High Speed Two Phase 2a: West Midlands to Crewe

Working Draft Environmental Impact Assessment Report

Volume 2: Community Area report

CA3: Stone and Swynnerton

September 2016

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Department for Transport

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Structure of the working draft Environmental Impact Assessment Report

This document is part 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 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, assessment and mitigation between now and when the hybrid Bill is deposited.

The working draft EIA Report comprises the following documents:

Non-technical summary

This provides a summary in non-technical language of:

- the Proposed Scheme and reasonable alternatives considered;
- the impacts of the Proposed Scheme (and, where possible, the likely significant environmental effects), both beneficial and adverse; and
- the proposed means of avoiding, reducing or managing the likely significant adverse effects.

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the EIA process and the approach to consultation and engagement;
- 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; and
- a summary of the strategic, route-wide and route corridor alternatives to the scheme and local alternatives considered prior to November 2015.

Volume 1 also comprises a glossary of terms and list of abbreviations and two appendices which are listed below.

Volume 2: Community area reports and map books

These cover the following community areas: 1 Fradley to Colton; 2 Colwich to Yarlet; 3 Stone and Swynnerton; 4 Whitmore Heath to Madeley; and 5 South Cheshire. The reports provide the following for each area:

- 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 environmental impacts of the Proposed Scheme (and, where possible, the likely significant environmental effects), both beneficial and adverse; and
- the proposed means of avoiding, reducing or managing the likely significant adverse effects.

The maps relevant to the Stone and Swynnerton area are provided in a separate corresponding document entitled Volume 2, CA3 Map Book, which should be read in conjunction with this report. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and operation features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing proposed viewpoint and photomontage locations (Map Series LV-11, to be read in conjunction with Section 11, Landscape and visual), noise contour maps (Map Series SV-01, to be read in conjunction with Section 13, Sound, noise and vibration) and maps showing key water features (Map Series WR-01, to be read in conjunction with Section 15, Water and flood risk).

Volume 3: Route-wide effects

This describes the impacts and effects 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 measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

1 Introduction

1.1 Introduction to HS2

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

1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London, Birmingham and the West Midlands that will become operational in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Two (London - West Midlands) Bill in 2013 and ES deposited with Additional Provisions to that Bill in 2014 and 2015. The Bill is proceeding through Parliament with the aim of achieving Royal Assent by the end of 2016 and commencing construction in 2017.

1.1.3 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 (WCML) 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'.

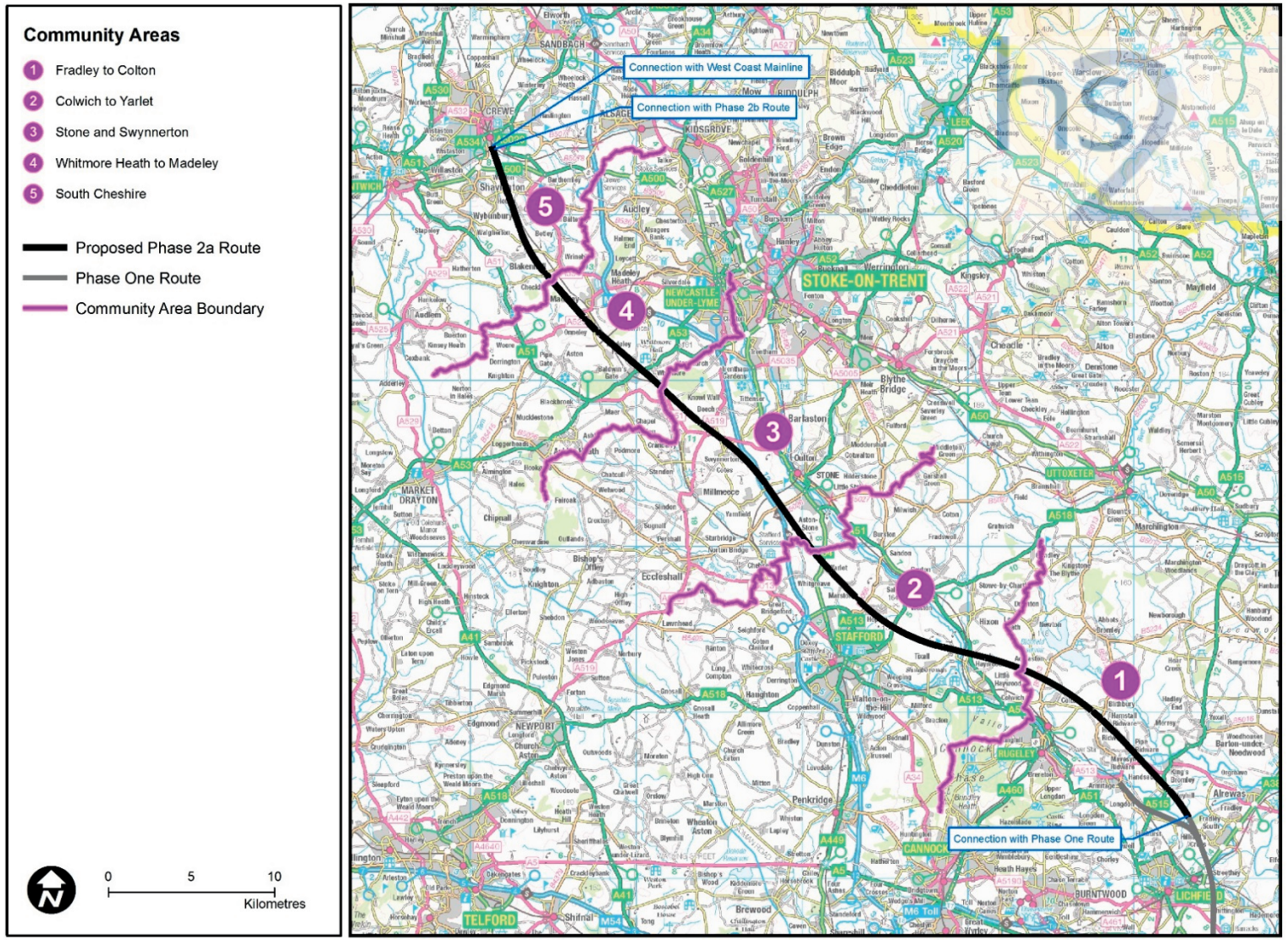
1.1.4 Phase 2a (the Proposed Scheme), the subject of this working draft Environmental Impact Assessment (EIA) Report[1], comprises the first section of the western leg of Phase Two from the West Midlands to Crewe (approximately 60km (37 miles) in length). It would connect with Phase One near Fradley, to the north-east of Lichfield, and connect to the WCML 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.

1.1.5 An announcement on the Phase Two route from Crewe to Manchester and from the West Midlands to Leeds, referred to as Phase 2b, is expected in Autumn 2016. Construction of Phase 2b would commence in approximately 2023, with operation planned to start around 2033.

1.1.6 The proposed Phase 2a route has been divided into five community areas (CAs), for environmental assessment and community engagement purposes. These are shown in Figure 1.

[1] Note that Parliament's Standing Order 27A makes reference to production of an environmental statement (ES). Under the EIA Directive 2014/52/EU, the output of the environmental assessment is an Environmental Impact Assessment (EIA) Report. This report uses the term EIA Report where referring to the output of the EIA. This 'working draft' EIA report provides an initial environmental assessment of the current stage of design.

Figure 1: The HS2 Phase 2a route and community areas



1.2 Purpose of this report

1.2.1 This working draft EIA Report sets out the current design of the Proposed Scheme, the current environmental baseline information, and describes the likely impacts (and, where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Stone and Swynnerton area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area.

1.2.2 Consultation on the working draft EIA Report is being carried out as early as possible 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. Parliamentary Standing Orders do not require a working draft EIA Report. Developing a working draft EIA Report and consulting on it in advance of the statutory formal EIA Report means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.

1.2.3 As this is a working draft 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 the likely impact to inform the consultation.

1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal EIA Report to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)[2,3]. It is possible that the effects and mitigation described in the formal EIA Report may differ from those presented in this working draft EIA Report, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1 – an introduction to HS2 and the purpose and structure of this report;
- Section 2 – overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;
- Section 3 – consultation and stakeholder engagement; and
- Sections 4 to 15 – an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);

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

- cultural heritage (Section 7);
- ecology and biodiversity (Section 8);
- health (Section 9);
- land quality (Section 10);
- landscape and visual (Section 11);
- socio-economics (Section 12);
- sound, noise and vibration (Section 13);
- traffic and transport (Section 14); and
- water resources and flood risk (Section 15).

1.3.2 Each environmental topic section comprises:

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

1.3.3 Following consultation on this working draft EIA Report, the proposed mitigation measures may be amended to take account of design changes and comments received. Mitigation measures will be set out in full in the formal EIA Report.

1.3.4 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the draft Scope and Methodology Report (SMR)[4]. The draft SMR was consulted on between 8 March and 13 May 2016 and subsequently updated to take in consideration comments received. The revised SMR is published alongside this working draft EIA Report, which will be used to develop the formal EIA Report.

1.3.5 The maps relevant to the Stone and Swynnerton area are provided in a separate corresponding document entitled Volume 2, CA3 Map Book, which should be read in conjunction with this report.

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

[4] https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-draft-environmental-impact-assessment-scope-and-methodology-report-consultation

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Stone and Swynnerton area covers approximately a 14km section of the Proposed Scheme, passing through the parishes of Stone Rural, Chebsey and Swynnerton within the Stafford Borough Council (SBC) and Staffordshire County Council (SCC) areas. The boundary between Marston parish and Stone Rural parish forms the southern boundary of this section. The boundary between Swynnerton parish and Whitmore parish forms the northern boundary of this section.

2.1.2 As shown in Figure 2 the Colwich to Yarlet community area (CA2) lies to the south and Whitmore Heath to Madeley community area (CA4) lies to the north.

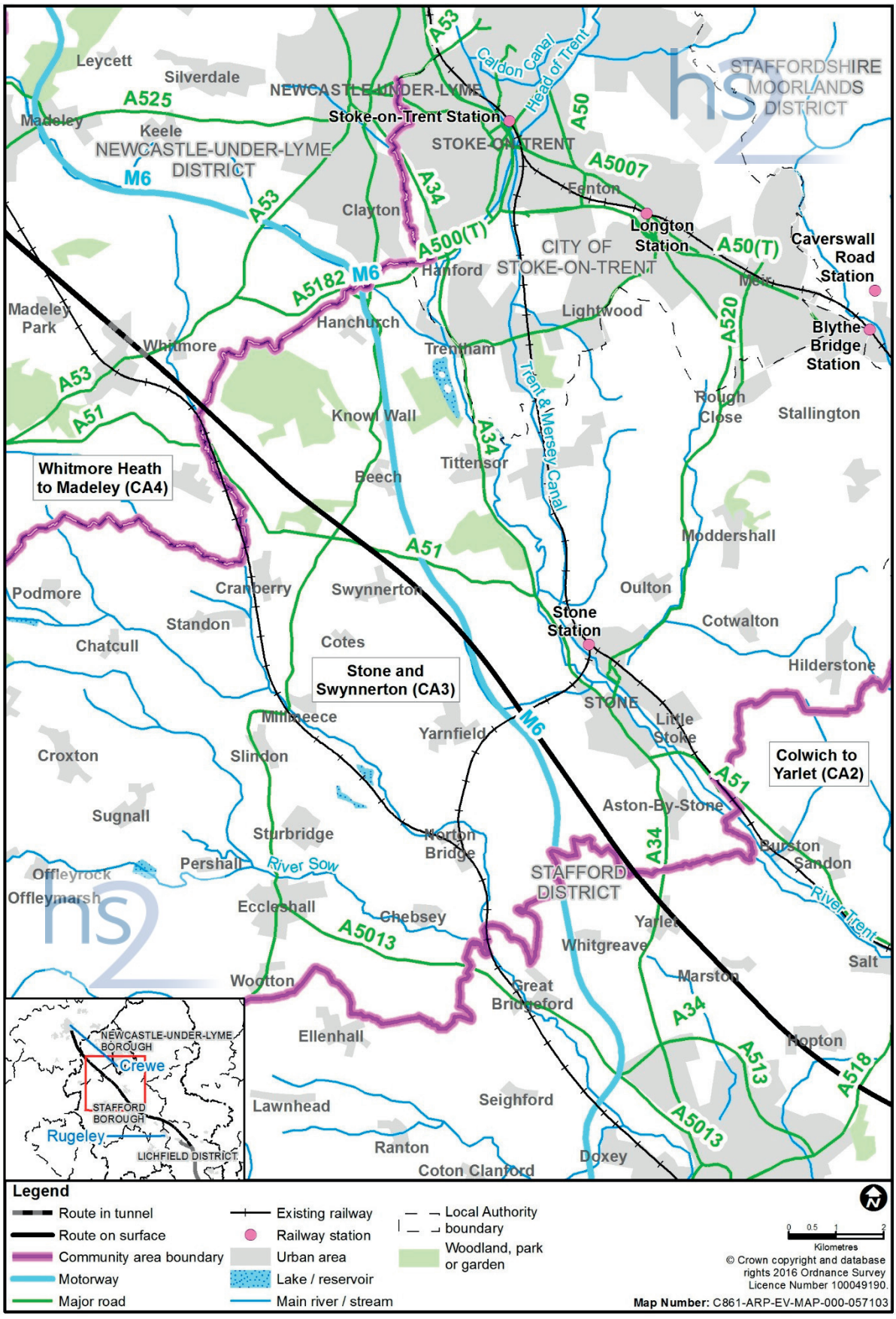
Settlement, land use and topography

2.1.3 The area is predominantly rural in character, with agriculture being the main land use, interspersed with small villages and a scattering of isolated dwellings and farmsteads. The residential areas mainly relate to Stone and Walton and within the wider rural area there are a number of villages and hamlets, including Yarnfield and Swynnerton.

2.1.4 At the southern end of this area, the route would pass approximately 1.6km to the west of the village of Aston-by-Stone and approximately 600m north-east of the village of Stableford at the northern end. Land use in the area is split between large blocks of arable and pasture, with dairy farms west of Walton, Swynnerton and at The Rowe.

2.1.5 Topography in the south of the Stone and Swynnerton area is characterised by a series of rounded summits with elevations of between 140m and 160m above Ordnance Datum (AOD). Topography around Swynnerton consists of a series of ridges, the highest of which is Knowl Wall (200m AOD). Slopes are generally shallow to moderate, falling to between 130m and 140m AOD. Small pockets of land between Yarnfield and Stone along the Filly Brook, extending north in line with the M6, and land to the east of Stableford extending north is classified as Flood Zone 3 (meaning there is 1 in 100 or greater annual probability of flooding).

Figure 2: Area context map



Key transport infrastructure

2.1.6 The M6 passes through the area, with Junction 15 located at the northern boundary. The A34 Stafford Road/The Fillybrooks passes through the area in a north-south alignment, connecting Trentham in the north with Aston-by-Stone in the south. Other main transport routes include the A51 Stone Road connecting Stone to Stableford (via Swynnerton) and the A519 Newcastle Road, which connects Eccleshall with Newcastle-under-Lyme.

2.1.7 The Proposed Scheme would cross the Norton Bridge to Stone railway to the east of the M6 (between the B5026 Eccleshall Road and Yarnfield Lane).

2.1.8 There are footways and Public Rights of Way (PRoW) in the built-up areas of Stone, Walton, Yarnfield and Swynnerton. In the Stone and Walton area, the Trent and Mersey canal towpath linking Barlaston to the north and Stafford to the south-west, provides an off-road cycle route. There are advisory cycle routes passing through Swynnerton, including Stab Lane and Cotes Lane.

Socio-economic profile

2.1.9 Within the SBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (12%), with agriculture, forestry and fishing as second largest (11%), followed by retail (10%).

2.1.10 According to the Annual Population Survey (2016)[5] , the employment rate[6] within the SBC area was 75% (61,200 people) and unemployment[7] in the SBC area was 3%.

2.1.11 According to the Annual Population Survey (2015)[8], 41% of SBC's residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 5% of residents had no qualifications.

Notable community facilities

2.1.12 The main concentration of community facilities in this area is in Stone. Yarnfield and Swynnerton are smaller villages that are located closer to the Proposed Scheme, and include a limited number of local services. The M6 is a defining feature in this area, acting as a barrier between communities to the east and west of it.

2.1.13 Stone encompasses the adjoining settlement of Walton alongside the River Trent, approximately 5km south of Trentham, which is part of the wider Stoke-on-Trent settlement area. Stone includes a range of community facilities including nine primary schools and one secondary school, Trentside Clinic, Stone Youth and Community

[5] Annual Population Survey, (2015), NOMIS, Accessed: 25 July 2016.
[6] The proportion of working age (16-64 year olds) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment'.
[7] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.
[8] Annual Population Survey, (2015), NOMIS, Accessed: 26 April 2016.

Centre, Walton Community Centre and Stone Air Cadets hut, Stone library, Stone police station and seven churches.

2.1.14 Yarnfield is a village located approximately 2.5km south-west of Stone. It includes a limited number of community facilities, including Springfield First School and Saint Barnabas Church.

2.1.15 Swynnerton is a small village linked to the Swynnerton Hall estate. The village includes a primary school, a post office and village shop, and St Mary's Church and Our Lady of the Assumption Roman Catholic Church.

Recreation, leisure and open space

2.1.16 The Stone and Swynnerton area is predominantly rural, with open space, woodland and farmland. The Proposed Scheme would cross several PRoW, including the Staffordshire Cakes and Ale Trail, Two Saints Way, and the Trent and Mersey canal walk. Swynnerton Old Park is located to the north-east of the Proposed Scheme, and includes a wide range of walking and cycling routes, which also link to Hatton Common. There are a number of indoor recreational facilities in Stone including a soft play centre and trampoline park, and a number of public houses.

