse effects.

In addition, the Proposed Scheme would cross an area underlain by coal resources and a gas exploration area. This has the potential to affect future coal mining and gas exploration or production activities. There are no national or local geological sites within the community area.

Landscape and visual

Construction of the Proposed Scheme and changes to the existing landform and vegetation patterns would permanently affect the character and appearance of the local landscape. Significant adverse effects would be reduced by the measures incorporated into the design to reduce the visibility of the Proposed Scheme (for example, tree planting to provide screening along the route), land shaping to link earthworks into their wider landscape context, compensatory woodland planting, hedgerow replacement and restoration, and new wetland features to compensate for the loss of ponds.

The effects of the Proposed Scheme on the character and appearance of the local landscape would reduce over time as mitigation planting matures. Despite these measures, significant adverse effects would, however, potentially remain in some parts of the local landscape due to the presence of the Proposed Scheme infrastructure in this area, principally the viaducts over Meece Brook and the River Lea; Stableford

5 Public right of way that is promoted by Staffordshire County Council with associated way marking.

North, Lea South, Lea North and Checkley South embankments; and cuttings and tunnel portals at Whitmore Heath and Madeley.

The presence of construction works may have a temporary significant adverse effect on the following landscape character areas: Baldwin's Gate Sandstone Hills and Heaths, Upper Meece Brook Valley Ancient Redlands, Upper Meece Brook Valley Alluvial Lowlands, Whitmore Hall Valley Ancient Redlands, Hey Sprink Ancient Redlands and Woodlands, Upper Lea Valley Ancient Redlands (see Figure 20), Old Madeley Manor Ancient Redlands, Madeley Ancient Redlands, Madeley Ancient Clay Farmlands, Checkley Farms and Woods and Madeley Valley. With the exception of Baldwin's Gate Sandstone Hills and Heaths and Whitmore Hall Valley Ancient Redlands landscape character areas, these likely significant adverse effects would remain during operation of the Proposed Scheme.

The construction works and activities may also have a temporary significant adverse effect on residents and others experiencing views in a number of locations including: users of footpaths

Figure 20: View over Upper Lea Valley Ancient Redlands landscape character area

east of Baldwin's Gate looking east; users of the Whitmore Cricket Club looking south-west; residents and footpath users near Rectory Lane (Baldwin's Gate) looking south-east; residents on Snape Hall Road (Whitmore Heath) looking south and south-west; users of footpaths in the Lea Valley looking north-east; residents on Manor Road and east of Lower Bitterns Wood looking north/north-east; residents and footpath users on the A525 Bar Hill Road looking west and south; and users of public rights of way near Wrinehill Wood and near the River Lea at Wrinehill Hall. These receptors may continue to experience permanent significant adverse visual effects during operation of the Proposed Scheme.

Socio-economics

The Proposed Scheme would result in the displacement or possible loss of approximately five jobs within this area. Taking into account the availability of alternative premises and the total number of people employed within the district (approximately 47,000), the displacement or possible loss of jobs is considered to be relatively modest compared to the scale of economic activity and opportunity in the area. Any businesses displaced by the Proposed Scheme would be compensated in accordance with the National Compensation Code.

The Proposed Scheme would result in construction and operational employment opportunities being created within the community area, the effects of which are reported on a route-wide basis in Section 9.12.

Sound, noise and vibration

A comprehensive set of mitigation measures, including those in the draft CoCP, would be implemented to control noise and vibration throughout the construction works.

Noise from construction could potentially result in adverse effects on dwellings closest to the construction works at Hill Chorlton, Whitmore Heath, Madeley Park Wood and Bar Hill and Madeley. Further work is currently being undertaken to confirm the likely significant construction noise and vibration effects, including any temporary effects from construction traffic. This assessment will be reported in the formal EIA Report.

Operational noise would be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Operation of the railway would potentially result in adverse noise effects, due to potential noise increases and hence adverse change in the existing acoustic character around the parts of the following communities closest to the route: Hill Chorlton, Whitmore Heath (north) and Bar Hill, Madeley. Operation of the railway would also potentially result in adverse effects due to ground-borne noise and vibration at Whitmore Heath.

For dwellings which satisfy the applicable qualifying criteria, noise insulation would be offered to avoid significant adverse effects – at this early stage this is anticipated to be near Wrinehill and Bar Hill, Madeley. Assessment is currently being undertaken to confirm the likely significant effects due to operational noise and vibration, especially at non-residential locations and quiet

areas and in terms of establishing existing baseline conditions. This will be reported in the formal EIA Report.

Traffic and transport

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 M6, A51 London Road, A53 Newcastle Road/Whitmore Road, A5182 Trentham Road, A525 Bar Hill Road/Newcastle Road and Manor Road. Increases in traffic flows could also affect non-motorised users (i.e. pedestrians, cyclists and horse riders) in terms of the ease with which they can cross these routes.

Five public rights of way would be temporarily diverted during construction, with one permanently closed. This may result in significant adverse effects on non-motorised users.