Policy and planning context

Planning framework

2.1.17 HS2 is not included or referred to in many local plans, given that it is being developed on a national basis to meet a national need. Relevant local plan documents and policies have nevertheless been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

2.1.18 The following local policies have been considered and referred to where appropriate to the assessment:

- Adopted Plan for Stafford Borough 2011 - 2031 (2014)[9];
- Adopted Staffordshire and Stoke-on-Trent Minerals Local Plan 1994 - 2006 (saved policies) (1999)[10]; and
- Adopted Staffordshire and Stoke-on-Trent Joint Waste Core Strategy 2010 - 2026 (2013)[11].

2.1.19 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for approval. This is the case with the Stafford Borough Council Plan for Stafford Borough: Part 2 Publication Submission – 2015[12], which was submitted to the Secretary of State on 27 April 2016 and the new

[9] http://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Plan%20for%20Stafford%20Borough/PFSB-Adoption.pdf
[10] https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/mineralslocalplan/MineralsLocalPlanadoptedsavedpolicieswebversion1.pdf
[11] https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/wastelocalplan/Adopted-Staffordshire-and-Stoke-on-Trent-Joint-Waste-Local-Plan-(2010-to-2026)-(adopted-March-2013).pdf
[12] http://www.staffordbc.gov.uk/live/Documents/Programme%20Officer/Programme%20Officer%202016/P2-A1-The-Plan-for-Stafford-Borough-Part-2---2015.pdf

Minerals Local Plan for Staffordshire (2015 to 2030) - Submission Draft - June 2015[13] submitted to the Secretary of State on 8 January 2016.

2.1.20 There are a number of key planning designations in the area. These include conservation areas, listed buildings, scheduled monuments, important archaeological sites, historic parks and gardens and ancient woodland.

Committed development

2.1.21 Committed developments are defined as developments with planning permission or sites allocated in adopted development plans. Committed developments have not been considered in the assessment for the working draft EIA Report. Those within, or close to, the land required for the Proposed Scheme will be considered in the formal EIA Report.

2.2 Description of the Proposed Scheme

General

2.2.1 The following section describes the main features of the Proposed Scheme in the Stone and Swynnerton area, including the proposed environmental mitigation measures that have been identified, based on the current level of design. Further generic information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is set out in Volume 1, Section 9.

2.2.2 Land required permanently for the Proposed Scheme is described in this section and is shown on Map Series CT-06. Land would also be required on a temporary basis for construction. This is set out in Section 2.3 and is shown on Map Series CT-05.

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

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

- reviewing the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas, following hydraulic modelling[14];
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;

[13] https://consultation.staffordshire.gov.uk/environment/staffordshire-minerals-local-plan/user_uploads/0100-the-new__---june-2015.pdf
[14] The design of viaducts is currently based on flood risk data received from third parties. The effects of any viaducts, bridges, embankments or other structures that intrude into floodplains would be assessed in detail and included in the hybrid Bill design and formal EIA Report.

- refinement of maintenance access routes and access to balancing ponds;
- additional environmental features required to mitigate likely significant adverse environmental effects;
- accommodation works and crossings of the route for private means of access;
- refinement of construction compound locations and haul roads;
- refinement of auto-transformer station and mid-point auto-transformer station locations; and
- the potential to relocate permanent maintenance facilities[15] from the South Cheshire area (CA5) to the Stone and Swynnerton area.

Overview

2.2.5 The Proposed Scheme through this area would extend from the south-west of Aston-by-Stone and run northwards to the south of Stone, passing Swynnerton towards Swynnerton Old Park in the north.

2.2.6 This section of route is illustrated on maps CT-06-219b to CT-06-228a in the Volume 2, CA3 Map Book.

Yarlet to Stone Rural Bridleway 0.1135 realignment

2.2.7 This section would commence at the northern boundary of the Colwich to Yarlet area (CA2), approximately 1km north-west of Yarlet, heading in a north-west direction to the Stone Rural Bridleway 0.1135 realignment. At the start of this section, the route would be within Yarlet Central cutting, continuing onto Yarlet embankment until reaching the realigned Stone Rural Bridleway 0.1135.

2.2.8 This section of route is illustrated on maps CT-06-220 to CT-06-221 in the Volume 2, CA3 Map Book.

2.2.9 Key features of this approximately 1.7km section would include:

- Yarlet Central cutting, continuing in the Stone and Swynnerton area from the Colwich to Yarlet area (CA2) for approximately 750m in length, up to 15m in depth and up to 95m in width;
- diversion of Peasley Bank watercourse adjacent to the route of the Proposed Scheme via Peasley Bank drop inlet culvert ending in Colwich to Yarlet area (CA2) and commencing in the Stone and Swynnerton area (CA3);
- Stone Rural Footpath 28 overbridge to allow pedestrian access over the route of the Proposed Scheme;
- a high-pressure gas diversion crossing the route of the Proposed Scheme approximately 20m south-east of its existing alignment;

[15] These facilities would operate as a base for maintenance activities to support the railway infrastructure. It would comprise a depot, storage and workshop areas, office and parking facilities and sidings for handling and storage of railway infrastructure replacement materials and maintenance trains.

- eight ecological mitigation ponds, six located on the eastern side of the route of the Proposed Scheme and two on the west;
- landscaping earthworks on both sides of the route of the Proposed Scheme up to, and including, the realigned Stone Rural Bridleway 0.1135;
- Yarlet embankment and associated landscape mitigation, approximately 950m in length and up to 16m in height;
- diversion of a tributary of the River Trent for approximately 400m through the Pirehill culvert from the western end of the Stone Rural Bridleway 0.1135 realignment;
- a balancing pond for railway drainage located approximately 100m east of the Stone Rural Bridleway 0.1135 accommodation overbridge, with access from the realigned Stone Rural Bridleway 0.1135;
- areas of woodland habitat creation on both sides of the route of the Proposed Scheme on the approach to the Stone Rural Bridleway 0.1135 accommodation overbridge;
- Stone Rural Bridleway 0.1135 accommodation overbridge approximately 50m south of its existing alignment; and
- realignment of Stone Rural Bridleway 0.1135 via Stone Rural Bridleway 0.1135 accommodation overbridge, to maintain bridleway access either side of the route of the Proposed Scheme.

2.2.10 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.11 Construction of this section would be managed from the Stone Rural Bridleway satellite compound, which is described in Section 2.3 and shown on Map CT-05-221 in the Volume 2, CA3 Map book.

Stone Rural Bridleway 0.1135 realignment to the B5026 Eccleshall Road realignment

2.2.12 The route of the Proposed Scheme would continue from the realigned Stone Rural Bridleway 0.1135, running adjacent to the M6 to the realignment of the B5026 Eccleshall Road. In this section the route would be in the Yarlet North cutting.

2.2.13 This section of route is illustrated on maps CT-06-221 and CT-06-222 in the Volume 2, CA3 Map Book.

2.2.14 Key features of this approximately 1.7km section would include:

- a section of Yarlet North cutting, approximately 1.7km in length, 75m in width and up to 10m in depth;
- an area of woodland habitat creation on the western side of the route of the Proposed Scheme, immediately following Stone Rural Bridleway 0.1135;
- twelve ecological mitigation ponds, three located on the eastern side of the route of the Proposed Scheme and nine on the western side;

- realignment of the Stone Rural Footpath 32 crossing the route of the Proposed Scheme via Stone Rural Footpath 32 accommodation overbridge near Walton Heath Farm to enable pedestrian and vehicular access over the route;
- diversion of a tributary of the River Trent adjacent to the west of the route of the Proposed Scheme from north of the M6 Stafford motorway service area (M6 northbound) for approximately 1km, crossing the route at Filly Brook viaduct;
- realignment of B5026 Eccleshall Road, 50m north of its existing alignment; and
- B5026 Eccleshall Road overbridge to enable vehicular access across the route of the Proposed Scheme.

2.2.15 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.16 Construction of this section would be managed from the Eccleshall Road satellite compound, which is described in Section 2.3, and as shown on Map CT-05-222 in the Volume 2, CA3 Map Book.

B5026 Eccleshall Road realignment to Yarnfield Lane realignment

2.2.17 The route of the Proposed Scheme would continue from the B5026 Eccleshall Road overbridge in Yarlet North cutting. The route would then continue on Yarnfield South embankment before crossing the Norton Bridge to Stone Railway and Filly Brook on Filly Brook viaduct. Continuing onto Yarlet North embankment, the route would then cross over the realigned Yarnfield Lane at a height of approximately 10m above existing ground level.

2.2.18 This section of route is illustrated on maps CT-06-222 and CT-06-223 in the Volume 2, CA3 Map Book.

2.2.19 Key features of this approximately 1.3km section would include:

- a section of Yarlet North cutting, approximately 310m in length, 75m in width and up to 8m in depth;
- Yarnfield South embankment approximately 370m in length and up to 9m in height;
- an area of woodland and grassland habitat creation along the route of the Proposed Scheme in this section;
- two balancing ponds for railway drainage, one located immediately to the south of the Norton Bridge to Stone Railway, with access from the northern side of the B5026 Eccleshall Road realignment, and one located opposite Pool House Farm on the eastern side of the route of the Proposed Scheme, with access from the realigned Yarnfield Lane;
- continuation of the diversion of an unnamed watercourse from the previous section adjacent to the western side of the route of the Proposed Scheme and crossing under the route at Filly Brook viaduct;

- Filly Brook viaduct crossing over Norton Bridge to Stone Railway and Filly Brook, approximately 180m in length and up to 15m in height;
- replacement floodplain storage area and woodland and wetland habitat creation south-east of Pool House Farm;
- Yarnfield North embankment and associated landscaping earthworks, approximately 450m in length and up to 12m in height;
- diversion of a tributary of Filly Brook for approximately 150m at Pool House Farm, crossing beneath the northern end of Filly Brook viaduct;
- one ecological mitigation pond located on the eastern side of the Proposed Scheme, adjacent to the realigned Yarnfield Lane;
- realignment of Yarnfield Lane approximately 50m south-east of its existing alignment, to allow vehicular and pedestrian access either side of the route of the Proposed Scheme; and
- Yarnfield Lane underbridge.

2.2.20 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.21 Construction of this section would be managed from the Eccleshall Road satellite compound and Yarnfield Lane satellite compound, which are described in Section 2.3 and shown on maps CT-05-222 and CT-05-223 in the Volume 2, CA3 Map Book.

Yarnfield Lane realignment to Meaford North embankment

2.2.22 The route of the Proposed Scheme would continue on the Yarnfield North embankment and would enter the Meaford cutting. The route would continue on Meaford South embankment, crossing over the M6 on the M6 Meaford viaduct and continuing on Meaford North embankment.

2.2.23 This section of route is illustrated on maps CT-06-223, CT-06-224, CT-06-224-L1 and CT-06-224-R1 in the Volume 2, CA3 Map Book.

2.2.24 Key features of this approximately 2.3km section would include:

- Yarnfield North embankment and associated landscaping earthworks, approximately 450m in length and up to 12m in height;
- diversion of Stone Rural Footpath 33 for approximately 400m via Yarnfield Lane underbridge, running parallel to the west of the route of the Proposed Scheme in a northern direction for approximately 450m;
- Yarnfield Lane auto-transformer station, with access from the realigned Yarnfield Lane to the west;
- an area of woodland habitat creation on the western side of the route of the Proposed Scheme from Yarnfield Lane to the M6 Meaford viaduct;
- thirteen ecological mitigation ponds, five on the eastern side of the route of the Proposed Scheme and eight to the west;

- Meaford cutting, approximately 400m in length, 25m in width and up to 2m in depth;
- Meaford South embankment, approximately 370m in length and up to 7m in height;
- M6 Meaford viaduct, approximately 170m in length and up to 15m in height;
- areas of grassland and woodland habitat creation beneath the M6 Meaford viaduct;
- Meaford North embankment and associated landscaping earthworks, approximately 900m in length and up to 15m in height;
- localised realignment of M6 to enable the widening of the central reserve to accommodate the M6 Meaford viaduct piers;
- diversion of a tributary of Filly Brook watercourse for approximately 150m beneath the M6 Meaford viaduct;
- Swynnerton (South) underbridge, approximately 150m north of the M6 Meaford viaduct to allow access either side of the route of the Proposed Scheme;
- one balancing pond for railway drainage on the western side of the route of the Proposed Scheme and east of Swynnerton Grange, with access running from Hall Lane;
- diversion of two overhead power lines, one crossing the route of the Proposed Scheme north-east of Swynnerton Grange, and one south-west of Blakelow Farm; and
- Swynnerton Footpath 27 accommodation underbridge for the realignment of the Swynnerton Footpath 27 to enable both pedestrian and vehicular access either side of the route of the Proposed Scheme.

2.2.25 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.26 Construction of this section would be managed from the Yarnfield Lane satellite compound, M6 East viaduct satellite compound and M6 West viaduct satellite compound, which are described in Section 2.3, and as shown on maps CT-05-223 and CT-05-224 in the Volume 2, CA3 Map book.

Meaford North embankment to A519 Newcastle Road overbridge

2.2.27 From Meaford North embankment the route of the Proposed Scheme would continue in the Swynnerton South cutting. The route would then continue onto Swynnerton embankment. For the remainder of this section, the route would continue in Swynnerton North cutting, ending at the A519 Newcastle Road overbridge.

2.2.28 This section of route is illustrated on maps CT-06-224, CT-06-224-L1 and CT-06-224-R1 to CT-06-226 in the Volume 2, CA3 Map Book.

2.2.29 Key features of this approximately 2.7 km section would include:

- Swynnerton South cutting, approximately 370m in length, 35m in width and up to 3m in depth;
- areas of woodland habitat creation on both sides of the route of the Proposed Scheme;
- eleven ecological mitigation ponds, four located on the eastern side of the route of the Proposed Scheme and seven on the western side;
- diversion of Swynnerton Footpath 17 along the western side of the route of the Proposed Scheme for approximately 300m and crossing the route via Swynnerton Footpath 27 accommodation underbridge;
- Lodge Covert underbridge to enable vehicular access either side of the route of the Proposed Scheme, as well as the diversion of a tributary of Filly Brook;
- Swynnerton embankment, approximately 1km in length and up to 5m in height;
- two balancing ponds for railway drainage, one located on the eastern side of the route of the Proposed Scheme near Lodge Covert underbridge, and one located to the south-west of Sandyford Farm, both accessed from the A51 Stone Road;
- a 3m high noise fence barrier, approximately 1km in length, on the western side of the route of the Proposed Scheme from just north of the Lodge Covert underbridge to the Tittensor Road overbridge;
- Sandyford underbridge to the south of Sandyford Farm to allow vehicular access either side of the route of the Proposed Scheme;
- diversion of a tributary of the Filly Brook via Swynnerton culvert located to the west of Sandyford Farm;
- Swynnerton auto-transformer station on the western side of the route of the Proposed Scheme, west of Sandyford Farm, with access from the diverted Tittensor Road;
- Swynnerton North cutting, approximately 1.3km in length, 105m in width and up to 17m in depth;
- diversion of Tittensor Road, approximately 450m north-west of its existing alignment, with associated earthworks on both sides;
- Tittensor Road overbridge, which would cross the route approximately 400m north-west of its existing location;
- diversion of the A51 Stone Road so as to remain to the east of the Proposed Scheme, and joining the A519 Newcastle Road approximately 400m east of the existing intersection;
- diversion of Stab Lane so as to remain to the west of the Proposed Scheme, and joining its existing alignment approximately 400m east of the A519 Newcastle Road junction;

- permanent closure of Swynnerton Bridleway 54 where it meets the realigned A51 Stone Road (approximately 50m north of where it currently ends); and
- A519 Newcastle Road overbridge for the diversions of the A51 Stone Road and Stab Lane to allow vehicular access over the route of the Proposed Scheme.

2.2.30 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.31 Construction of this section would be managed from the M6 West satellite compound, Tittensor Road satellite compound and the A519 Newcastle Road main compound, which are described in Section 2.3 and as shown on maps CT-05-224 to CT-05-226 in the Volume 2, CA3 Map Book

A519 Newcastle Road overbridge to Swynnerton Footpath 52 realignment

2.2.32 The route of the Proposed Scheme would continue in the Swynnerton North cutting from the A519 Newcastle Road overbridge and cross Clifford's Wood underbridge. The route would then continue on Hatton embankment to the Swynnerton Footpath 52 accommodation overbridge. In this section, approximately 170m of the route would be at ground level.

2.2.33 This section of route is illustrated on maps CT-06-226 and CT-06-227 in the Volume 2, CA3 Map Book.

2.2.34 Key features of this approximately 1.8km long section would include:

- Swynnerton North cutting, approximately 650m in length, up to 105m in width and 17m in depth;
- Swynnerton (North) overbridge to the north of Swynnerton Heath Farm, to allow vehicular access either side of the route of the Proposed Scheme;
- two balancing ponds for railway drainage, one located west of the route of the Proposed Scheme at Clifford's Wood with access from the A519 Newcastle Road, and one located between the Common Lane Cold War Bunkers on the western side of the route, with access from Swynnerton Footpath 52/Common Lane (North);
- Hatton embankment approximately 1km in length and up to 9m in height;
- areas of woodland habitat creation adjacent to both sides of the route of the Proposed Scheme for approximately 1.5km of the section;
- Clifford's Wood underbridge to enable vehicular access either side of the route of the Proposed Scheme and the diversion of a tributary of Meece Brook watercourse;
- an area of grassland habitat creation immediately following Clifford's Wood underbridge, on both sides of the route of the Proposed Scheme;
- Plantation overbridge located north of Clifford's Wood, to allow vehicular access either side of the route of the Proposed Scheme;

- Plantation culvert approximately 120m south of Swynnerton Footpath 52 accommodation underbridge for diversion of a tributary of Meece Brook;
- replacement floodplain storage area located to the west of the Swynnerton Footpath 52 realignment on the western side of the route of the Proposed Scheme;
- realignment of Swynnerton Footpath 52, approximately 50m east of its existing alignment; and
- Swynnerton Footpath 52 accommodation underbridge, crossing the route of the Proposed Scheme approximately 20m south of its existing alignment to allow pedestrian and vehicular access either side of the route of the Proposed Scheme, and the diversion of a tributary of Meece Brook via Common Lane culvert.

2.2.35 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.36 Construction of this section would be managed from A519 Newcastle Road main compound and Swynnerton Footpath 52 satellite compound, which are described in Section 2.3, and as shown on maps CT-05-226 and CT-05-227 in the Volume 2, CA3 Map Book.

Swynnerton Footpath 52 realignment to Shelton under Harley

2.2.37 The route would continue on Hatton embankment from the realignment of Swynnerton Footpath 52 and would enter Hatton South cutting and Hatton North cutting, ending on Stableford North embankment. The Stableford mid-point auto-transformer station would be located at the end of this section. This section of the route would end at Shelton under Harley at the boundary with the Whitmore Heath to Madeley area (CA4).

2.2.38 This section of route is illustrated on maps CT-06-227 to CT-06-228a in the Volume 2 CA3 Map Book.

2.2.39 Key features of this approximately 2.3km section would include:

- Hatton embankment, approximately 70m in length and up to 9m in height;
- Hatton South cutting, approximately 1.3km in length, 70m in width and up to 10m in depth;
- diversion of Swynnerton Footpath 15 via the Swynnerton Footpath 52 accommodation underbridge to allow pedestrian access either side of the route of the Proposed Scheme. The diversion of Swynnerton Footpath 15 would continue in a north-west direction for approximately 500m on either side of the route of the Proposed Scheme to reconnect with its existing route;

- Dog Lane drop inlet culvert[16], where the existing Dog Lane would cross the route of the Proposed Scheme, with access from the diverted Bent Lane (North);
- Hatton North cutting, approximately 700m in length, 40m in width and up to 4m in depth;
- Dog Lane overbridge for the realignment of Dog Lane, crossing the route of the Proposed Scheme 150m north-west of its existing alignment;
- diversion of Bent Lane to create Bent Lane (North), to the east of the route of the Proposed Scheme, and passing south of Shelton under Harley before continuing to the Whitmore Heath to Madeley area (CA4);
- diversion of Bent Lane to create Bent Lane (South), to the south of, and parallel to, the route of the Proposed Scheme, continuing to the Whitmore borehole facility (in the Whitmore Heath to Madeley area (CA4));
- one balancing pond for railway drainage on the western side of the route of the Proposed Scheme with access via the realigned Bent Lane (South);
- replacement floodplain storage area to the west of the route of the Proposed Scheme, between the West Coast Main Line (WCML) and the Bent Lane (South) diversion;
- diversion of Swynnerton Footpath 10 along the western side of the route of the Proposed Scheme continuing into the Whitmore Heath to Madeley area (CA4);
- Stableford South embankment, approximately 180m in length and up to approximately 8m in height; and
- Stableford mid-point auto-transformer station on the eastern side of the route of the Proposed Scheme, with access from the diverted Bent Lane (North).

2.2.40 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.41 Construction of this section would be managed from the Swynnerton Footpath 52 satellite compound and Dog Lane satellite compound, which are described in Section 2.3 and as shown on maps CT-05-227 and CT-05-228a in the Volume 2, CA3 Map Book.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Stone and Swynnerton area. It includes:

- an overview of the construction process;
- a description of the advance works;

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

- a description of the engineering works to build the Proposed Scheme;
- information on construction waste and material resources;
- a description of how the Proposed Scheme would be commissioned; and
- an indicative construction programme.

2.3.2 The construction arrangements described in this section provide the basis for the assessment presented in this working draft EIA Report.

2.3.3 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2. Land would also be required temporarily for construction. Key temporary construction features are illustrated on the construction Maps Series CT-05 in Volume 2, CA3 Map Book. Land required temporarily would be prepared for its eventual end use once the construction works in that area are complete. Land would be returned to its pre-construction use, wherever appropriate, or to a condition as agreed with the owners of the land and relevant planning authority.

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

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

Code of Construction Practice

2.3.6 All contractors would be required to comply with a Code of Construction Practice (CoCP). In addition, local environmental management plans (LEMPs) would be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, with the objective of ensuring that the effects of the works upon people and the natural environment are reduced as far as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process.

2.3.7 A draft CoCP has been prepared and is published alongside this document, as an appendix to Volume 1. It will remain under review as the design of the Proposed Scheme develops and further engagement with stakeholders is undertaken.

Overview of the construction process

2.3.8 Building and preparing the Proposed Scheme for operation would comprise the following general stages:

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

2.3.9 General information about the construction process are set out in more detail in Volume 1, Section 6, including:

- the approach to environmental management during construction and the role of the CoCP;
- working hours;
- management of construction traffic; and
- handling of construction materials.

Advance works

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

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

Engineering works

Introduction

2.3.11 Construction of the Proposed Scheme would require engineering works along the entire length of the route, and within land adjacent to the route. This would comprise two broad types of engineering work:

- civil engineering works, such as earthworks and erection of bridges and viaducts; and/or
- works to install railway systems, which would include track, overhead line equipment, signalling, communications equipment and traction power supply.

2.3.12 The installation of track in open areas would comprise the laying of ballast and/or slab tracks, sleepers and rail.

2.3.13 The construction of the Proposed Scheme would be subdivided into sections, each of which would be managed from compounds. The compounds would act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds would either be main compounds or satellite compounds. Satellite compounds are generally smaller. Compounds would be used for civil engineering works or for railway installation works, or for both.

2.3.14 Eight civil engineering satellite compounds would be located in the Stone and Swynnerton area, two of which would continue to be used as railway installation satellite compounds following the completion of civil engineering works at those compounds.

2.3.15 All satellite compounds for civil engineering works within the Stone and Swynnerton area would be managed from the A519 Newcastle Road main compound. All satellite compounds for railway systems works would be managed from the Stone railhead main compound.

2.3.16 Figure 3 shows the management relationship for civil engineering works compounds and Figure 4 the railway installation works. Details about individual compounds are provided in subsequent sections of this report.

General overview of construction compounds

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

- space for the storage of bulk materials;
- space for the receipt, storage and loading/unloading of excavated material;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage, including plant maintenance facilities; and

- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

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

2.3.19 The storage of soil, stripped as part of the works prior to it being used when the land is reinstated, requires land for the duration of construction. The location of soil would generally be adjacent to compounds and areas of construction activity.

2.3.20 Stone railhead main compound, shown on maps CT-05-221 to CT-05-223 in the Volume 2, CA3 Map Book, would be located in the Stone and Swynnerton area, and would serve as the main compound for all railway systems installations and works for the Proposed Scheme. The railhead compound would be required to allow receipt and stabling of full construction trains. The railhead compound would 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 railhead would be in a good strategic location, located at a mid-way point along the route of the Proposed Scheme and therefore able to support construction activities for the full length of the Proposed Scheme. Additionally, it would have good connection to both the existing Norton Bridge to Stone Railway and the route of the Proposed Scheme in both directions. Road access to the railhead compound, including options to access the site from the M6 and/or the local road network, will be considered as part of the ongoing design development of the Proposed Scheme. The presence of the railhead compound may require the temporary closure of Yarnfield Lane. Options are being considered to determine if use of Yarnfield Lane could be maintained during the operation of the railhead compound.

2.3.21 Facilities at the railhead, and associated compound, would include offices, storage, a rail marshalling yard and pre-assembly depot and railway reception loops to manage trains from the national network, and could include worker accommodation. Sidings, approximately 700m in length, with storage and construction facilities for the track and overhead line equipment, would be provided. The proposed railhead compound design will be reported in the formal EIA Report.

2.3.22 During railway systems construction, the railhead would be used to import bulk materials, such as track ballast, rail and sleepers, by train via the Norton Bridge to Stone Railway. Materials would be stockpiled within the footprint of the railhead compound. Construction plant such as large earth-moving machinery, would be used to transport materials from the railhead through the compound. The railway sidings and office area on the site would be lit by mast floodlights. The lighting arrangement will be confirmed in the formal EIA Report. Access roads would also be lit with standard-height masts of up to approximately 12m. Stockpile areas would only be lit when in use.

2.3.23 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5.6 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes and transfer nodes

2.3.24 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, would take place within the construction compounds, on public roads and between the compounds and working areas. Construction traffic would also utilise the existing rail network. The construction compounds would provide the interface between the construction works and the public road or rail network. The likely road routes to access compounds in the Stone and Swynnerton area are described in subsequent sections of this report.

2.3.25 Where reasonably practicable, movements between the construction compounds and the work sites would be on designated haul roads within the site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.26 Areas of land are also required for the storage and loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas are referred to as transfer nodes and are shown on maps CT-05-222, CT-05-223 and CT-05-226 in the Volume 2, CA3 Map Book.

Figure 3: Construction compounds showing key indicative civil engineering works within the Stone and Swynnerton area

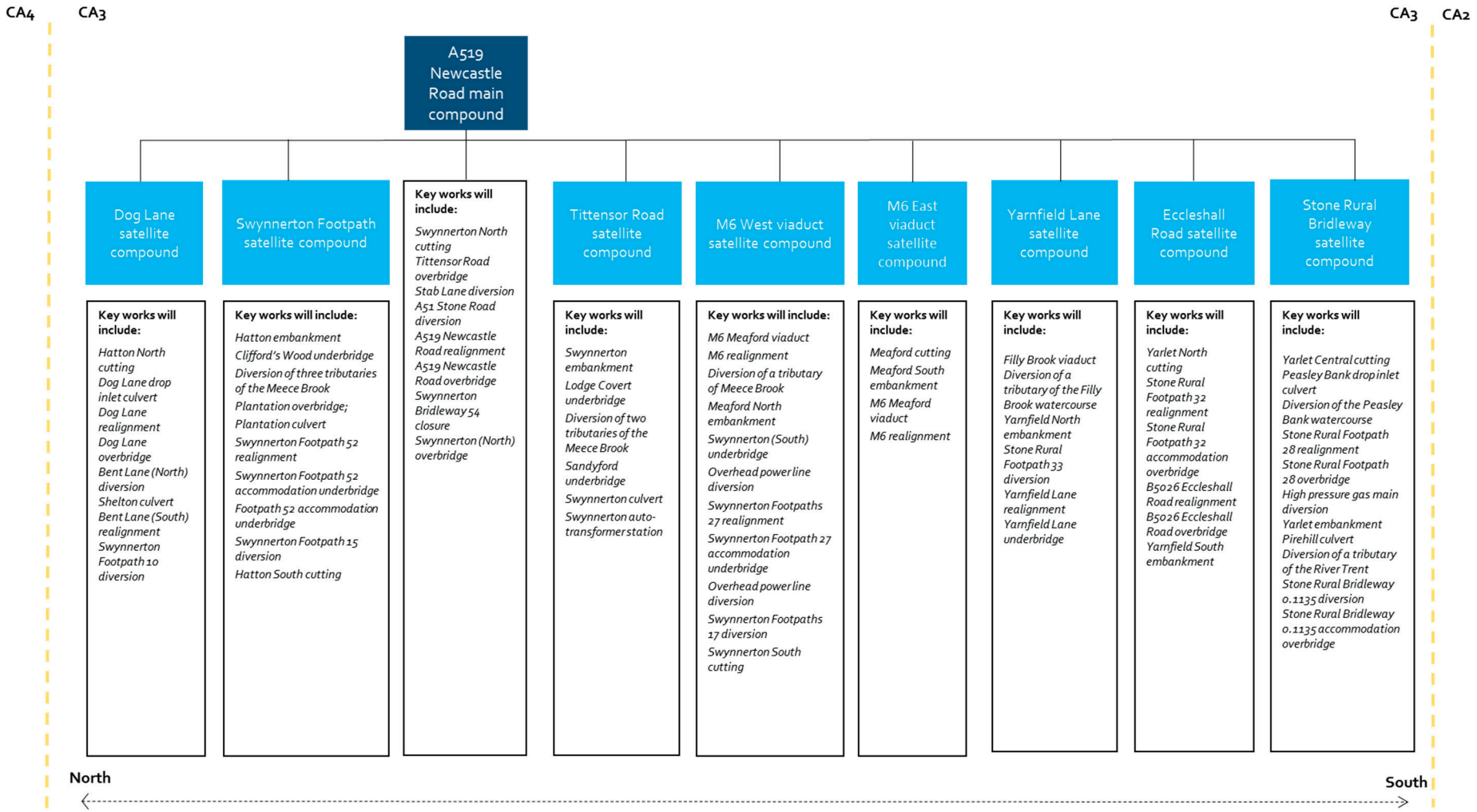
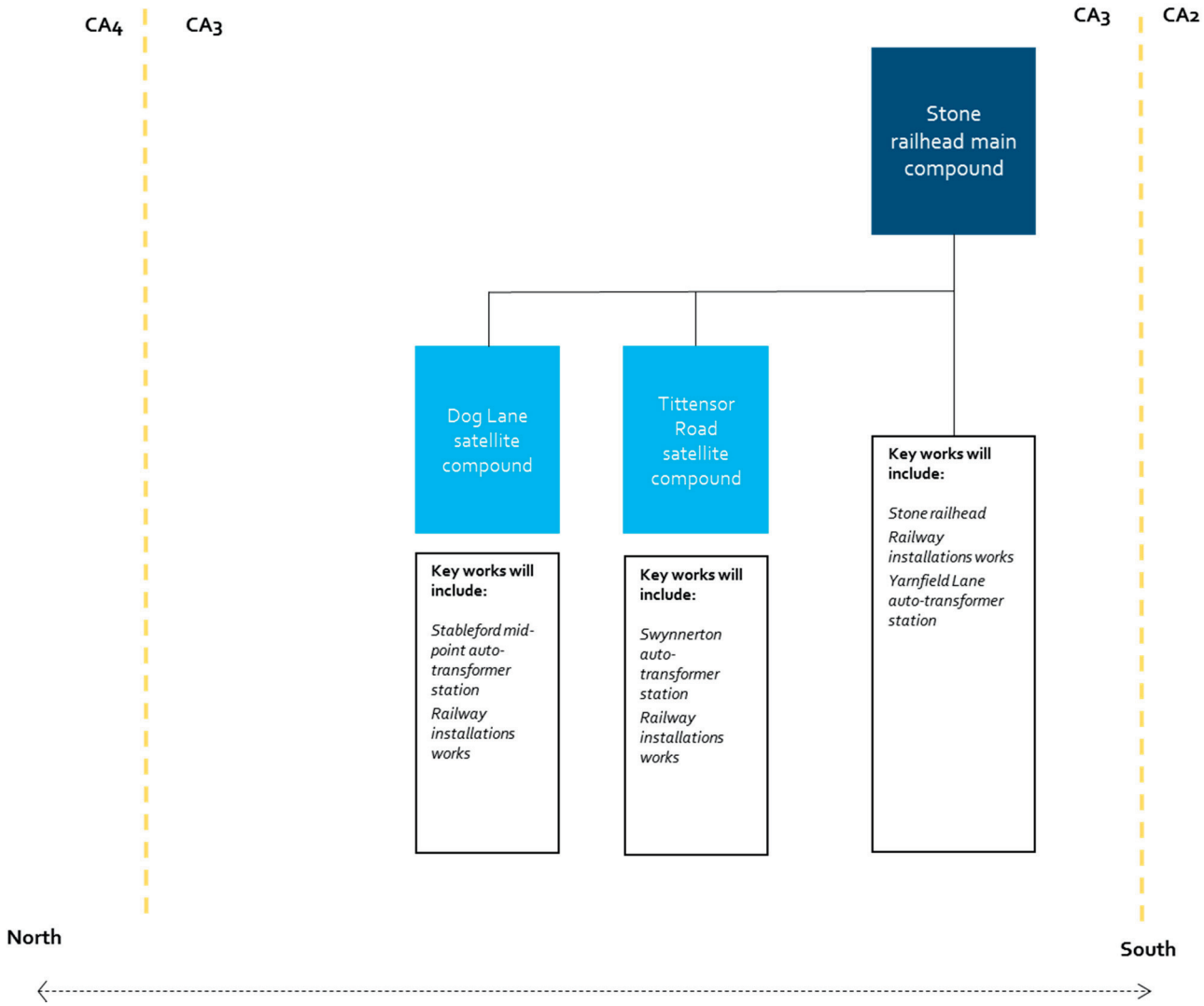


Figure 4: Construction compounds showing key indicative railway installation works within the Stone and Swynnerton area



Stone Rural Bridleway satellite compound

2.3.27 This compound would provide for civil engineering works and would:

- be operational for approximately four years and six months, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 25 workers at peak times) throughout much of the works period;
- be accessed via Pirehill Lane and Stone Rural Bridleway 0.1135; and
- be managed from A519 Newcastle Road main compound.

2.3.28 The compound would be used to manage the construction of the following works:

- Yarlet Central cutting;
- diversion of the Peasley Bank watercourse;
- Stone Rural Footpath 28 realignment;
- Stone Rural Footpath 28 overbridge;
- diversion of a high pressure gas main;
- Yarlet embankment;
- Pirehill culvert;
- diversion of a tributary of the River Trent;
- Stone Rural Bridleway 0.1135 realignment;
- Stone Rural Bridleway 0.1135 accommodation overbridge; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.29 It is currently anticipated that no demolitions would be required as a result of the works to be managed from this compound.