Effects during construction would be reduced by the creation of a haul route adjacent to the route of the Proposed Scheme, which would be used to transport materials and equipment, thereby reducing heavy goods vehicle movements on the local road network. The majority of roads crossing the route would be kept open during construction. Road closures would be restricted to overnight and weekend works. Routeing heavy goods vehicles along the strategic and/or primary road network (as far as reasonably practicable), the provision of temporary alternative routes for public rights of way, and provision of on-site welfare facilities to reduce daily travel by site workers would further reduce impacts during construction. Implementation of the draft CoCP in combination with a construction workforce travel plan would further mitigate transport-related effects during construction.

The permanent closure of Snape Hall Road may result in a significant adverse effect for pedestrians, cyclists and equestrians using the route, as could the permanent closure, diversion or realignment of four public rights of way.

Water resources and flood risk

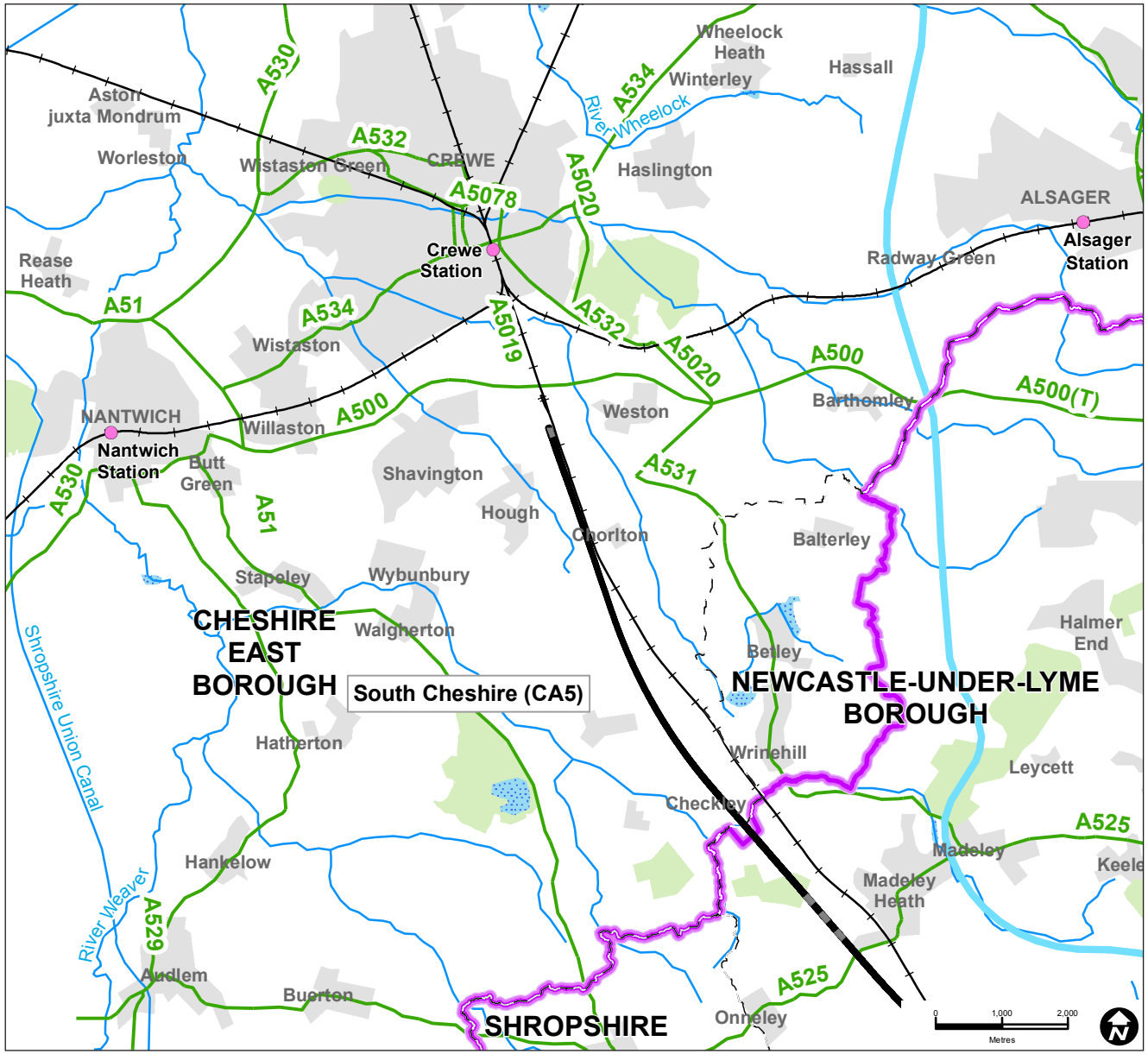
Construction works associated with the Madeley tunnel may result in the loss or deterioration of two springs, and impact on another spring to the south of Grafton's Wood. These springs are considered to be high value resources, and as such, the impacts would give rise to significant adverse effects. Surveys are currently being undertaken to enable the development of an approach to mitigate the effects of removing the springs and replacing them nearby. This will be reported in the formal EIA Report.

Construction works in the south of this area may affect a public water abstraction near Whitmore. Mitigation is currently being discussed with the owner of the abstraction, Severn Trent Water Limited, to ensure continued supply during the construction period. Permanent impacts on three unlicensed private groundwater abstractions close to the Proposed Scheme are also likely to result in significant adverse effects. Mitigation measures will be reported in the formal EIA Report.

The proposed culverts at Swynnerton Footpath 10 underbridge, Snape Hall Road, Whitmore Wood, Madeley Park, Wrinehill South and Madeley Bridleway 2 underbridge may potentially result in significant adverse effects on the natural form of the affected watercourses. Suitable measures are currently being considered to mitigate these effects, details of which will be provided in the formal EIA Report.

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.

Figure 21: South Cheshire (community area 5) route and context map



8.6 South Cheshire

Overview

The South Cheshire area is approximately eight kilometres in length, extending from Madeley in the south to the Crewe urban fringe in the north. The first half of the area is predominantly rural in character, interspersed with small villages and a scattering of isolated dwellings and farmsteads. The second half of the area becomes more urbanised as the route approaches Crewe.

The Proposed Scheme

The route of the Proposed Scheme would alternate between embankment, viaduct and cutting through the South Cheshire community area. Entering the area south of Checkley Brook on viaduct, the route of the Proposed Scheme would then run on embankment before transitioning into a shallow cutting, passing under Checkley Lane overbridge towards the realigned Den Lane and Den Lane underbridge.

Continuing northwards, the route would pass under a viaduct, which would carry two spurs over the route: a northbound spur to connect to the West Coast Main Line towards Crewe and a southbound spur to connect to the West Coast Main Line towards London. For the Proposed Scheme to integrate with the existing West Coast Main Line, modifications would be required including a new section of West Coast Main Line and modifications to the existing line to the north and south of the new section.

The Proposed Scheme would end to the south of Crewe in a retained cutting, connecting into a tunnel which would form part of the proposed HS2 Phase 2b scheme.

Access tracks that connect the route of the Proposed Scheme with the proposed infrastructure maintenance depot would run along the western side of the route. The Crewe infrastructure maintenance depot would be located at the northern end of the area, approximately 37 hectares in size, and extending for three kilometres to the west of the Proposed Scheme.

The Proposed Scheme would require the demolition of up to 44 dwellings in this area. This includes up to 40 houses, which as of Summer 2016, were estimated to have been completed or were under construction at the Basford West development area (an area required for the infrastructure maintenance depot). The effect on the complete Basford West development site will be reported in the formal EIA Report. A potential alternative location for a permanent maintenance facility is also being considered within the land proposed for the temporary railhead at Stone (see Section 3.2). Should this be selected as the preferred location for the permanent maintenance facility, the Basford West development area would no longer be required. The effects of this change would be assessed and reported in the formal EIA Report.

In this area there would be one permanent road closure, permanent realignment of eight roads and permanent diversion of one road. The Proposed Scheme would result in the permanent closure of four public rights of way and the permanent realignment of 19 public rights of way. Eight watercourses would be permanently diverted and one overhead power line would be temporarily realigned. One main compound and 14 satellite construction compounds would be required.

Environmental effects

This section provides a summary of the likely environmental impacts (and, where practicable, likely significant environmental effects) identified for the South Cheshire area.

Agriculture, forestry and soils

It is currently expected that approximately 500 hectares of agricultural land would be required for construction of the Proposed Scheme in this area, of which approximately 42% is thought to be high quality land. This will be confirmed in the formal EIA Report once agricultural land surveys are complete, as will the extent of land required permanently for the Proposed Scheme. To avoid or reduce environmental impacts, the soils 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.

Construction of the Proposed Scheme may result in significant adverse effects at eight farm holdings in this area due to the proportion of land required, impacts on farm infrastructure and/or severance (where the Proposed Scheme causes areas of land to become 'cut off' from the rest of the farm). Land required temporarily would, in agreement with the landowner, be returned to the farm holding following the completion of construction. However, due to the high level of impact during construction at some locations (for example, severance of land), this may result in temporary significant adverse effects at some farm holdings. This assessment of temporary effects is currently being undertaken and will be reported in the formal EIA Report.

The operation of the Proposed Scheme may also result in potentially significant adverse effects on livestock sensitive to noise at The Grange and Ellesmere Dairy Farm, both of which lie within 100m of the Proposed Scheme. Further work is being undertaken to identify whether any significant adverse effects on these farms are anticipated, the findings from which will be reported in the formal EIA Report.

Air quality

Measures in the draft CoCP would be implemented to manage dust, air pollution and odour during construction. The main impacts to local air quality during construction would arise from construction activities, demolition, site preparation works, the use of haul routes and additional traffic on local roads. With the implementation of the measures set out in the draft CoCP, no significant adverse effects are considered likely from on-site emissions (e.g. dust emissions) during construction of the Proposed Scheme. An assessment of the air quality effects of increased traffic flows on local roads as a result of Proposed Scheme construction traffic travelling to and from the construction sites is currently being undertaken and will be reported in the formal EIA Report.