2.3.30 It is currently anticipated that no diversions of public roads would be required as a result of the works to be managed from this compound.

2.3.31 Temporary realignment of Stone Rural Footpath 28 would be required, diverting users approximately 50m to the south during the construction of the Stone Rural Footpath 28 overbridge for a period of approximately one year and six months. Following completion of the construction of Stone Rural Footpath 28 overbridge, the footpath would be permanently realigned via the overbridge close to its existing alignment. The temporary diversion of Stone Rural Bridleway 0.1135 for approximately 1km would be required for approximately 12 months and would be situated 50m south-east of its existing alignment. On completion, Stone Rural Bridleway 0.1135 would be permanently diverted approximately 150m over Stone Rural Bridleway 0.1135 accommodation overbridge.

2.3.32 A permanent diversion of Peasley Bank watercourse would be required adjacent to the route of the Proposed Scheme.

2.3.33 A permanent diversion of a tributary of the River Trent would be required as a result of the Stone Rural Bridleway 0.1135 realignment crossing beneath the route of the Proposed Scheme and the Stone Rural Bridleway 0.1135.

2.3.34 A permanent diversion of a high-pressure gas main would be required immediately north of the Stone Rural Footpath 28 overbridge, reconnecting approximately 20m south-east of its existing alignment, beyond Yarlet South cutting.

Eccleshall Road satellite compound and transfer node

2.3.35 This compound would provide for civil engineering works and would:

- be operational for approximately four years and six months, commencing during 2020;
- support approximately 65 civil engineering workers per day (approximately 100 workers at peak times) throughout much of the works period;
- be accessed via the B5026 Eccleshall Road; and
- be managed from A519 Newcastle Road main compound.

2.3.36 The compound would be used to manage the construction of the following works:

- Yarlet North cutting;
- Stone Rural Footpath 32 realignment;
- Stone Rural Footpath 32 accommodation overbridge;
- B5026 Eccleshall Road realignment;
- B5026 Eccleshall Road overbridge;
- diversion of an unnamed watercourse;
- Yarnfield South embankment; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.37 It is currently anticipated that no demolitions would be required as a result of the works to be managed from this compound.

2.3.38 Permanent realignment of B5026 Eccleshall Road would be required over a distance of approximately 350m, and approximately 50m north of its current alignment. During the construction period, temporary diversion of traffic on the B5026 Eccleshall Road would be required. The B5026 Eccleshall Road realignment and overbridge would require intermittent lane restrictions of the existing road over a period of approximately three months. The new section of road would be constructed offline and tie in works would be required to reconnect the section of new road to the existing road. Traffic would be diverted via Meece Road, Yarnfield Lane, Trent Road and the A519 Newcastle Road during construction.

2.3.39 A temporary realignment of Stone Rural Footpath 32 would be required, diverting users approximately 50m to the north of the Stone Rural Footpath 32 overbridge for a period of approximately one year and six months. Following completion of the

construction of the overbridge, the footpath would be permanently realigned via the overbridge close to its existing alignment.

2.3.40 Permanent diversion of an unnamed watercourse would be required, crossing the route of the Proposed Scheme under Filly Brook viaduct, to the southern side of the Norton Bridge to Stone Railway.

2.3.41 It is currently anticipated that no diversions of utilities would be required as a result of the works to be managed from this compound.

Stone railhead main compound

2.3.42 This compound would manage the construction of the Stone railhead and support the rail systems satellite compounds across the route of the Proposed Scheme, and would:

- be operational for approximately six years and nine months, commencing during 2020;
- support approximately 180 railway systems workers per day (approximately 290 workers at peak times) throughout much of the works period;
- be accessed via the B5026 Eccleshall Road and Yarnfield Lane from the A34 Stafford Road/The Fillybrooks, with planned upgraded emergency junction off the M6 (southbound) which would subsequently provide access to the compound (subject to confirmation with Highways England); and
- provide worker accommodation and welfare facilities in the form of a modular three-storey building for approximately 240 workers for the whole construction period.

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

- Stone railhead;
- railway installation works;
- Yarnfield Lane auto-transformer station; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.44 Civil engineering works and demolitions associated with the Stone railhead would be managed from the Yarnfield Lane satellite compound.

2.3.45 Temporary closure of Yarnfield Lane may be required for the construction of the Stone railhead and associated compound for a period of approximately three years. Options are being considered to determine if the use of Yarnfield Lane could be maintained during the operation of the railhead compound. Management of the temporary diversion of traffic from Yarnfield Lane is detailed under the Yarnfield Lane satellite compound.

2.3.46 It is currently anticipated that no permanent diversions of public roads would be required as a result of the works to be managed from this compound.

2.3.47 Temporary diversion of Stone Rural Footpath 33 would be required for the construction and operation of the Stone railhead, and associated compound for a

period of approximately three years. The temporary diversion of Stone Rural Footpath 33 would be managed by the Yarnfield Lane satellite compound.

2.3.48 It is currently anticipated that no permanent diversions of PRoW would be required as a result of the works to be managed from this compound.

2.3.49 It is currently anticipated that no temporary or permanent diversions of watercourses or utilities would be required as a result of the works to be managed from this compound.

Yarnfield Lane satellite compound and transfer node

2.3.50 This compound would provide for civil engineering and would:

- be operational for approximately six years and nine months, commencing during 2020;
- support approximately 90 civil engineering workers per day (approximately 135 workers at peak times) throughout much of the works period;
- be accessed via Yarnfield Lane from the A34 Stafford Road/The Fillybrooks; and
- be managed from A519 Newcastle Road main compound for civil engineering works.

2.3.51 The compound would be used primarily to manage the construction of the following works:

- Filly Brook viaduct;
- diversion of a tributary of the Filly Brook watercourse;
- Yarnfield North embankment;
- Stone Rural Footpath 33 diversion;
- Yarnfield Lane realignment;
- Yarnfield Lane underbridge; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.52 This compound would also manage the civil engineering works and demolitions associated with the Stone railhead.

2.3.53 It is currently anticipated that the following demolitions would be required as a result of the works to be managed from this compound:

- three two-storey brick cottages at Brookhouse, Yarnfield Lane;
- two two-storey brick cottages at Little Micklow Farm; and
- seventeen steel frame outbuildings at Pool House Farm.

2.3.54 Permanent realignment of Yarnfield Lane approximately 50m south-east of the existing alignment would be required, crossing the route of the Proposed Scheme via

Yarnfield Lane underbridge. During the construction period, temporary closure of Yarnfield Lane and the resulting diversion of traffic would be required via Meece Road, Eccleshall Road, Trent Road and the A519 Newcastle Road for a period of approximately three years. Temporary diversion of Stone Rural Footpath 33, would be required for a period of approximately three years during the construction works, diverting users for approximately 600m via the realigned Yarnfield Lane, before heading north-west adjacent to the M6 to connect up with the existing PRoW. On completion of the construction works, the footpath would be permanently diverted via the Yarnfield Lane underbridge, before running parallel to the west of the route in a northern direction for approximately 450m.

2.3.55 Permanent diversion of a tributary of Filly Brook would be required. The watercourse would be diverted to follow the Yarnfield North embankment, before crossing beneath the Filly Brook viaduct to the northern side of the route of the Proposed Scheme.

2.3.56 It is currently anticipated that no diversions of utilities would be required as a result of the works to be managed from this compound.

M6 East viaduct satellite compound

2.3.57 This compound would provide for civil engineering works and would:

- be operational for approximately four years and three months, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 25 workers at peak times) throughout much of the works period;
- be accessed initially via the Yarnfield Lane satellite compound; and
- be managed from A519 Newcastle Road main compound.

2.3.58 The compound would be used primarily to manage the construction of the following works:

- Meaford cutting;
- Meaford South embankment;
- M6 Meaford viaduct;
- M6 realignment; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.59 It is currently anticipated that no demolitions would be required as a result of the works to be managed from this compound.

2.3.60 Lane restrictions on the M6 would be required over a period of approximately one year and six months to allow for the localised realignment of the M6 and construction of the M6 Meaford viaduct. Overnight and/or weekend lane closures may also be required during the construction period.

2.3.61 It is currently anticipated that no diversions of PRoW, watercourses or utilities would be required as a result of the works managed from this compound.

M6 West viaduct satellite compound

2.3.62 This compound would provide for civil engineering works and would:

- be operational for approximately four years and three months, commencing during 2020;
- support approximately 25 civil engineering workers per day (approximately 40 workers at peak times) throughout much of the works period;
- be accessed via the M6 (subject to confirmation with Highways England) and/or Tittensor Road satellite compound; and
- be managed from A519 Newcastle Road main compound.

2.3.63 The compound would be used primarily to manage the construction of the following works:

- M6 Meaford viaduct;
- M6 realignment;
- diversion of a tributary of Meece Brook watercourse;
- Meaford North embankment;
- Swynnerton (South) underbridge;
- overhead power lines diversion;
- Swynnerton Footpath 27 realignment;
- Swynnerton Footpath 27 accommodation underbridge;
- Swynnerton Footpath 17 diversion;
- Swynnerton South cutting; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.64 It is currently anticipated that no demolitions would be required as a result of the works to be managed from this compound.

2.3.65 It is currently anticipated that no temporary closures of public roads would be required as a result of the works to be managed from this compound.

2.3.66 Lane restrictions on the M6 would be required over a period of approximately one year and six months to allow for the localised realignment of the M6 and construction of the M6 Meaford viaduct. Overnight and/or weekend lane closures may also be required during the construction period.

2.3.67 Temporary realignment of Swynnerton Footpath 27 would be required during the construction period, diverting users around the area required for construction works for approximately 150m over a period of approximately one year and six months.

Once completed, the footpath would be permanently realigned via the Stone Rural Footpath 27 overbridge.

2.3.68 Temporary diversion of Swynnerton Footpath 17 would be required during the construction period, diverting users around the edge of the area required for construction works for approximately 400m in a north-west direction adjacent to the route of the Proposed Scheme over a period of approximately one year and six months. Once completed, the footpath would be permanently diverted via the Swynnerton Footpath 27, joining it on the southern side of the Proposed Scheme at the Swynnerton Footpath 27 overbridge.

2.3.69 It is currently anticipated that no temporary diversions of watercourses would be required as a result of the works to be managed from this compound.

2.3.70 A permanent diversion of a tributary of Meece Brook watercourse would be required. The watercourse would cross beneath the M6 Meaford viaduct, adjacent to the Meaford North embankment.

2.3.71 Two overhead power lines would be temporarily realigned where they cross the route of the Proposed Scheme at Meaford embankment, north of the M6 Meaford viaduct, to allow permanent realignment of these.

Tittensor Road satellite compound

2.3.72 This compound would provide for civil engineering works and railway systems works and would:

- be operational for approximately seven years, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 25 workers at peak times) throughout much of the works period;
- approximately 30 railway systems workers per day (approximately 40 during peak times) throughout much of the works period;
- be accessed via Tittensor Road; and
- be managed from the A519 Newcastle Road main compound for civil engineering works and the Stone railhead main compound for railway systems works.

2.3.73 The compound would be used to manage the construction of the following works:

- Swynnerton embankment;
- Lodge Covert underbridge;
- diversion of an two tributaries of the Meece Brook watercourse;
- Sandyford underbridge;
- Swynnerton culvert; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.74 It is currently anticipated that no demolitions would be required as a result of the works to be managed from this compound.

2.3.75 It is currently anticipated that no temporary or permanent diversions of public roads and PRoW would be required as a result of the works to be managed from this compound.

2.3.76 It is currently anticipated that no temporary diversions of watercourses would be required as a result of the works to be managed from this compound.

2.3.77 A permanent diversion of two tributaries of the Meece Brook watercourse would be required. One watercourse would cross beneath the route of the Proposed Scheme via Lodge Covert underbridge and the other would cross beneath the route via Swynnerton culvert.

2.3.78 It is currently anticipated that no temporary or permanent diversions of utilities would be required as a result of the works to be managed from this compound.

A519 Newcastle Road main compound

2.3.79 This compound would provide for civil engineering works and support the civil engineering satellite compounds in this area and in the Whitmore Heath to Madeley area (CA4) and would:

- be operational for approximately four years and three months, commencing during 2020;
- support approximately 200 civil engineering workers per day (approximately 300 workers at peak times) throughout much of the works period; and
- be accessed via the A519 Newcastle Road and the A51 Stone Road.

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

- Swynnerton North cutting;
- Tittensor Road diversion;
- Tittensor Road overbridge;
- Stab Lane diversion;
- A51 Stone Road diversion;
- A519 Newcastle Road realignment;
- A519 Newcastle Road overbridge;
- Swynnerton Bridleway 54 closure;
- Swynnerton (North) overbridge; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.81 It is currently anticipated that no demolitions will be required as a result of the works to be managed from compound.

2.3.82 The A51 Stone Road would be closed for approximately one year to allow for the construction of the A519 Newcastle Road overbridge and the realignment of the A51 Stone Road. Traffic would be temporarily diverted via the A519 Newcastle Road and Stab Lane. Once completed, the A51 Stone Road would be permanently realigned to run parallel to the route of the Proposed Scheme until it joins the A519 Newcastle Road approximately 150m east of the A519 Newcastle Road overbridge.

2.3.83 A temporary diversion of traffic on Tittensor Road would be required via Stab Lane and the A519 Newcastle Road for approximately three months, to allow a short section of new road to be constructed offline. Once completed, Tittensor Road would be permanently diverted approximately 350m north-west of the existing alignment and would connect into the A51 Stone Road diversion on the northern side of the route of the Proposed Scheme.

2.3.84 Stab Lane would be permanently diverted to the north-west of its existing alignment before re-joining its existing alignment approximately 300m to the west of Whitehouse residential property, running adjacent to the route of the Proposed Scheme.

2.3.85 Permanent closure of Swynnerton Bridleway 54 would be required for approximately 50m to enable connection of the bridleway to the A51 Stone Road diversion.

2.3.86 It is currently anticipated that no diversions of watercourses and utilities would be required as a result of the works to be managed from this compound.

Swynnerton Footpath 52 satellite compound

2.3.87 This compound would provide for civil engineering works and would:

- be operational for approximately four years and three months, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 25 workers at peak times) throughout much of the works period;
- be accessed via the A519 Newcastle Road; and
- be managed from the A519 Newcastle Road main compound.

2.3.88 The compound would be used primarily to manage the construction of the following works:

- Hatton embankment;
- Clifford's Wood underbridge;
- diversion of three tributaries of the Meece Brook watercourse;
- Plantation overbridge;
- Plantation culvert;
- Swynnerton Footpath 52 realignment;
- Swynnerton Footpath 52 accommodation underbridge;

- Swynnerton Footpath 15 diversion;
- Hatton South cutting; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.89 The demolition of a Ministry of Defence reinforced concrete bunker at the Common Lane Cold War bunker site would be required as a result of the works to be managed from this compound.

2.3.90 It is currently anticipated that no temporary or permanent diversions of public roads would be required as a result of the works to be managed from this compound.

2.3.91 Swynnerton Footpath 52 would be temporarily realigned approximately 150m to the north for a period of approximately one year and six months. Once completed, the footpath would be permanently realigned approximately 50m east of its existing alignment and would cross the route of the Proposed Scheme via the Swynnerton Footpath 52 accommodation overbridge.

2.3.92 Swynnerton Footpath 15 would be temporarily diverted to the south for a distance of approximately 500m, crossing the route of the Proposed Scheme via the Swynnerton Footpath 52 accommodation overbridge, before heading north for a further 500m to rejoin its existing alignment. Once completed, Swynnerton Footpath 15 would be permanently diverted along a similar route to the temporary diversion described above, following the Hatton South cutting on both sides of the route, and crossing via the Swynnerton Footpath 52 accommodation overbridge.

2.3.93 Temporary widening of Swynnerton Footpath 52 would be required for a period of approximately three months to allow for the construction of a short section of new footpath and provide vehicular access to the compound. Once completed, Swynnerton Footpath 52 would be permanently realigned approximately 50m to the east of its current location and would cross the Proposed Scheme via the Swynnerton Footpath 52 accommodation overbridge.

2.3.94 A permanent diversion of three tributaries of the Meece Brook watercourse would be required. The first watercourse would cross beneath Clifford's Wood underbridge. The second watercourse would cross beneath the route of the Proposed Scheme via Plantation culvert. The third watercourse would cross beneath the route of the Proposed Scheme via Swynnerton Footpath 52 accommodation underbridge.

2.3.95 It is currently anticipated that no diversions of utilities would be required as a result of the works to be managed from this compound.

Dog Lane satellite compound

2.3.96 This compound would provide for civil engineering works and railway systems works and would:

- be operational for approximately four years and three months, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 30 workers at peak times) throughout much of the works period;

- support 30 railway systems workers per day (approximately 40 during peak times) throughout much of the works period;
- be accessed via Bent Lane and Bent Lane (North);
- be managed from the A519 Newcastle Road main compound for civil engineering works and the Stone railhead main compound for railway systems works.

2.3.97 The compound would be used to manage the construction of the following works:

- Hatton North cutting;
- Dog Lane drop inlet culvert;
- Dog Lane realignment;
- Dog Lane overbridge;
- Bent Lane (North) diversion;
- Shelton culvert;
- Bent Lane (South) diversion;
- Swynnerton Footpath 10 diversion; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.98 It is currently anticipated that demolition of a residential property at Shelton under Harley Farm would be required as a result of the works to be managed from this compound.