No local air quality impacts are anticipated due to changes in road traffic flows during the operation of the Proposed Scheme. An air quality assessment is being undertaken, with conclusions to be provided in the formal EIA Report.

Community

Construction of the Proposed Scheme would lead to the permanent loss of up to 44 properties: three on Chorlton Lane, one on Weston Lane and up to 40 on the Basford West site accessed from the B5071 Jack Mills Way, the last of which represents a significant adverse community effect due to the number of properties demolished. The effect on the complete Basford West development site will be reported in the formal EIA Report. This effect would be removed should the potential alternative location for a permanent maintenance facility be selected within the land proposed for the temporary railhead at Stone. This will be confirmed in the formal EIA Report.

A temporary significant adverse isolation effect is anticipated at six residential properties on Den Lane during construction (due to reduced accessibility), with a permanent isolation effect on 10 residential properties on Newcastle Road. In addition, temporary and permanent significant adverse effects are expected at Mill Lane allotments due to the loss of land required for the construction and operation of the Proposed Scheme.

Construction and operation of the Proposed Scheme could lead to in-combination effects on the community in this area (for example, from noise and visual effects), which will be assessed and reported in the formal EIA Report.

Cultural heritage

The Proposed Scheme is being designed to reduce impacts on heritage assets as far as reasonably practicable. However, construction works are likely to require the permanent removal of some non-designated heritage assets. These include archaeological remains at the medieval settlement at Godwyneslegh, Basford Hall, the Hall and Mill of Shaw, and a moated site at Lane End Farm. Historic railway features including Den Bridge and sidings, Grand Junction Railway embankment and cutting, Casey Bridge and Basford Hall Junction and signal box would also be affected. A programme of archaeological and built heritage investigation and recording would be undertaken prior to or during construction works affecting these assets.

The Proposed Scheme may lead to permanent impacts on the setting of heritage assets, including two Grade II listed buildings; Basford Bridge Cottage and Shavington Hall. Effects would be reduced through landscape planting and noise mitigation measures incorporated into the design.

Ecology and biodiversity

Ecology survey and assessment work is ongoing and baseline information regarding ecological features is limited at this stage. The assessment for this working draft EIA Report is therefore provisional and has been undertaken based on a precautionary approach. A fuller assessment of significant effects will be included in the formal EIA Report.

Construction of the Proposed Scheme would result in a permanent loss of approximately one hectare (10%) of habitat at Basford Brook and Mere Gutter local wildlife site. Despite limiting the footprint of earthworks to minimise habitat loss, this would significantly adversely affect the integrity of the sites. In addition there would be a

loss of approximately 11 hectares of semi-natural woodland, 69 ponds, approximately 23 kilometres of hedgerows and permanent loss of grassland, the removal and fragmentation of which would impact the conservation status of these habitat types as well as potentially significantly affect bat, hazel dormouse, polecat, great crested newt, terrestrial invertebrate, reptile and bird populations.

Significant adverse effects may be experienced by otter and water vole in watercourses affected by the Proposed Scheme, as a result of the loss of water-margin habitat. Similarly fish, aquatic invertebrates and white-clawed crayfish may be affected as a result of construction disturbance.

During operation of the Proposed Scheme, bats and barn owls would be at risk of mortality from passing trains.

Mitigation measures to limit disturbance to habitat and species during construction are contained in the draft CoCP which includes the translocation of protected species where appropriate. Measures to further reduce the effects identified will also be considered and reported in the formal EIA Report.

Some areas of habitat creation have been identified in the working draft EIA Report. Further habitat creation opportunities are currently being explored and will be reported in the formal EIA Report.

Health

The Proposed Scheme would impact on a range of environmental and social factors that have the potential to affect health.

Construction traffic has the potential to increase journey times for local residents, which could temporarily reduce the beneficial effects gained through access to community facilities, social and family networks.

The temporary construction workforce could comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial impacts will be undertaken and reported in the formal EIA Report.

Reduced access to areas of green space including Mill Lane allotments during construction and operation could result in a reduction in the mental and physical wellbeing benefits afforded by these spaces. Additionally, levels of physical activity could potentially be affected by disruption to roads and public rights of way that may be used as active travel routes. There would be temporary alternative routes for a number of public rights of way.

Land quality

The application of measures within the draft CoCP would ensure no significant adverse effects with respect to land contamination. If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination. There would be a significant beneficial effect associated with the remediation of part of Brickfield Tip landfill.

Based on *The Cheshire Replacement Minerals Local Plan (1999)*, the Proposed Scheme would not cross any mineral safeguarding areas. Cheshire East Council are in the process of undertaking a review of the Mineral Plan and it is understood that there is a future proposal for mineral safeguarding areas for salt and sand and gravel extraction along the line of the Proposed Scheme. The Proposed Scheme also crosses an area of potential exploitation for petroleum resources and shale gas. Potential adverse effects may occur on parts of these mineral resources if they are not exploited before or during construction, but the impact would be limited in extent. This would be discussed with the Mineral Planning Authority at Cheshire East Council, and the mineral/land owner to avoid significant adverse effects. There are no national or local geological sites within the community area.