2.3.99 A temporary diversion of traffic on Dog Lane would be required via local roads for a period of three months to allow for the offline construction of a short section of new road. Once completed, Dog Lane would be permanently realigned approximately 120m to the north of its existing alignment and would cross the route of the Proposed Scheme via the Dog Lane overbridge.

2.3.100 Bent Lane would be permanently diverted to the north, parallel to the route from the existing intersection with Dog Lane, past Shelton under Harley Farm, and continuing in to the Whitmore Heath to Madeley area. To the south, Bent Lane would be diverted to run parallel to the route. These new sections of road are referred throughout this document as Bent Lane (North) and Bent Lane (South).

2.3.101 It is currently anticipated that no temporary diversions of PRoW would be required as a result of the works to be managed from this compound.

2.3.102 A permanent diversion of Swynnerton Footpath 10 would be required from the diverted Bent Lane (North) for approximately 250m, north of its existing alignment into the Whitmore Heath to Madeley area, crossing the Proposed Scheme via the Swynnerton Footpath 10 overbridge.

2.3.103 It is currently anticipated that no temporary or permanent diversions of watercourses and utilities would be required as a result of the works to be managed from this compound.

Construction waste and material resources

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

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

Commissioning of the railway

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

Construction programme

2.3.107 A construction programme illustrating indicative periods for the construction activities described above is provided in Figure 5.

Figure 5: Indicative construction programme

Construction activity	2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters				2027 quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Preparatory and enabling works																																
Site compound set up, clearance, enabling works																																
Drainage and watercourse diversions																																
Road, footpath and utility diversions																																
Main construction works - Earthworks																																
Cuttings																																
Embankments																																
Mitigation earthworks																																
Main construction works - Structures																																
Retaining walls																																
Viaducts, underbridges and culverts																																
Overbridges and accommodation structures																																
Auto-transformer and sub-stations																																
Reinstatement, soft landscaping and finishes																																
Rail infrastructure fit-out																																
Track laying and overhhead line equipment (inc Railhead)																																
Commissioning																																
Commissioning																																

Key	
	Construction activity that takes place at one or more locations for the majority of the quarter highlighted
	Construction activity that takes place at discrete locations for intermittent periods during the quarter highlighted

2.4 Operation of the Proposed Scheme

Operational specification

Introduction

2.4.1 Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme and how they change when the remainder of Phase Two, as a whole, is operational.

HS2 services

2.4.2 It is anticipated that there would be up to six trains per hour in each direction upon opening in 2027, rising to up to 12 trains per hour each way passing through the Stone and Swynnerton area when the full Phase Two route is operational. Services are expected to operate between 05:00 and 24:00 from Monday to Saturday and between 08:00 and 24:00 on Sunday.

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

Maintenance

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

2.4.5 It is intended that inspections of the route would take place on a regular basis when the railway is not operating. There would be routine preventative maintenance, including grinding and milling of the rails in line with the maintenance strategy to keep them in good condition, and more periodic heavy maintenance as necessary.

2.4.6 Railway maintenance vehicles would be parked either at the defined maintenance loops in Pipe Ridware, in the Fradley to Colton area (CA1) or at the HS2 infrastructure maintenance depot (IMD), currently proposed at Crewe in the South Cheshire area (CA5). The maintenance loops would enable maintenance trains to be stabled temporarily during the day when maintenance activities are being undertaken over a number of nights without returning to the HS2 Crewe IMD. Further information on the maintenance loops can be found in Volume 2, CA1 Fradley to Colton. Further information on the HS2 Crewe IMD can be found in Volume 2, CA5 South Cheshire.

Operational waste and material resources

2.4.7 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and any associated potential significant environmental effects are provided in Volume 3, Section 15.

2.5 Route section alternatives

Introduction

2.5.1 The strategic and route corridor alternatives to the Proposed Scheme are presented in the Alternatives report as an appendix to the Volume 1.. The local alternatives

considered for the Proposed Scheme within the Stone and Swynnerton area are described in this section.

2.5.2 Since November 2015, as part of the design development process, a series of potentially feasible local alternatives have been reviewed within workshops attended by engineering, planning and environmental specialists. The potential environmental impacts of each design option have been reviewed during these workshops. The purpose of the reviews has been to ensure that the Proposed Scheme draws the appropriate balance between engineering requirements, cost and potential environmental impacts.

2.5.3 The following sub-paragraphs describe the local alternatives considered in this area and includes a comparison of the environmental effects associated with each option and the main reasons for selecting the option to be taken forward into the Proposed Scheme. In considering the environmental effects, all topics have been taken into account; however, only those topics where there is a potential for a moderate or major effect are reported below.

Stone railhead and Stone railhead main compound

2.5.4 As part of the design development process, since the announcement of the scheme in November 2015, consideration has been given to the location of a temporary railhead and associated compound. The railhead, and associated compound, would be required to accommodate rail systems construction works, as well as allow receipt and stabling of full construction trains. The introduction of a railhead is required to facilitate efficient construction of the Proposed Scheme so as to maintain the proposed programme. The introduction of a railhead in this area would not require a change to the route in any of the options considered.

2.5.5 A preliminary options appraisal was undertaken and four options were not taken forward for further consideration. A railhead located near Madeley was discounted due to the engineering practicability of being located between the Madeley and Whitmore tunnels. Two different locations to the west of Stone and east of the route of the Proposed Scheme, which would connect into the Norton Bridge and Stone railway, were discounted for their proximity to the community of Stone and the impact on the local road network. A railhead location that would connect into the route of the Proposed Scheme, crossing the M6 and connecting into the Norton Bridge to Stone Railway, was discounted due to the proximity to the community of Yarnfield and the requirement to take a large area of agricultural land.

2.5.6 The following options were identified, analysed and the impacts assessed:

- Option 2 Stone North-West: a railhead, and associated compound, located to the west of Stone, on severed land between the M6 and the route of the Proposed Scheme. This option would enable a southbound connection into the route of the Proposed Scheme, as well as a connection into both directions of the Norton Bridge to Stone Railway, on the northern side, via an approximately 700m long railway siding in the direction of Stone. The land required for the railhead and associated compound extends approximately 1.6km north of the Norton Bridge to Stone Railway, with a width of approximately 300m;

- Option 3 Stone South-West: a railhead, and associated compound, located to the south-west of Stone, on severed land between the M6 and the route of the Proposed Scheme, connecting into both directions of the Norton Bridge to Stone Railway, on the northern side, via an approximately 700m long railway siding in the direction of Stone. This option enables a connection into the route of the Proposed Scheme in both directions. The land required for the railhead, and associated compound would extend in a south-easterly direction from the Norton Bridge to Stone Railway for approximately 2.5km;
- Option 5 Basford Hall, Crewe: a railhead, and associated compound, located in the proposed area of the HS2 Crewe IMD in the South Cheshire area (CA5). This option provides a southbound connection into the route of the Proposed Scheme and a connection into the WCML in both directions via approximately 2.2km railway sidings. The land required for the railhead and associated compound has an approximate length of 1.3km and a width of approximately 300m at its widest extent; and
- Option 8 Stone Hybrid: a railhead, and associated compound, between the M6 and the route of the Proposed Scheme, utilising land both north and south of the Norton Bridge to Stone Railway. The railhead would connect into both directions of the Norton Bridge to Stone Railway, on the southern side, via an approximately 700m long railway siding in the direction of Stone. This option enables a connection into the route of the Proposed Scheme in both directions. The land required for the railhead and associated compound utilises severed land between the M6 and the Proposed Scheme.

2.5.7 Option 2 would require the temporary closure of Yarnfield Lane with traffic being diverted onto Eccleshall Road, which has the potential to result in congestion and delays. There are historic landfills and former quarries within the land required and there would be loss of agricultural land, impact on land holdings and a degrading of the open rural landscape character in the area. The railhead and associated compound would be visible from Stone. Filly Brook and its associated floodplain would be directly impacted and there would be a loss of ecological priority habitats and biodiversity.

2.5.8 Option 3 would result in considerable waste impacts due to the earthwork excavation quantities required to construct the railhead and associated compound at this location. There would be a loss of agricultural land and commercial agricultural holdings would be severely impacted. The railhead and associated compound would be visible from Stone and there would be a degrading of the open rural landscape character. A tributary of the Filly Brook and its associated flood plain would be directly impacted.

2.5.9 Option 5 would impact on an approved planning application for general industry, storage and distribution and a separate application for residential development, offices and local amenity facilities. This option would result in an impact on the community due to the location within an urban and residential context. This option is less environmentally sensitive in comparison with alternative locations with regard to water and flood risk, as well as overall landscape impacts, due to its location within a more urban context and the landscape character of the surrounding area.

2.5.10 Option 8 would result in the likely sterilisation of a mineral safeguarding area (MSA) for sand and gravels. There would also be a loss of ecological priority habitats and biodiversity and an area of floodplain associated with the Filly Brook. This option may require the temporary closure of Yarnfield Lane with traffic being diverted onto the B5026 Eccleshall Road, which has the potential to result in congestion and delays. Agricultural land would be impacted due to the large amounts of land required in a largely rural landscape; increasing the visual disturbance in the area.

2.5.11 Option 8 has been taken forward into the Proposed Scheme. The location of the railhead in Option 8 would enable access to the route of the Proposed Scheme in both directions, considerably reducing the programme and constructability risk through the ability to serve the construction of the Proposed Scheme in two directions. This option is also strategically positioned in the middle section of the route of the Proposed Scheme and would require considerably less excavation, transportation and storage of material than Option 3. The preferred environmental option is Option 5, as it would have less environmental impacts when compared with the other options. However, Option 8 incurs only a minor worsening for environmental issues when compared to Option 5.

2.5.12 As part of the next phase of design development, further consideration will be given to the location of permanent maintenance facilities in the Phase 2a area, including locations at Crewe (the HS2 Crewe IMD) and the Stone railhead. These facilities would be a permanent feature of the Proposed Scheme, operating 24 hours a day, seven days a week, and are likely to include the following facilities:

- a two-track siding for plant train stabling, approximately 140m in length;
- a two-track siding for ballast train stabling, approximately 250m in length;
- a siding for refuelling and water provision;
- workshop area with associated siding;
- secure compound and covered and open store areas for rail systems parts;
- laydown area for track and overhead line equipment;
- ballast storage area;
- lighting;
- administration building and staff welfare facilities; and
- car parking.

2.5.13 The footprint of permanent maintenance facilities at Stone would be unlikely to require an increase in land from that which has been identified for the railhead and associated compound.

2.5.14 The proposed location and design of the permanent maintenance facilities will be reported in the formal EIA Report.

Bent Lane (North) diversion

2.5.15 As part of the design development process, since the announcement of the scheme in November 2015, consideration has been given to the diversion of Bent Lane, south-west of Swynnerton Old Park. The Proposed Scheme would result in the creation of Bent Lane (North) passing south of Shelton under Harley, maintaining access to Whitmore, which would otherwise be severed by the route of the Proposed Scheme.

2.5.16 The following options for Bent Lane (North) were identified, analysed and impact assessed:

- Option 1: (Route announced in November 2015) Bent Lane (North) diversion would continue from Dog Lane on the northern side of the route of the Proposed Scheme in a westerly direction for approximately 400m before passing approximately 150m north of Shelton under Harley. The diversion would then continue in a south-westerly direction into the Whitmore Heath to Madeley area (CA4) for approximately 450m before reconnecting into the existing Bent Lane; and
- Option 2: Bent Lane (North) diversion would continue from Dog Lane on the northern side of the route of the Proposed Scheme in a westerly direction for approximately 500m before passing adjacent and to the south of Shelton under Harley. This option would then continue on the existing Bent Lane alignment for approximately 250m into the Whitmore Heath to Madeley area (CA4), remaining north of the Proposed Scheme.

2.5.17 Option 1 would sever the Shelton under Harley farm buildings from their wider land use through both the construction and operation phases. With this option the open rural landscape character would be impacted, including the historic context of Swynnerton Old Park, and would be visible from both Shelton under Harley and the park.

2.5.18 Option 2 would directly affect surface water flow paths and is likely to impact on groundwater quality during construction due to the proximity of the Sever Trent Water boreholes and a source protection zone 1 (SPZ1). This option negates the severance of Shelton under Harley Farm, limiting agricultural land and connectivity loss, whilst also reducing the amount of land required as a result of the Proposed Scheme. Option 2 would require less land; construction activities would be located further away from Swynnerton Old Park, and it would reduce the potential to impact on ecological priority habitats and biodiversity within the park. Severance of Shelton under Harley Farm would be avoided and the loss of agricultural land would be reduced.

2.5.19 Option 2 has been taken forward into the Proposed Scheme. Option 2 is also the preferred environmental option, as it would provide greater environmental benefits than Option 1. Mitigation against the outstanding environmental issues of this option will be addressed, where practicable, within the topic chapters.

3 Stakeholder engagement and consultation

3.1 Introduction

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

3.1.2 This section summarises the engagement and consultation that has been undertaken within the Stone and Swynnerton area since the route announcement in November 2015. It identifies the stakeholders who have been engaged during this process and how they have informed the design and assessment of the Proposed Scheme to date.

3.1.3 These stakeholders include:

- technical and specialist groups / stakeholders;
- local authorities and parish councils;
- communities; and
- directly affected individuals and landowners.

3.1.4 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.

3.1.5 Whilst stakeholders have informed the design and assessment of the Proposed Scheme to date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft 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.

3.2 Key stages of Phase 2a engagement and consultation

3.2.1 The process of engagement began in 2009 and remains ongoing. A summary of engagement undertaken or underway since the route announcement in November 2015 is provided in Table 1 and reported in this section. This has included the draft SMR, property consultation and a series of meetings with national and local environmental stakeholders, local authorities, parish councils, individual landowners and organisations.

Table 1: Mechanisms and timeline of stakeholder engagement since route announcement

Date	Engagement and consultation activity and mechanisms	Stakeholders engaged/consulted
December 2015-ongoing	Commencement of direct engagement for the development of the Proposed Scheme and assessment.	Direct engagement with local authorities and with technical and specialist stakeholders.

Date	Engagement and consultation activity and mechanisms	Stakeholders engaged/consulted
8 March-13 May 2016	Consultation on the draft EIA and Equality Impact Assessment (EQIA) SMR to inform the EIA and EQIA.	Published and made available nationally on HS2 website[17] Technical and specialist stakeholders, and councils, directly invited to participate.
January 2016 ongoing	Site visits with farmers and growers.	Direct engagement with individual farmers and growers.
November 2015-February 2016	Consultation on property compensation with owners and occupiers	Direct engagement with individual farmers and growers.
September-November 2016	Consultation on the working draft EIA Report, EQIA Report and design refinements	Direct engagement with communities through public events and documents available at a range of community locations across the route.

3.3 Technical and specialist groups

3.3.1 Engagement has also been undertaken with technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged in this context include:

- Environment Agency;
- Natural England;
- Historic England;
- National Trust;
- Canal & River Trust;
- the Staffordshire Wildlife Trust;
- Department of Environment Food and Rural Affairs (Defra);
- Food and Environment Research Agency (FERA);
- the Woodland Trust;
- British Geological Survey (BGS);
- National Farmers Union;
- Country Land and Business Association; and
- Highways England.

[17] UK Government: HS2 Phase Two: West Midlands to Crewe Draft Environmental Impact Assessment Scope and Methodology Report consultation. Available online at: https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-draft-environmental-impact-assessment-scope-and-methodology-report-consultation

3.3.2 Engagement with these stakeholders has been instrumental in providing detailed specialist baseline information to inform the working draft EIA Report and the design development of the Proposed Scheme.

3.3.3 Local organisations with a specialist interest in the community - for example, the Staffordshire Wildlife Trust have been engaged and have informed individual technical assessments, such as the ecological assessment.

3.3.4 Further information about topic-specific engagement is provided in Sections 4 - 15.

3.3.5 Engagement is also ongoing with utility companies and statutory stakeholders such as Network Rail and the Oil and Pipelines Agency to establish what infrastructure exist in the Stone and Swynnerton area and how it may need to be modified as part of the Proposed Scheme.

3.4 Local authorities and parish councils

3.4.1 The Stone and Swynnerton area is represented by the following county, borough, district and parish councils:

- Staffordshire County Council;
- Stafford Borough Council;
- Stone Rural Parish Council; and
- Swynnerton Parish Council.

3.4.2 Direct engagement has been undertaken with these councils 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.

3.4.3 Engagement has focused on the technical areas which inform the assessment, including, cultural heritage, ecology and biodiversity, land quality, landscape and visual, sound, noise and vibration, traffic and transport, water and flood risk, amongst others topics.

3.4.4 Some key discussion and inputs gained from engagement with Staffordshire County Council and Stafford Borough Council include:

- discussions with regard to the planned highways and PRoW routes, noting local conditions and concerns regarding traffic, congestion and community impact;
- understanding and gathering information on listed buildings and local sites of archaeological interest;
- gathering information on the potential contamination of local sites to inform the development of the Proposed Scheme and the land quality assessment;
- collating information regarding water, flood risk and groundwater issues within the local area and identifying vulnerabilities to flooding or groundwater issues which should inform the development of the Proposed Scheme and assessment;

- agreeing appropriate viewpoints for assessing impacts to the landscape and visual assessment;
- identifying locations for surveying and data collection to inform the sound, noise and vibration assessment; and
- understanding the local community and those within it who have particular sensitivities or vulnerability, to inform the assessment of community, health and wellbeing, and the separate equalities assessment.

3.4.5 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft CoCP.

3.5 Communities

3.5.1 Community stakeholders in the area include a range of local interest groups, local facility and service providers, schools and educational establishments.

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

3.5.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular with those close to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft EIA Report, whilst also informing the separate equality impact assessment (EQIA) being undertaken in parallel to the EIA.

3.5.4 As part of the consultation process for this working draft EIA Report and on refinements to the design, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity, including a mailout to properties along the line of route, newspaper adverts, and posters sent to local venues. Documents have been made available online and in community libraries.

3.6 Directly affected individuals and landowners

3.6.1 This group includes farmers, growers and those with residential property potentially affected by the Proposed Scheme.

Farmers and growers

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

refined to reduce the loss of agricultural land, and the location of accommodation overbridges across the route have been refined to better reflect the need of farmers.

3.6.3 Twelve farm visits have been undertaken in this area and these will continue, as appropriate, as the Proposed Scheme develops.

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

Property consultation

3.6.5 A property consultation took place between 30 November 2015 and 25 February 2016. Its purpose was to inform the Government's decision on whether the compensation and assistance schemes in place for Phase One would be altered for Phase 2a, based on the views of those individuals and organisations who expressed their opinions on the proposals.

3.6.6 The analysis of consultation responses was summarised in HS2 Phase Two: West Midlands to Crewe Property Consultation 2015. A Report to HS2 Ltd and the Department for Transport[18] and the Government response issued in the Decision Document HS2 Phase Two: West Midlands to Crewe Property Consultation 2015[19].

3.6.7 A programme of property consultation events was undertaken route-wide, in parallel to the working draft EIA process. Within the local area, a property consultation event was held for landowners and individuals at Yarnfield Village Hall on the 16 January 2016. The purpose of the property consultations were to give members of the public the opportunity to speak with property, environment and engineering specialists about the details of the Government's proposals for compensation and assistance for property owners living in the Stone and Swynnerton area.

3.7 SMR consultation

3.7.1 The draft SMR was formally consulted on in March to May 2016. As set out in Volume 1, the draft SMR was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public.

3.7.2 Twenty-six responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Report published alongside this working draft EIA Report and will be used to inform the assessment methodologies applied for the formal EIA Report.

3.8 Informing the Proposed Scheme

3.8.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to route announcement in November 2015.

[18] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/526063/HS2_Phase_2a_Property_Consultation_2015_Response_Summary_Report.pdf

[19] UK Government: HS2 Phase Two: West Midlands to Crewe Property Consultation 2015. Available online at: https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-property-consultation-2015

3.8.2 The main themes to emerge from stakeholder engagement in the Stone and Swynnerton since the route announcement in November 2015, and which are informing the Proposed Scheme are:

- retention or realignment of PRoW;
- the importance of maintaining accessibility of local roads for agricultural and business use as well as everyday use, particularly for the residents of villages such as Swynnerton and Yarnfield;
- the visual impact of the Proposed Scheme in particular through the historical landscape at Swynnerton Old Park and ancient woodlands;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- the route of the Proposed Scheme and local roads so as to minimise impact of severed agricultural land as well as residential properties particularly at Swynnerton; and
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks.

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

3.9 Consultation on the working draft EIA Report and ongoing engagement

3.9.1 As set out in Volume 1, the working draft EIA Report is being formally consulted upon between September and November 2016. Parallel consultations on the working draft EQIA and refinements to the design are also being undertaken during this period. As part of the process of consultation, stakeholders are invited to comment on the Proposed Scheme and the working draft EIA and EQIA Reports which inform it.

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

4 Agriculture, forestry and soils

4.1 Introduction

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

4.1.2 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[20] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of the impacts on agricultural land is the extent to which land of best and most versatile (BMV) agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

4.1.3 Forestry is considered as a land use feature and the impacts have been calculated quantitatively. The qualitative effects on forestry land and woodland are addressed principally in Section 8, Ecology and biodiversity, and Section 11, Landscape and visual.

4.1.4 Soil attributes, other than for food and biomass production, are identified in this section but the resulting function or service provided is assessed in other sections, notably Section 7, Cultural heritage; Section 8, Ecology and biodiversity; and Section 11, Landscape and visual.

4.1.5 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Engagement with farmers and landowners has been undertaken. The purpose of the engagement has been to obtain factual baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement with farmers and landowners will continue as part of the development of the Proposed Scheme, with progress documented in the Farmer's Pack[21] for each farm holding.

4.1.6 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

[20] Ministry of Agriculture, Fisheries and Food (1988), Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land.
[21] HS2 Guide for Farmers and Growers (2016). Available online at: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in the draft SMR and Volume 1.

4.2.2 The study area for the agriculture, forestry and soils assessment covers all of the open and undeveloped land that would be required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of BMV land and forestry land in the general locality, taken as 2km either side of the centre line of the Proposed Scheme.

4.2.3 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1. These assumptions include the restoration of agricultural land to its existing condition, the handing back of land used temporarily to the original landowner and the non-replacement of capital items demolished. There are no assumptions or limitations that are specific to the assessment in this study area.

4.3 Environmental baseline

Introduction

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

Soil and land resources

Geology and soil parent materials

4.3.2 Bedrock geology is broadly of Triassic-age sedimentary mudstone, siltstone and sandstone. The underlying geology mapped by the BGS[22] in the south of the area is dominated by mudstone of the Mercia Mudstone Group. A small deposit of the Stafford Halite Member is also found in the south, to the north-west of Yarlet, and comprises halite-stone and mudstone. A full description of the geological characteristics of this area is provided in Section 10, Land quality.

4.3.3 From Swynnerton northwards, the bedrock geology is dominated by sandstones and siltstones. The Wildmoor Sandstone is dominant in the area and the Kidderminster Sandstone and Tarporley Siltstone formations are also present, with the latter including bands of the Helsby Sandstone Formation. The different sandstone formations have been eroded variably to form the present-day ridges and valleys.

4.3.4 Superficial deposits are not recorded over most of the area. There are, however, deposits of glacial till overlying the mudstone and halite on a plateau and across higher slopes north of Yarlet and at Aston-by-Stone. Glacial till is also mapped over the siltstone and sandstone bedrock on moderate slopes to the north-east of

[22] British Geological Survey (2016). Geology of Britain viewer, Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Swynnerton and on the upper and moderate slopes to the west of Beech. These deposits comprise unsorted material ranging in size from clay to boulders (hence also commonly referred to as boulder clay). Peat is mapped east of Yarnfield.

4.3.5 Superficial glacial head deposits are mapped in a small area to the north of Swynnerton. These deposits include poorly sorted sand and gravel.

4.3.6 There are also superficial deposits of alluvium mapped over the mudstone within the Filly Brook between Stone and Yarnfield. Alluvial deposits typically comprise consolidated silty clay, but may also contain silt, sand, peat and gravel. These deposits also extend northwards in line with the M6.

4.3.7 Two narrow valleys are cut into the Wildmoor Sandstone north of Stableford. The valley bottoms are overlain by superficial alluvium whilst Quaternary alluvial fan deposits are mapped on the valley sides, typically on the steepest slopes. These sand and gravel deposits are derived from local sources and develop at the mouths of tributary valleys.

Topography and drainage

4.3.8 Topography in the south of the area is characterised by a series of rounded summits with elevations of between 140m and 160m AOD. The slopes to these summits are moderate to steep, irregular and convexo-concave in profile. The shallower slopes generally have a north-easterly aspect and fall to the River Trent in the east, at around 85m AOD.

4.3.9 To the east of Yarnfield, the Filly Brook runs in a shallow valley at an altitude of around 95m AOD.

4.3.10 Topography around Swynnerton is characterised by a series of ridges, generally aligned from north-west to south-east, at around 185m AOD. The highest is at Knowl Wall, with an altitude of over 200m AOD. Slopes are typically shallow to moderate, falling to altitudes of 130m to 140m AOD.

4.3.11 Small pockets of land in this area are at risk of flooding by rivers. Land between Yarnfield and Stone along the Filly Brook (extending northwards in line with the M6) and land to the east of Stableford, extending northwards along a narrow valley, is classified as Flood Zone 3, in which there is a 1 in 100 or greater annual probability of flooding. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.12 The characteristics of the soils are described by the Soil Survey of England and Wales[23,24] and shown on the National Soil Map[25].

4.3.13 There are three groups of soil associations in this area. The first group comprises clay loam, silty clay loam or clay topsoils, overlying clay or silty clay subsoils of the

[23] Soil Survey of Great Britain - England and Wales (1964), *The Soils of the West Midlands,* Bulletin No. 2, Harpenden.
[24] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden.
[25] Cranfield University (2001), *The National Soil Map.*

Worcester and Whimple 3 associations. These soils occur on steep to moderate slopes respectively. They are slowly permeable, and typically of Wetness Class[26] (WC) III.

4.3.14 The second group comprises clay loam or sandy clay loam topsoils over clay loam or clay subsoils. Soils within this group include the Wigton Moor, Enborne and Clifton associations. These profiles are imperfectly (WC III) to poorly (WC IV) drained. These soils were identified in the detailed ALC surveys undertaken at Walton, Stone by the former Ministry of Agriculture, Fisheries and Food (MAFF)[27].

4.3.15 The third group comprises coarse loamy and sandy profiles of the Wick, Delamere and Bridgnorth associations. These soil profiles are well and moderately well drained (WC I and II) and affected by droughtiness[28].

4.3.16 The presence of soils within this third group is confirmed by the detailed soil surveys undertaken for this assessment around Swynnerton. The soil survey identified predominantly dark reddish-brown or dark brown medium sandy loam topsoil, with loamy sand, sandy clay loam and occasional medium clay loam also present. Topsoils are slightly stony, typically up to around 5% stone. The subsoils are predominantly loamy sands and sandy loam, with occasional sand. Some subsoils in this group are slightly to moderately stony (5 to 15%) and are gleyed[29] from high groundwater tables. The profiles remain permeable because of the coarse textures.

Soil and land use interactions

Agricultural land quality

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

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

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

4.3.20 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[30] for two points within the area. The data show climate in the area to be cool and moist. The number of Field Capacity Days (FCDs), when the soil moisture deficit is zero, ranges from 184 to 191 days per annum. This is higher than average for lowland England (150 days) and generally constrains

[26] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WCI which is well drained to WCVI which is very poorly drained.
[27] MAFF (1997), Agricultural Land Classification Report, Land north of Eccleshall Road, Walton, Stone; and Land south of Eccleshall Road, Walton, Stone.
[28] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil.
[29] Conditions of poor aeration resulting in chemical reduction of iron and other elements and in grey colours and ochreous or rusty mottles, usually caused by poor or imperfect drainage.
[30] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*

agricultural cultivations and soil handling for relatively long periods over winter. Crop moisture deficits are moderate to moderately small.

4.3.21 Site factors include gradient and microrelief, which are likely to be limiting to agricultural land quality, particularly in the north of this area. Flood risk represents a potential limitation around the Filly Brook between Yarnfield and Stone, and east of Stableford. Further details are provided in Section 15, Water resources and flood risk.

4.3.22 The main physical limitations that result from interactions between soil, climate and site are soil wetness, soil droughtiness and a localised susceptibility to erosion. Each soil is allocated a WC based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade.

4.3.23 The first (Worcester and Whimple 3) and second (Wigton Moor, Enborne and Clifton) groups of soil associations identified, comprising imperfectly drained profiles of WC III with medium loamy topsoils, are limited by wetness and workability to Subgrade 3a, whilst those with heavier loamy topsoils are limited to Subgrade 3b. Most of the site at Walton, Stone surveyed by MAFF was classified as Subgrade 3a on the basis of a soil wetness and workability limitation. Other poorly drained profiles of WC IV with medium loamy topsoils are of Subgrade 3b, whilst those with heavier loamy topsoils are of Grade 4.

4.3.24 The third group, which includes well-drained, coarse loamy and sandy soils of the Wick, Delamere and Bridgnorth associations, is most likely to be affected by soil droughtiness. The severity of this limitation is determined by factors such as topsoil and subsoil texture, specific stone content and depth to the sandstone bedrock. The Delamere association also includes very acidic soils that are typically under woodland or heath and are of very poor quality when in agricultural use.

4.3.25 The droughtiness limitation for most of the third group of soils is likely to be slight because crop moisture deficits are moderate to moderately small in this area. This has been confirmed by the soil surveys at Swynnerton undertaken for this assessment, which show most of the land with these soils to be very good quality Grade 2 agricultural land.

4.3.26 The low-lying land between Yarnfield and Stone along the Filly Brook, and land to the east of Stableford, is shown to be at risk of flooding, limiting land quality to Subgrade 3b. The soils in these areas function as water stores for flood attenuation, as well as providing a habitat for ecology and biodiversity.

4.3.27 Defra mapping[31] shows that there is generally a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.

Other soil interactions

4.3.28 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental

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

sustainability. These are outlined in sources such as the Soil Strategy for England[32] and The Natural Choice: securing the value of nature[33], and include:

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

4.3.29 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. An assessment of the value and sensitivity of woodland resources is reported in Section 8, Ecology and biodiversity.

4.3.30 The soils in the low-lying land between Yarnfield and Stone along the Filly Brook, and land to the east of Stableford, shown to be at risk of flooding, also function as water stores for flood attenuation, as well as providing a habitat for ecology and biodiversity.

Land use

Land use description

4.3.31 Land use in the Stone and Swynnerton area is split between large blocks of arable and pasture, with dairy farms west of Walton, Swynnerton and at The Rowe (Stableford). The fields are regular in shape and medium to large in scale, reflecting the size of the farm holdings. There is also an equestrian enterprise near Walton.

4.3.32 There are large stands of woodland in the north of the area, the largest of which is at Swynnerton Old Park and Maer Hills, with others including Clifford's Wood and Hatton Common. Closer to Swynnerton are areas of woodland, including Cash's Pit, Stabhill Plantation, Closepit Plantation and Lodge Covert. There are no woodlands of note in the south of the area.

4.3.33 A number of environmental designations potentially influence land use within the area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply that seek to reduce nitrogen losses from agricultural sources to water. Some agricultural land is also subject to agri-environment management prescriptions, which seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (the Entry Level Scheme (ELS) or Higher Level Scheme (HLS)), or the Countryside Stewardship Scheme (CSS), which has replaced Environmental Stewardship. Holdings that have land entered into an agri-environment scheme are shown in Table 2.

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

Number, type and size of holdings

4.3.34 Table 2 sets out the current understanding of the main farm holdings within this area. The details of holdings have been obtained from face-to-face interviews with the farm owners and occupiers. Other farm holdings may be identified as survey work continues and the design develops.

4.3.35 Table 2 sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Smaller (less intensively used) units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 2: Summary characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
New House Farm	Dairy	50	None	ELS	High
Aston Pool Farm	Dairy and arable	300	Commercial lets and residential lets	ELS	High
Pirehill Cottage Farm	Cattle and sheep	40	Cottages let	None	Medium
North Pirehill Farm	Arable and beef	225	Telecoms mast and cottages let	None	Medium
Walton House Farm	Equestrian, arable	27	DIY livery yard, 0.4ha solar farm, wind turbine, residential barn conversions let and B1/B2/B8 barn let	ELS	Medium
Walton Heath Farm	Dairy	67	None	ELS	High
Micklow House Farm	Beef, arable, sheep	332	Feed mill	None	Medium
Pool House Farm	Store cattle	12	B1/B2/B8 barn let. Owner also undertakes agricultural and civil contracting	None	Medium
Darlaston Grange Farm	Arable	95	None	ELS	Medium
Darlaston Wood Farm	To be confirmed in formal EIA Report				
Swynnerton Estate	Arable and dairy heifer rearing	925	Forestry land let to Forestry Commission and extensive estate	HLS and ELS measures	Medium

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
			operations including firework storage and shoot		
Sandyford Farm	Dairy	146	None	ELS	High
Hatton Farm	Arable and beef cattle	121	Logging business	Formerly ELS. May enter CSS.	Medium
Rowe Farm	Dairy	198	Waste importation	None	High
Shelton under Harley Farm	Dairy	140	None	ELS	High

4.4 Effects arising during construction

Avoidance and mitigation measures

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

4.4.2 Compliance with the draft CoCP would avoid or reduce environmental impacts during construction. Those measures that are particularly relevant relate to: the handling of soils and their reinstatement to subsequent agricultural, forestry or other open land uses; and arrangements to ensure that agriculture can continue to function adjacent to the works during and following the construction period.

4.4.3 There would be no reduction in the long-term capability or quality of land where agricultural or forestry uses are to be resumed, provided good practice techniques are used to handle, store and reinstate soils. Some land with heavier textured soils, particularly the Enborne and Clifton associations, may also require careful management during the aftercare period to achieve this outcome.

Assessment of impacts and effects

Introduction

4.4.4 The acquisition and use of land for the Proposed Scheme would interfere with existing uses of that land and, in some locations, would preclude existing land uses, and in places, sever and fragment individual fields and operational units of agricultural and forestry land. This would result in potential effects associated with the ability of affected agricultural interests to continue to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure, such as drainage. The Proposed Scheme seeks, however,

to minimise this disruption, and where appropriate and reasonably practicable, to incorporate inaccessible severed land as part of environmental mitigation works.

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

- part of the operational railway and kept under the control of the operator;
- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure, to be undertaken normally by the owner and/or occupier, except where remedial operations are required which may be undertaken by the nominated undertaker);
- used for drainage or replacement floodplain storage area, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation; the ownership and responsibility for managing agricultural land reinstated to landscape planting, new woodland and new ecological habitats would be the subject of agreements with existing land owners.