Landscape and visual

Construction of the Proposed Scheme and changes to the existing landform and vegetation patterns would permanently affect the character and appearance of the local landscape. Significant adverse effects would be reduced by the measures incorporated into the design to reduce the visibility of the Proposed Scheme (for example, tree planting to provide screening along the route), land shaping to link earthworks into their wider landscape context, compensatory woodland planting, hedgerow replacement and restoration, and new wetland features to compensate for the loss of ponds.

The effect of the Proposed Scheme on the character and appearance of the local landscape would reduce over time as mitigation planting matures. Despite these measures, significant adverse effects would, however, potentially remain in some parts of the local landscape due to the presence of the Proposed Scheme infrastructure in this area, principally the viaducts and embankments at Checkley, Blakenhall and Chorlton; cuttings at Blakenhall and south of Crewe; and the Crewe infrastructure maintenance depot.

The presence of construction works may significantly adversely affect the following landscape character areas: Madeley Valley (see Figure 22), Checkley Brook Lower Farms and Woods, Blakenhall Lower Farms and Woods, The Grange Lower Farms and Woods, Wychwood Park, Shavington/Crewe Outer Fringe Lower Farms and Woods and Crewe Urban Fringe. Four of these landscape character areas (Madeley Valley, Blakenhall Lower Farms and Woods, Shavington/Crewe Outer Fringe Lower Farms and Woods and Crewe Urban Fringe) are also expected to potentially experience significant adverse visual effects during operation of the Proposed Scheme.

Construction works and activities may have significant adverse effects on residents in a number of locations in the area, including: near Checkley Wood looking north and north-east; on and east of Turncocks Lane looking north and east; on Checkley Lane looking east; along Mill Lane looking north-east; on Den Lane looking west and east; on Wrinehill Road looking north-east and

Figure 22: View over Madeley Valley landscape character area

east; along the western edge of Wychwood Park and Waybutt Lane looking west; along Newcastle Road looking north and south; on Back Lane looking east; and along Larch Avenue (looking north and east), Weston Lane (looking north and south), Crewe Road (looking east), White Lane (looking north-west and west) and north-west and west from Weston. In addition, users of a number of footpaths would be affected. A number of these receptors may also potentially continue to experience significant adverse visual effects during operation of the Proposed Scheme.

Socio-economics

The Proposed Scheme is not anticipated to result in the displacement or possible loss of jobs within this area. The Proposed Scheme would result in the creation of construction and operational employment opportunities within the community area, the effects of which are reported on a route-wide basis in Section 9.12.

Sound, noise and vibration

A comprehensive set of mitigation measures, including those in the draft CoCP, would be implemented to control noise and vibration throughout the construction works.

Noise from construction could potentially result in adverse effects on dwellings closest to the construction works at Den Lane, Mill Lane, Chorlton Lane, Chorlton, Basford, Casey Lane, Newcastle Road and Basford West. Further work is currently being undertaken to confirm the likely significant construction noise and vibration effects, including any temporary effects from construction traffic. This assessment will be reported in the formal EIA Report.

Operational noise would be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Operation of the railway would potentially result in adverse noise effects, due to potential noise increases and hence adverse change in the existing acoustic character around those parts of the following communities where they are closest to the route: Den Lane, Mill Lane, Chorlton Lane, Chorlton and Basford.

For dwellings which satisfy the applicable qualifying criteria, noise insulation would be offered to avoid significant adverse effects – at this early stage this is anticipated to be near Blakenhall. Assessment is currently being undertaken to confirm the likely significant effects due to operational noise and vibration, especially at non-residential locations and quiet areas and in terms of establishing existing baseline conditions. This will be reported in the formal EIA Report.

Traffic and transport

Construction of the Proposed Scheme has the potential to lead to additional congestion and/or increase delays for road users on a number of routes including the M6, A51 London Road, A500 Newcastle Road/Shavington Bypass, A531 Newcastle Road, B5071 Wynbury Lane/Bridge Street, Newcastle Road, Weston Lane, Chorlton Lane, Wrinehill Road/Den Lane, B5071 Jack Mills Way and Crewe Road. The increases in traffic could also affect non-motorised users (i.e. pedestrians, cyclists and horse riders) in terms of the ease with which they can cross these routes.

Nineteen public rights of way would be temporarily affected during construction with users diverted at different times during the construction period. This could result in significant adverse effects on users.

Effects during construction would be reduced by the creation of a haul route adjacent to the route of the Proposed Scheme, which would be used to transport materials and equipment, thereby reducing heavy goods vehicle movements on the local road network. The majority of roads crossing the route would be kept open during construction. Road closures would be restricted to overnight and weekend works where reasonably practicable. Routeing heavy goods vehicles along the strategic and/or primary road network (as far as reasonably practicable), the provision of temporary alternative routes for public rights of way, and provision of on-site welfare facilities to reduce daily travel by site workers would further reduce impacts during construction. Implementation of the draft CoCP

would further mitigate transport-related effects during construction.