Temporary effects during construction

Impacts on agricultural land

4.4.6 ALC surveys are ongoing; however, current indications show that the Proposed Scheme is likely to require approximately 380ha of agricultural land during the construction phase in the Stone and Swynnerton area, of which 360ha (95%) is likely to be classified as BMV land (Grades 2 and 3a). In addition, there are approximately 22ha of woodland within the construction boundary in this area.

4.4.7 BMV land in this local area is a receptor of low sensitivity and the potential effect of the Proposed Scheme on BMV land in the Stone and Swynnerton area during the construction phase is assessed as a likely moderate adverse effect, which is significant.

4.4.8 Following completion of construction, temporary facilities would be removed and the topsoil and subsoil would be reinstated in accordance with the agreed end use for the land. Based on the current design, overall for the Proposed Scheme, it is estimated that there would not be any significant surplus of topsoil or subsoil material arising. Some permanently displaced soils may be used to restore land to agriculture with slightly deeper topsoil and subsoil layers, or other uses where appropriate. This could improve the quality of agricultural land locally, for example where droughty soils are limited by soil depth, and would be subject to the soil resource plans that would be prepared during the detailed design stage.

Nature of the soil to be disturbed

4.4.9 The sensitivity of the soils that would be disturbed by construction activity reflects their textural characteristics, in the light of local rainfall conditions, as set out in the draft SMR. Soils with high clay and silt fractions in areas of heaviest rainfall are most susceptible to the effects of handling during construction and the re-instatement of land, whereas soils with a high sand fraction in areas of lowest rainfall are the least susceptible.

4.4.10 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as the Defra Code of Practice for the Sustainable Use of Soils[34]. These principles would be followed throughout the construction period.

4.4.11 The seasonally waterlogged Enborne and Clifton associations are least able to remain structurally stable when moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.12 The disturbance of peat soils has implications for carbon emissions and biodiversity. In view of this, the disturbance of any deep peat soils would be reduced where possible during the design of the Proposed Scheme. Where disturbance cannot be avoided, the peat soils would be handled with particular care and when reinstated opportunities would be taken to use them to create habitats and enhance biodiversity.

Impacts on holdings

4.4.13 Land may be required from holdings both permanently and temporarily (i.e. the latter just during the construction period). In most cases, the temporary and permanent land requirement would occur simultaneously at the start of the construction period and it is the combined effect of both that would have the most impact on the holding. In due course some agricultural land would be restored and the impact on individual holdings would be reduced.

4.4.14 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be summarised and reported by land holding in the formal EIA Report. The assessment will consider the total area of land required on a particular holding during the construction phase in absolute terms and as a percentage of the total area farmed. It will also show the area of land that would be returned to the holding following the construction period. The scale of effect will be based on the proportion of the holding required, rather than the absolute area of land.

4.4.15 The effects of severance during construction will be judged on the ease and availability of access to severed land. These would mostly be the same during and post construction but occasionally they will differ between the phases. The disruptive effects, principally of construction noise and dust, will be assessed according to their effects on land uses and enterprises.

Permanent effects of construction

Impacts on agricultural and forestry land

4.4.16 The extent of land required permanently for the Proposed Scheme by ALC grade, following construction and restoration to the agreed end use, is currently unknown but will be reported in the formal EIA Report.

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

Impacts on holdings

4.4.17 The potential permanent residual effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised for those holdings that have been surveyed in Table 3. The scale of effect of the land potentially required is based on the proportion of land required. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

Table 3: Summary of potential permanent effects on holdings from construction

Holding reference/name	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
New House Farm	Low	Low	Negligible	Moderate adverse
Aston Pool Farm	Negligible	Medium	Low	Major/moderate adverse
Pirehill Cottage Farm	Medium	Negligible	Negligible	Moderate adverse
North Pirehill Farm	Medium	Low	Low	Moderate adverse
Walton House Farm	Medium	High	High	Major/moderate adverse
Walton Heath Farm	Low	Low	Negligible	Moderate adverse
Micklow House Farm	Negligible	Medium	Negligible	Moderate adverse
Darlaston Grange Farm	Medium	Medium	Negligible	Moderate adverse
Darlaston Wood Farm	To be confirmed in formal EIA Report			
Pool House Farm	High	Negligible	High	Major/moderate adverse
Swynnerton Estate	Low	Low	Medium (loss of bunker used for non-agricultural diversification)	Moderate adverse
Sandyford Farm	Low	Low	Low	Moderate adverse
Hatton Farm	Low	Low	Negligible	Minor adverse

Holding reference/name	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Rowe Farm	Negligible	Medium	Medium	Major/moderate adverse
Shelton under Harley Farm	High	Medium	Low	Major adverse

4.4.18 Overall, the construction of the Proposed Scheme would potentially affect 15 known holdings in this area. On the basis of information currently available, 13 could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant. The effect on one holding is currently unknown, and will be reported in the formal EIA Report.

4.4.19 Six dairy units, which are generally more susceptible to the effects of severance than other farm holdings, are likely to be significantly 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 particularly to the proportion of land required.

4.4.20 In addition to the major adverse effects anticipated at Shelton under Harley Farm, four farms are anticipated to experience major/moderate adverse effects. Two of these are dairy farms affected by severance (Aston Pool Farm and Rowe Farm) whilst the other two are relatively small farms affected by the proportion of land required and the loss of farm infrastructure (Walton House Farm and Pool House Farm).

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

Other mitigation measures

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

Summary of likely residual significant effects

4.4.23 Although the extent of land required permanently by ALC grade is unknown, current indications are that the effect on BMV agricultural land during construction would be moderate adverse in the Stone and Swynnerton area, and therefore significant.

4.4.24 On the basis of information currently available, 13 of the 15 farm holdings within this area would experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant. One farm is expected to experience a major adverse effect, principally from the impact of the area of land required. Four farms are anticipated to experience major/moderate adverse effects and eight to experience moderate adverse effects. The effect on one holding is currently unknown, and will be reported in the formal EIA Report.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No measures are currently anticipated to be required to mitigate the operational effects of the Proposed Scheme on agriculture, forestry and soils, although further work is required to assess potential noise effects on livestock units.

Assessment of impacts and effects

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

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

4.5.3 The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal EIA Report. Six sets of farm buildings at Walton House Farm, Pool House Farm, Sandyford Farm, Shelton under Harley Farm, Micklow House Farm and Swynnerton Heath Farm lie within 100m of the Proposed Scheme. Further work is required to identify if any significant effects on the use of these buildings are anticipated, the findings of which will be reported in the formal EIA Report.

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

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

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

Other mitigation measures

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

Summary of likely residual significant effects

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

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme within the Stone and Swynnerton area.

5.1.2 Nitrogen dioxide (NO_2), oxides of nitrogen (NOx), fine particulate matter (PM10, PM2.5) and dust[35] were considered in the assessment. Emissions of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.3 Engagement with SBC has been undertaken. The purpose of this engagement has been to obtain relevant baseline information. Engagement with SBC will continue as part of the development of the Proposed Scheme.

5.1.4 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1 and the draft SMR.

5.2.2 The study area for the air quality assessment has been determined on the basis of where impacts on local air quality may occur from construction activities, from changes in the nature of traffic during construction and operation, or where road alignments have changed.

5.3 Environmental baseline

Background air quality

5.3.1 The main sources of air pollution in the Stone and Swynnerton area are emissions from road vehicles and agricultural activities. The main roads within the area are the A34 Stafford Road/The Fillybrooks, the A51 Stone Road, the A519 Newcastle Road and the M6. There are industrial emission sources in the region; however, none of these are considered likely to have an effect on local air quality in the area.

5.3.2 Estimates of background air quality have been obtained from Defra for the baseline year of 2015. The data are estimated for 1km grid squares for NOx, NO_2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the area.

[35] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.

Local monitoring data

5.3.3 There are currently 15 diffusion tube sites located within the Stone and Swynnerton area for monitoring NO2 concentrations. Measured NO2 concentrations in 2014[36] were within the air quality standard.

Air quality management areas

5.3.4 There are no air quality management areas within the Swynnerton and Stone area.

Receptors

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

5.4 Effects arising during construction

Avoidance and mitigation measures

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

5.4.2 The draft CoCP also makes provision for the preparation of LEMPs. These plans would set out how, during construction of the Proposed Scheme, the environmental and community protection measures required for each area would be delivered, including through the implementation of specific measures required to control dust and other emissions from activities in the area.

5.4.3 The assessment has assumed that the general measures detailed in the draft CoCP would be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring after engagement with the local authorities to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of haul routes and designated vehicle waiting areas to suppress dust;

[36] Monitoring data for 2015 is not yet available. This will be included in the formal EIA Report.

- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- using enclosures to contain dust emitted from construction activities; and
- undertaking soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

Assessment of impacts and effects

Temporary effects

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

5.4.5 Construction activities, such as demolition, earthworks, construction and trackout[37], have been assessed for their risk to have an effect on dust soiling and human health[38]. There are residential receptors located within 350m of these activities in this area.

5.4.6 In the absence of mitigation, there is a low risk of dust soiling and human health effects arising from demolition activities at receptors in the area around Dog Lane, with a negligible risk at receptors around the Eccleshall Road satellite compound. For earthworks, there is a medium risk of dust soiling but low risk of human health effects at receptors close to the works along the route of the Proposed Scheme. There is also a medium risk of dust soiling and low risk of human health effects from construction activities at receptors close to the proposed compound locations and in areas where road realignment is necessary. For trackout, there is a medium risk for dust soiling and low risk for human health effects at receptors along the construction routes and close to the works.

5.4.7 With the application of the mitigation measures contained in the draft CoCP, no significant effects are anticipated from these dust generating activities.

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

5.4.9 It is expected that the M6, the A51 Stone Road, the A34 Stafford Road/The Fillybrooks and the A519 Newcastle Road would provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is expected on the M6, the A51 Stone Road, the A34 Stafford Road/The Fillybrooks, the A519 Newcastle Road, the B5026 Eccleshall Road, Yarnfield Lane, Tittensor Road and Bent Lane. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal EIA Report.

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

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

Permanent effects

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

Other mitigation measures

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

Summary of likely residual significant effects

5.4.13 The methods outlined within the draft CoCP are considered effective at reducing dust and construction traffic emissions and, therefore, no significant residual effects are considered likely.

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme could arise from vehicle emissions due to changes in the volume, composition and distribution of traffic in the area.

5.5.3 Where the changes in traffic emissions require it, a detailed assessment of air quality impacts will be undertaken and reported in the formal EIA Report.

Other mitigation measures

5.5.4 In the event that significant effects on local air quality are identified from the assessment of traffic emissions during operation of the Proposed Scheme, relevant mitigation measures will be proposed and reported in the formal EIA Report.

Summary of likely residual significant effects

5.5.5 A summary of the likely residual significant effects on local air quality will be reported in the formal EIA Report.

6 Community

6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effect on local communities resulting from the construction and operation of the Proposed Scheme in the Stone and Swynnerton area.

6.1.2 Engagement with relevant stakeholders will be undertaken as part of the development of the Proposed Scheme.

6.1.3 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

6.2 Scope, assumptions and limitations

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

6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (for example, air quality, sound, noise and vibration, landscape and visual, traffic and transport). Likely significant in-combination effects on community facilities and resources are not reported in the working draft EIA Report but will be reported in the formal EIA Report.

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

6.3 Environmental baseline

Existing baseline

6.3.1 The Stone and Swynnerton area extends for approximately 14km of the Proposed Scheme in Staffordshire. It extends from approximately 1km north-west of Yarlet to Shelton under Harley in the north-west. It passes near the settlements of Yarnfield, Stone and Swynnerton. The area is characterised by small clusters of dwellings and individual dwellings within rural areas close to the Proposed Scheme.

6.3.2 The area is predominantly rural, made up of small settlements with limited community facilities. In general, the majority of community facilities, such as GP surgeries, schools and community meeting places, are located within the larger settlement of Stone. There are also some smaller services within the village centres of Yarnfield and Swynnerton.

6.3.3 There is one promoted[39] PRoW in the area, the Staffordshire Cake and Ale Trail.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The following measures have been introduced to reduce the likelihood of significant effects in the Stone and Swynnerton area.

6.4.2 The realignment of Bent Lane has been amended to reduce the number of demolitions of residential properties in Shelton under Harley. PRoW routes would be maintained and would remain operational wherever reasonably practicable.

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.3 The construction of the Tittensor Road realignment would require a small part of the gardens associated with two residential properties located between Tittensor Road and Stab Lane in Swynnerton. Parts of these areas would be required permanently, as described below. These areas of land are likely to be required for a short period. This is not considered to have a significant community effect.

6.4.4 The construction of the Bent Lane (North) diversion would require part of the gardens associated with two residential properties on Bent Lane in Shelton under Harley. These areas of land are likely to be required for a short period. This is not considered to have a significant community effect.

Community facilities

6.4.5 It is currently anticipated that there would be no temporary effects have been identified as a result of the land required for construction or due to isolation.

Recreational facilities

6.4.6 It is currently anticipated that there would be no temporary effects have been identified as a result of the land required for construction or due to isolation.

Open space and PRoW

6.4.7 Land required for the construction and operation of the Proposed Scheme would result in severance of one promoted PRoW, the Staffordshire Cake and Ale Trail, which is considered to provide a recreational resource. The Proposed Scheme includes permanent, and as required, temporary realignments for the PRoW. The effect on this PRoW would not be significant.

[39] Promoted PRoWs refers to those PRoWs which are a "promoted" destination in their own right as a recreational resource.

Permanent effects

Residential properties

6.4.8 The construction of the Yarnfield North embankment and the Stone railhead would require the demolition of five residential properties east of the M6. The residential properties would therefore be permanently lost.

6.4.9 The embankments associated with the Tittensor Road realignment would permanently require a small part of the gardens associated with two residential properties located between Tittensor Road and Stab Lane in Swynnerton. Although the impact on the individuals may be significant, due to the loss of garden, it would not result in a significant effect at a community level.

6.4.10 The construction of the Hatton North cutting and the Bent Lane (North) diversion would require the demolition of one residential property in Shelton under Harley. Shelton under Harley is a small hamlet made up of only four residential properties. The permanent loss of the property would result in a moderate adverse significant effect at a community level, given the impact on the hamlet.

Community facilities

6.4.11 No permanent effects on community facilities have been identified at this stage.

Recreational facilities

6.4.12 No permanent effects on recreational facilities have been identified at this stage.

Open space and PRoW

6.4.13 Land required for the Proposed Scheme would result in severance of one promoted PRoW, the Staffordshire Cake and Ale Trail, which is considered to provide a recreational resource. The Proposed Scheme would include permanent and, as required, temporary realignment for the PRoW; consequently, the effect on this PRoW would not be significant.

Other mitigation measures

6.4.14 No other mitigation measures have been identified.

Summary of likely residual significant effects

6.4.15 One of the four residential properties in the hamlet of Shelton under Harley would be lost, resulting in a permanent moderate adverse community effect.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 No relevant avoidance and mitigation measures have been identified at this time.

Assessment of impacts and effects

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

Other mitigation measures

6.5.3 Any specific mitigation measures will be described in the formal EIA Report.

Summary of likely residual significant effects

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

7 Cultural heritage

7.1 Introduction

7.1.1 This section of the report provides a description of the current baseline for heritage assets and of the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme within the Stone and Swynnerton area. Consideration is given to the extent and heritage value (significance) of heritage assets including archaeological and palaeoenvironmental remains, historic buildings and the built environment.

7.1.2 The main issue with regard to heritage assets is the extent to which the Proposed Scheme affects designated and non-designated heritage assets. Impacts on heritage assets as a result of the Proposed Scheme will occur largely through the physical removal and alteration of heritage assets and changes to their setting.

7.1.3 Maps showing the location of the key environmental features can be found in the Volume 2 CA3 Map Book. Only designated heritage assets within the Stone and Swynnerton area are shown on Maps CT-10-111b to CT-10-115a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps. A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal EIA Report.

7.1.4 Engagement with Historic England and SCC has been undertaken. The purpose of this engagement has been to obtain relevant baseline information. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

7.2 Scope, assumptions and limitations

7.2.1 The assessment scope, key assumptions and limitations for the cultural heritage assessment are set out in Volume 1 and the draft SMR.

7.2.2 Detailed assessment of effects on the historic landscape will be considered in the formal EIA Report

7.2.3 A detailed assessment of all assets, designated and non-designated, has been carried out within a study area defined as the land required, temporarily or permanently, to construct and operate the Proposed Scheme plus 500m.

7.2.4 The setting of all designated heritage assets up to 2km from the land required, temporarily or permanently, to construct and operate the Proposed Scheme has also been considered.

7.2.5 In undertaking the assessment the following limitations were identified:

- the LiDAR[40] data examined covers the majority of the study area, although there were some areas for which data was unavailable; and
- not all areas within the study area were available for field survey (due to limited land access and site conditions), such as site reconnaissance visits and

[40] Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.

geophysical survey. This work is ongoing and will be included as part of the formal EIA Report.

7.2.6 Information from other sources of data, including the Historic Environment Record (HER) and local archives has been used to provide information relating to the potential heritage assets that may be present.

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

7.3 Environmental baseline

7.3.1 Documentary baseline data were collected from a variety of sources in compiling this assessment including:

- Staffordshire HER;
- Staffordshire Record Office collections;
- material held at the William Salt Library, Stafford;
- historical Ordnance Survey mapping; and
- other published sources

7.3.2 In addition to collating this baseline data, the following surveys were undertaken:

- detailed and systematic transcription of remote sensing data including LiDAR and aerial photographs;
- walkover and site reconnaissance from areas of public access. This was undertaken to understand the character and form of heritage assets and the historic landscape; and
- settings assessments of all designated heritage sites within 2km of the Proposed Scheme.