The permanent closure of the B5071 Jack Mills Way (which opened in 2015) may increase journey times, increase traffic on surrounding roads as well as result in a significant adverse effect for non-motorised users of the route. As the road currently provides local and strategic links to Crewe and Nantwich as well as the A500 Shavington Bypass and the M6, HS2 Ltd will continue to work with Cheshire East Council to maintain the improvements provided by the B5071 Jack Mills Way or reconfigure the Proposed Scheme so that the existing road is retained. A potential alternative location for the permanent maintenance facilities is also being considered at the land proposed for the temporary railhead at Stone. Changes to the design and the effects of any changes will be reported in the formal EIA Report.

Pedestrians, cyclists and horse riders may also be significantly adversely affected by the permanent diversion of Chorlton Lane, permanent realignment of eight roads and permanent closure, realignment or diversion of 23 public rights of way.

Water resources and flood risk

Construction of the Blakenhall drop inlet culvert, Gonsley drop inlet culvert, A500 Gresty Brook culvert and Blakenhall south inverted siphon and the West Coast Main Line Den Lane, West Coast Main Line Betley South and West Coast Main Line Betley North culvert and A500 Gresty Brook culvert extensions and Half Moon inverted siphon would potentially result in permanent significant adverse effects related to changes in the natural form of the affected watercourses. Additionally, construction of the Basford West culvert under the infrastructure maintenance depot, which would prevent future restoration of the natural watercourse in this area, has potential to have a permanent significant adverse effect. Suitable measures are currently being considered to mitigate these effects, details of which will be provided in the formal EIA Report.

The Proposed Scheme would potentially have a permanent significant adverse effect related to impacts on the two private licensed groundwater abstractions at Grange Farm. It could also have permanent significant adverse effects on potential spring features near Swill Brook, west of Swill Brook, south of Yew Tree Farm, west of Chorlton, near Basford House, near Ash Tree Farm and east of Manor Farm. Suitable measures are currently being considered to mitigate these effects, details of which will be provided in the formal EIA Report.

The loss of four existing ponds that balance surface water runoff from the Basford West development area, and part of the B5071 Jack Mills Way, has potential to have a significant adverse effect related to flood risk downstream on Gresty Brook. An investigation of the local drainage systems will be undertaken to identify the measures required to ensure that all surface water runoff from this area continues to be controlled in line with the original planning consents. The results of this investigation, and the mitigation measures proposed, will be reported in the formal EIA Report.

It is currently anticipated that it should be possible to develop the means of mitigating all of the above impacts, to ensure that there are no residual significant effects.

9. Summary of route-wide environmental effects

9.1 Introduction

This section presents a summary of the likely environmental impacts (and, where practicable, the likely significant environmental effects) that have been identified from initial assessment of the Proposed Scheme on a route-wide basis. Route-wide effects are those that occur at a scale larger than that presented in the community area reports and for which a route-wide assessment is, therefore, appropriate.

9.2 Agriculture, forestry and soils

Construction of the Proposed Scheme would require approximately 1,030 hectares of high quality agricultural land. Whilst the temporary loss of high quality agricultural land during construction is likely to be significant, it represents a very small percentage of the high quality land in a regional (approximately 1% in Staffordshire County and former Crewe and Nantwich Borough Council area) and national (approximately 0.03% in England) context.

Agricultural land required temporarily would be returned to agricultural use by following good practice guidance set out in the draft CoCP. It is considered that there would not be a significant surplus of displaced agricultural soils arising from the Proposed Scheme.

Approximately 78 hectares of woodland is located within the construction boundary, of which about one quarter is managed commercially. Temporary and permanent route-wide effects on forestry land are being assessed and will be presented in the formal EIA Report.

It is considered that there would be no significant adverse route-wide effects during operation on agriculture, forestry and soils.

9.3 Air quality

Measures in the draft CoCP would be implemented to manage dust, air pollution and odour during construction. With the implementation of these control measures, there would be no significant adverse effects on a route-wide basis associated with the construction of the Proposed Scheme. Similarly, there would be no significant adverse route-wide air quality effects during operation.

9.4 Climate change

The greenhouse gas assessment will report on construction and operational emissions associated with the Proposed Scheme. The Proposed Scheme's overall greenhouse gas emissions will be contextualised against UK national greenhouse gas emissions and relevant sectors such as the construction and transport sectors.

A climate change resilience assessment is currently being undertaken to identify the potential risks of climate change on the Proposed Scheme, and to assess the extent to which the Proposed Scheme is resilient to those potential risks. An in-combination climate change impacts assessment that considers climate change impacts in combination with the impacts of the Proposed Scheme on environmental receptors is also being undertaken.

The climate change resilience assessment, in-combination climate change impacts assessment and greenhouse gas assessment will be carried out at a route-wide level and reported in the formal EIA Report.

9.5 Community

Community effects from the construction and operation of the Proposed Scheme are considered to be of local significance. Construction worker impacts on community resources at a route-wide level will be reported in the formal EIA Report.

9.6 Cultural heritage

The Proposed Scheme would not have any direct physical effect on any World Heritage Site, scheduled monument, registered park and garden or registered battlefield, and would not require the demolition of any Grade I or Grade II* listed buildings. The Proposed Scheme would physically affect one Grade II listed milepost and two conservation areas (Ingestre and Swynnerton). Mitigation of the effects of the Proposed Scheme on cultural heritage will include a programme of historic environment investigation, recording, analysis reporting and archiving guided by a research and delivery strategy.

9.7 Ecology and biodiversity

Ecology survey and assessment work is ongoing and baseline information regarding ecological features is limited at this stage. The assessment made for this working draft EIA Report is therefore provisional and has been undertaken on a precautionary basis. A fuller assessment of significant effects will be included in the formal EIA Report.

No sites designated as being of international importance for nature conservation would be affected by construction or operation of the Proposed Scheme. Habitats Regulations Assessments undertaken by HS2 Ltd and agreed with Natural England concluded that there would be no likely significant effects on Pasturefields Salt Marsh Special Area of Conservation or the Midlands Meres and Mosses Phase 1 Ramsar site. Whitmore Wood and Barhill Wood Ancient Woodland Inventory Sites would be directly affected. Based on studies undertaken to date, there are a further 10 woodland areas that would be affected by construction of the Proposed Scheme that have the potential to be ancient woodland. Further assessment work is being undertaken and will be reported in the formal EIA Report.

Ten local wildlife sites would be subject to permanent loss of land and fragmentation. Assessment work is ongoing with results to be reported in the formal EIA Report.

On the basis of existing information, the land required for the construction of the Proposed Scheme would include the permanent loss of approximately 6.5 hectares of ancient woodland, approximately 114 kilometres of hedgerows and 158 ponds. The design of the Proposed Scheme includes some habitat creation in response to loss of habitats, and further areas of habitat creation will be identified and reported in the formal EIA Report.

Significant route-wide effects could occur on bat and barn owl populations due to the risk of mortality from passing trains. This will be considered further, with findings reported in the formal EIA Report, along with effects on protected species and species of principal importance.

9.8 Health

Local communities along the route would benefit from increased job opportunities, with the Proposed Scheme expected to generate the equivalent of approximately 1,400 permanent full time construction jobs at the worksites. A further 1,010 full-time jobs could be created as a result of increased indirect demand for goods and services in the local area. This may result in positive health and wellbeing effects.

The Proposed Scheme would result in the displacement of some existing businesses through land required for its construction. The relocation and loss of jobs as a result of the displacement of businesses is not considered to affect overall employment levels and associated levels of health and wellbeing across the community as a whole. Some individuals may be adversely affected, particularly among the more vulnerable members of the community. Workers who may be unable to commute to a new location could lose their jobs, resulting in long term effects on employment status and potential adverse health and wellbeing effects.

Certain routes would be subject to significant increases in traffic flows and/or diversions for the medium to long term. Traffic management plans would be produced (see draft CoCP) to ensure no direct adverse health effects associated with road safety, but increased traffic flows and congestion may contribute to traveller stress.

During the operation of the Proposed Scheme, residents along the route could be exposed to noise from passing trains. Any potential effects resulting from the noise assessment will be reported in the formal EIA Report.

9.9 Land quality

With the application of the draft CoCP and site-specific remediation where required, no significant adverse effects are anticipated during construction in respect of any land contamination. The Proposed Scheme overlies a number of sand and gravel and bedrock sand mineral safeguarding areas along the route. Exploitation of these resources before or during the construction phase, in areas not directly underlying the railway, would assist in minimising the impact on the resources as a whole. Discussions with mineral/land owners, the Mineral Planning Authority and other relevant stakeholders would assist in achieving effective management of minerals. With this mitigation, it is considered that, on a route-wide basis, the adverse effects on mineral resources would not be significant.

Any adverse contamination effects during operation through the use of the infrastructure maintenance depot, auto-transformer stations and trains would be controlled through environmental protocols, and are not anticipated to be significant.

9.10 Landscape and visual

No significant adverse route-wide effects are anticipated on landscape and visual receptors arising from the construction or operation of the Proposed Scheme. The landscape and visual impact assessment considers potential effects on the northernmost part of the Cannock Chase Area of Outstanding Natural Beauty. By virtue of its distance from the Proposed Scheme and visual containment created by vegetation and topography, no significant adverse route-wide effects are expected.

9.11 Major accidents and natural disasters

The route-wide assessment considers major accident and disaster scenarios during both the construction and operational phases of the Proposed Scheme.

The design, management, operation and maintenance of the Proposed Scheme must comply with a large number of legal requirements around health, safety and environmental risks. The assessment of any likely significant effects arising directly from the Proposed Scheme, if it were to be affected by a major accident and/or natural disaster, assumes that compliance with all relevant legislation is embedded in the Proposed Scheme.

HS2 Ltd has committed in their development agreement with the Government, to design, build and operate the Railway to meet or better the performance standard of HS1, and to reduce safety risks as far as reasonably practicable and in line with best current international practice. This commitment provides the framework within which the risk of major accidents and/or natural disasters impacting the environment would be managed, and applies through the entire supply chain.

Given the processes that are known to be in place, and the resulting measures that would be introduced to avoid and/or reduce the vulnerability of the Proposed Scheme to major accidents and/or natural disasters, no significant environmental effects are expected. Measures to avoid and/or reduce the vulnerability of the Proposed Scheme to major accidents and natural disasters are subject to review under other legislative processes in addition to those established by the hybrid Bill.

9.12 Socio-economics

The route-wide assessment for socio-economics considers the overall changes to employment levels arising from the construction and operation of the Proposed Scheme.

At a route-wide level the Proposed Scheme is expected to generate the equivalent of approximately 2,690 permanent full time construction jobs, which is considered a significant beneficial effect. Of these, an estimated 1,400 permanent full-time construction jobs would be based at worksites along the route, which would be accessible to local residents and to others living further afield. The construction works would also generate additional demand for goods and services in the local area, which could stimulate business growth and opportunities to generate further employment (equivalent to 1,010 full-time jobs), which would be a major beneficial effect and would therefore be significant.

Construction of the Proposed Scheme would result in the displacement of some existing businesses through land requirements. It is considered that this would result in the relocation of approximately 40 jobs. It is not possible at this stage to predict accurately the numbers of jobs at risk of being lost route-wide (as a result of businesses failing to relocate and closing, or relocating and contracting, and employees being unable to find work in the short term). However, based on assumptions, it is currently considered that approximately 10 jobs could be lost route-wide from businesses affected during construction, which is not considered to be significant given the scale of economic activity and employment opportunity in the area.

During operation of the Proposed Scheme, 300 direct jobs would be created at the infrastructure maintenance depot at Crewe, which is considered to be a significant beneficial effect. It is estimated that an additional 115 jobs would be created route-wide through indirect effects as a result of expenditure on supplies and services necessary for the operation of the Proposed Scheme.

9.13 Sound, noise and vibration

Noise and vibration effects from construction activities would be confined to local areas around construction sites. During the operational phase of the Proposed Scheme, effects from passing trains and fixed operational noise sources may occur on residents and other sensitive receptors (including schools, churches, hospitals and offices) but again, these would be local-level effects. It is considered that there would be no significant adverse noise or vibration effects on a route-wide basis associated with the construction or operation of the Proposed Scheme.

9.14 Traffic and transport

Traffic and transport effects during construction and operation are being considered at a regional and route-wide level. The traffic and transport assessment is largely based upon the output from transport models, which rely on ongoing economic assessments and modelling. Results will be reported in the formal EIA Report.

9.15 Waste and material resources

Construction of the Proposed Scheme would be undertaken in accordance with the measures set out in the draft CoCP, which include plans to reduce waste generated from construction activities where reasonably practicable; reuse soil and agricultural subsoil close to the point of excavation; and reuse excavated material that is either uncontaminated or can be cleaned.

Based on the design approach adopted for the Proposed Scheme, it is forecast that approximately 25 million tonnes of material would be generated throughout the seven year construction period, of which over 99% (24.9 million tonnes) would be diverted from landfill. This would be achieved by reusing suitable excavated material to construct the necessary engineering and environmental mitigation earthworks along the route and reusing, recycling or recovering construction and demolition wastes where feasible.

This would leave approximately 260,000 tonnes of non-hazardous material and approximately 6,000 tonnes of hazardous material to go to landfill, which would result in minor adverse environmental effects.

Operational waste would arise from passengers travelling in trains, from track maintenance and the operation of depots and signalling locations. There are no proposed railway stations along the route of the Proposed Scheme and consequently no passenger waste would arise on the route.

During operation, management of waste from trains and rolling stock maintenance would be managed by the train operating company.

It is estimated that track maintenance would generate approximately 793 tonnes of waste during the first year of operation in 2027, 85% of which would be diverted from landfill. Approximately 119 tonnes would require disposal to landfill.

Around 67 tonnes of waste would be generated in the first year of operation, from the operation of the infrastructure maintenance depot in the South Cheshire community area; signalling locations; and operations and maintenance sites. Of this total, 27 tonnes is likely to be sent to landfill.

Overall, the first year of operation would result in approximately 146 tonnes of waste being sent to landfill, which would be non-hazardous waste, and would result in negligible environmental effects.

During operation of the Proposed Scheme waste generation would be kept as low as reasonably practicable.

9.16 Water resources and flood risk

The overall effects of the Proposed Scheme on surface and groundwater bodies is being considered with specific reference to how the Proposed Scheme complies with the statutory requirements of the Water Framework Directive. A Water Framework Directive compliance assessment will be included with the formal EIA Report.

The potential risk to water resources associated with accidents or spillages from trains using the Proposed Scheme during its operational phase is being assessed. The results of this assessment will be reported in the formal EIA Report.

Route-wide effects on flood risk are also being assessed, with the Proposed Scheme aiming to taking account the requirements of the National Planning Policy Framework. This assessment will be reported in the formal EIA Report.

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