Designated assets

7.3.3 Designated heritage assets are set out below under three categories: those located partially or wholly within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme; those within 500m of the land required for construction and operation; and those between 500m and 2km away.

7.3.4 The only designated heritage asset within the Stone and Swynnerton area that is located partially or wholly within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme is a small portion of Swynnerton Conservation Area on its northern side (see Map CT-10-114 in the Volume 2, CA3 Map Book).

7.3.5 The following designated assets are located partially or wholly within 500m of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme (from south to north):

- Swynnerton Village Conservation Area, an 18th century estate village with medieval origins, including within its boundary the following listed buildings:
  - Swynnerton Hall Grade I listed building;
  - Church of St Mary, Swynnerton, Grade I listed building;
  - Chapel of Our Lady of the Assumption, Swynnerton, Grade II* listed building;
  - Gate Piers and Forecourt Wall of Swynnerton Hall, Grade II listed building;
  - Dixons and adjoining range of outbuildings to the north-east of Swynnerton Hall, Grade II listed building;
  - War Memorial, Swynnerton, Grade II listed building;
  - Queenswood, Swynnerton, Grade II listed building;
  - Old Post Office, Swynnerton, Grade II listed building;
  - The Thatched Cottage, Swynnerton, Grade II listed building;
- Water Tower, a Grade II listed building 800m north of Swynnerton Village; and
- Swynnerton Heath Farmhouse, Grade II listed building.

7.3.6 The following designated assets are located between 500m and 2km of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme (from south to north):

- three scheduled monuments: Bury Bank Multivallate Hillfort; Saxon's Lowe, Tittensor Common; and Bowl Barrow in Swynnerton Park;
- one Grade II* registered garden: Trentham Gardens;
- eight Grade II* listed buildings: The Priory, 8 Lichfield Street, Stone; Church of St Michael, Stone; Crompton Tomb, approximately 50m south-west of Church of St Michael; Jervis Mausoleum, approximately 5m east of Church of St Michael; The Crown Hotel, 38 High Street, Stone; Meaford Hall; The Nursery House; and Hatton Water Pumping Station and Chimney;
- seventy-four Grade II listed buildings predominantly within the town of Stone and settlements at Aston-by-Stone (seven), Walton (three), four canal bridges, three locks and three canal mileposts contained within the Trent and Mersey Canal Conservation Area; and
- four conservation areas: the Stafford Borough section of the Trent and Mersey Canal; Stone; Meaford; and Trentham Gardens.

Non-designated assets

7.3.7 The following non-designated heritage assets are located partially or wholly within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:

- a small sub-oval depression noted on LiDAR situated west of Newhouse Farm within an area containing numerous 'Old Clay Pits', 'Old Marl Pits' and 'Sand Pits', depicted on late 19th and early 20th century Ordnance Survey maps. Likely to represent a former extraction pit or pond;
- a possible enclosure south of Pirehill Cottage Farm noted on LiDAR. Late 19th and early 20th century Ordnance Survey maps show a small pond and two earthworks (possibly the result of quarrying) within the interior of this enclosure;
- North Pirehill Farm, Stone; an isolated farmstead established by the late 18th century which is shown on early historic mapping of the period. The original farm buildings are still extant although the farm layout has been changed by the addition of modern buildings;
- an area north of Pirehill Lane in the vicinity of the Stafford Motorway Service Area (M6 southbound) containing vestigial ridge and furrow, identified from aerial photographs and LiDAR data;
- a group of features south-west of North Pirehill Farm depicted in this area by late 19th and early 20th century Ordnance Survey maps and labelled as a 'Clay Pit' or 'Old Marl Pit';
- a slightly irregular sub-oval depression identified on LiDAR west of Micklow House Farm, which possibly represents a former extraction pit. A small pond is depicted in this location on late 19th century Ordnance Survey maps;
- an area of ridge and furrow identified from aerial photographs at Walton House, Stone, comprising reversed 'S' boundaries and extant earthworks, which are likely to be medieval in date;
- a peat extraction site, Walton Heath, indicated by the field name 'Black Pits' recorded on 1844 tithe map;
- Darlaston Pool, identified on LiDAR west of Pool House Farm. This comprises three small islands, two of which were joined to the bank by a narrow east-west causeway and may represent a medieval or later manorial fishpond or mill complex;
- an extensive area containing numerous parcels of vestigial ridge and furrow and possible associated land divisions or boundaries located between Darlaston and the M6, identified from aerial photographs and LiDAR;
- former trackways at Darlaston Park, Swynnerton, including a trackway connecting Swynnerton Grange to Yarnfield Lane which are shown on 19th century Ordnance Survey mapping;
- the earthwork remains of a probable former quarry with an associated holloway leading to it, identified on aerial photographs at Darlaston Grange, Stone;

- a ring ditch, representing a possible ploughed-out barrow, and curvilinear feature identified as cropmarks on aerial photography adjacent to the M6 west of Darlaston Wood. The possible ring ditch is also very faintly visible on LiDAR;
- a possible medieval enclosed settlement, identified on LiDAR, south-west of Swynnerton Grange which is defined by a possible infilled ditch with external and internal bank. Internally subdivided by a number of linear depressions, which presumably relate to infilled ditches or trackways/holloways. A small sub-rectangular enclosure or building platform is evident within/at the south-western edge of the enclosure;
- faint linear depressions noted on LiDAR south of Blakelow Farm, possibly former holloways or watercourses;
- an area of eroded ridge and furrow visible in aerial photographs between Sandyford Farm and Lodge Covert;
- remains of medieval ridge and furrow at Swynnerton, identified from aerial photographs;
- a possible Cold War site at Hatton Rough comprising a series of bunkers within large earthwork bunds set within a fenced enclosure, identified on aerial photography;
- possible ridge and furrow to the east of Stableford Bridge noted on LiDAR; and
- Shelton under Harley Farm, a modern farm lying on the presumed site of a settlement mentioned in Domesday. Historic mapping and archival material suggests a farmstead on the site since at least the 14th century. LiDAR indicates historic field boundaries survive to the south and west.

7.3.8 The following non-designated heritage assets are located partially or wholly within 500m of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:

- ridge and furrow, Hundred Acres, Stone, identified from aerial photographs, possibly medieval in date;
- the location of a possible lookout or beacon at Pire Hill implied from place-name and historic mapping evidence;
- Walton House Farm, an isolated farmstead laid out around a regular courtyard with a detached farmhouse. It was established in the mid to late 19th century and is shown on historic maps;
- a possible former water meadow, west of Walton, indicated by regular field boundaries and drains on modern and historic mapping;
- Walton Heath Farm, an isolated farmstead laid out around a regular courtyard with additional detached outbuildings and a detached farmhouse shown on historic maps;
- an isolated farm north-east of Walton Heath Farm of 19th century date, comprising a single building with small yard, shown on historic maps;

- the site of now-removed farmstead, north-east of Walton Heath Farm, present by the 1830s and shown on historic maps;
- an area of ridge and furrow with associated field boundaries and a former extraction pit north east of Cold Norton Cottages, identified in aerial photographs and on LiDAR;
- a triangular cast-iron milepost at Walton Heath recorded in the Staffordshire HER;
- Micklow House Farm, Stone, an isolated farmstead laid out around a large, regular courtyard with the farmhouse forming one side of the courtyard and additional detached outbuildings and shown on historic maps;
- an area of relict ridge and furrow cultivation north west of Whitemoor Farm identified in aerial photographs;
- Stone Hospital, Swynnerton, an infectious diseases hospital of 1908, subsequently a sanatorium, which is recorded in the Staffordshire HER;
- Darlaston Grange Farm, a 19th century farmstead with a regular courtyard, which is shown on historic maps;
- a group of six circular mounds, ranging in diameter from 10-18m and arranged in a north-north-east to south-south-east alignment, identified on LiDAR, south-east of Swynnerton Grange. These mounds might be prehistoric funerary monuments, forming a small dispersed cemetery. Alternatively, these features could be a spoil heaps of more recent origin, possibly associated with post-medieval quarrying or extraction. Two small depressions, which possibly represent in-filled extraction pits are also identifiable in the immediate vicinity;
- an area of relict ridge and furrow cultivation, identified in aerial photographs and on LiDAR, adjacent to the M6 west of Darlaston Wood Farm;
- a possible medieval or post-medieval building platform, identified on LiDAR south-east of Grange Cottage, at the junction of two parcels of ridge and furrow;
- Blakelow Farm, Swynnerton, an isolated farmstead laid out around a regular u-shaped courtyard, established by the late 18th century and shown on historic maps, which survives relatively unaltered;
- Swynnerton Grange Farm, an isolated farmstead laid out around a regular 'E-plan' courtyard which appears to have been extant by the early-mid 19th century, as shown on historic maps;
- an area of possible ridge and furrow, slightly sinuous in form identified in LiDAR south of Kennels Cottages;
- an extensive area of broad medieval ridge and furrow within Swynnerton Park, identified from aerial photography and LiDAR;

- ring ditch and linear feature at Sandyford, identified as cropmarks on aerial photographs;
- an area of narrow post-medieval ridge and furrow north-west of Swynnerton, identified from aerial photography and LiDAR;
- a cast iron mile post near Wychdon Lodge, which is dated 1909, recorded in the Staffordshire HER;
- an enclosure and curvilinear ditch west and north of Swynnerton Heath Farm, which were visible as slight earthworks in 1955 and not visible thereafter, identified from aerial photography;
- a night shelter for Second World War bombing decoy site north of Swynnerton, listed in Historic England monument data;
- an area of eroded ridge and furrow located between Clifford's Wood and The Hattons identified in aerial photographs;
- an area of narrow ridge and furrow enclosed by field boundaries between Clifford's Wood and New Waste Plantation, identified on aerial photographs;
- a large, irregularly shaped feature in woodland on Hatton Common, identified on LiDAR, which possibly represents former extraction;
- a block of possible ridge and furrow east of Stableford Bridge identified in LiDAR;
- three sub-circular mounds to the east of Stableford Bridge, identified from aerial photography. The features may represent spoil from extraction or could be the remains of prehistoric burial mounds;
- a series of bank features in woodland on Nursery Common, identified from aerial photography and likely to be related to woodland management;
- residual traces of possible water meadows or drainage systems along the Meece Brook extending between Chorlton Mill and Hatton Mill, identified from aerial photography;
- a series of sinuous former field boundaries west of Swynnerton Old Park and north-east of Shelton under Harley identified from LiDAR; and
- Swynnerton Old Park, a possible former deer park of medieval origin, recorded in the Staffordshire HER.

Cultural heritage overview

7.3.9 The solid geology of the study area is dominated by rocks formed during the Carboniferous and Triassic ages. The study area can be broadly split into southern and northern halves, with the dividing line just to the north of Stone. The solid geology of the study area is partially overlain by superficial deposits formed during the Quaternary period as a consequence of the repeated advance and retreat of the ice-sheets. Superficial deposits are patchy across the study area, largely occurring north of the route associated with the Trent Valley. Deposits of poorly sorted tills laid down

directly by the ice-sheet (previously termed boulder clays) are widespread across the study area, particularly from Aston-by-Stone, around Beech, and to the north of Stone where deposits form the southern edge of large till deposits concentrated around Stoke-on-Trent.

7.3.10 Developing an overview of the buried archaeological remains in this area is limited by the relatively small amount of investigative work undertaken. The most wide-ranging project was that associated with the proposed widening of the M6, which resulted in fieldwalking, geophysical survey and a small amount of trenching in the vicinity of North Pirehill and Cold Norton.

7.3.11 Aerial photographic and LiDAR assessments undertaken for the Proposed Scheme have highlighted the presence of features predominantly of relatively late date. This may reflect poor archaeological 'visibility' associated with the remains of earlier periods, perhaps because soil conditions in this area are not conducive to the development of cropmarks. The relative lack of evidence for activity pre-dating AD1000 is unlikely to be a true reflection of the potential for remains of early medieval, Roman and prehistoric date to be encountered in the area.

7.3.12 The position of the southern edge of the ice-sheet during the last glaciation is not well understood. The discovery of an antler pick of Upper Palaeolithic date from Darlaston may indicate that the potential for remains of this period to be present in the study area may be higher than previously thought.

7.3.13 Remains of Mesolithic and Neolithic date are also scant, being limited to a single Mesolithic flint scraper found during excavations in Stone, six Neolithic (or potentially early Bronze Age) stone tools found in the vicinity of Cold Norton Farm and an axe hammer of similar date found at Swynnerton.

7.3.14 Evidence for the Bronze Age is somewhat more extensive with scheduled barrows at Saxon's Low and in the grounds of Swynnerton Park, two potential barrows identified at Bury Bank, six south-west of Swynnerton Grange and another one west of Darlaston Wood. Place name evidence indicates that barrows were previously present in the vicinity of Micklow Farm and Blakelow Farm.

7.3.15 The barrows at Bury Bank were excavated in the 19th century with inconclusive results. A potential barrow near North Pirehill Farm, which had been identified in aerial photographs, was the subject of geophysical survey and trenching in 1993. This did not locate the barrow and as a result it was concluded that the feature identified in the aerial photographs was a geological feature.

7.3.16 The small hillfort at Bury Bank is the only surviving Iron Age monument in the study area. The defences were investigated in the 19th century; however, the date of construction and interior arrangements are unknown beyond the presence of two earlier barrows in the southern part of the fort.

7.3.17 Evidence of the Romano-British period is limited, reflecting the picture more widely in the county where Romano-British sites are a rarity.

7.3.18 The Domesday survey suggest that the a pattern of land occupation was well established by the second half of the 11th century, with settlements at Aston, Walton, Stoke by Stone, Swynnerton, Hatton and Shelton under Harley.

7.3.19 The organisation of Staffordshire into the administrative units known as 'hundreds' may have occurred as early as the 10th or 11th century. Pirehill Hundred occupied the north-western part of the county and it is assumed that the meeting centre of the Hundred was located at Pirehill, south-west of Stone. The implications for the presence of archaeological remains at this location are uncertain although hundredal centres in England frequently coincide with earlier prehistoric activity.

7.3.20 The evidence base for activity after AD1100 is much stronger than for earlier periods, with areas of ridge and furrow cultivation widespread throughout the study area, many of which may be medieval in date. Evidence of settlement contraction and movement can be seen at Cold Norton, Darlaston Green and Swynnerton Grange, probably reflecting the population decline after AD1350. Stone, which was granted a charter in AD1251, developed out of the market town that grew up next to the Augustinian Priory. By the 14th century, the settlement of the de Swynnertons (at Swynnerton village) provided an additional focus where the Chapel of the Blessed Virgin in the church of St Mary was a local site of pilgrimage. Deer parks were a significant feature of the medieval landscape in Staffordshire, with over 100 being identified in the county with an average size of between 160 and 200 hectares. Swynnerton Old Park probably reflects the location, if not the exact form, of one such park.

7.3.21 By the beginning of the 16th century substantial landholdings in the study area were held by religious houses, principally the Priory of Stone. The transfer of these landholdings to secular owners as a result of the religious reforms of the mid-16th century may have indirectly led to a process of enclosure and consolidation, which continued into the 19th century. It is probable that the process of enclosure started earliest in the vicinity of Swynnerton, for which there is no record of Parliamentary enclosure. By contrast, Stone and its environs have a fairly full record of Parliamentary enclosure, suggesting that the process took place later in this part of the study area. Enclosure in the late 18th and 19th centuries led to the creation of a series of isolated farmsteads located within the newly enclosed land. A number of farmsteads of this type survive in the vicinity of Stone (North Pirehill Farm, Walton Heath Farm, Walton House Farm, an outfarm north-east of Walton Heath Farm, Micklow House Farm, Darlaston Grange Farm, Blakelow Farm and Swynnerton Grange Farm).

7.3.22 Swynnerton Hall was constructed on its present site between 1725 and 1729 to replace an earlier residence destroyed in the mid-17th century. The park within which it is set demonstrates the general transition from deer parks to ornamental parks in the Georgian period. Capability Brown developed a scheme for the immediate environs of the house, although it is not clear how much of the scheme was adopted (if any). Swynnerton Hall remains in the ownership of the Fitzherbert family, who built the chapel of Our Lady of the Assumption in 1869. The village of Swynnerton in its present form is essentially an estate village of 18th or 19th century date.

7.3.23 In the 18th century Stone thrived as a coaching and carriage centre following the turnpiking of the Chester Road in in 1729. Brindley's Trent and Mersey Canal opened in 1777 and the headquarters of the Canal Company and some of its workshops and manufacturing facilities were located in Stone, consolidating the prosperity of the town and leaving a legacy of fine industrial and residential buildings. The 19th century saw the arrival of the railways and a consequent downturn in the viability of the canal.

Stone continued to prosper and expand as demonstrated by the Victorian industrial and residential suburb between the canal and Newcastle Road.

7.3.24 The 20th century saw a major change to the area with expansion of Stone and the nearby villages well beyond their historic core areas. During the Second World War an Ordnance Factory was established at Swynnerton, which brought tens of thousands of workers to the site on a daily basis. Although the factory closed in the late 1940s, the area remains in military use and other defence installations were constructed north of Swynnerton at Hatton Roughs.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The draft CoCP sets out the measures that would be adopted to control effects on cultural heritage assets. These include the following:

- management measures that would be implemented for heritage assets that are to be retained within the land required for the construction of the Proposed Scheme;
- route-wide principles, standards and techniques for works affecting heritage assets; and
- a programme of archaeological investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

7.4.2 The design of the Proposed Scheme seeks avoids the following impacts on heritage assets within the Stone and Swynnerton area:

- physical impacts on any listed structures or scheduled monuments;
- physical impacts on conservation areas at Stone, the Trent and Mersey Canal and Meaford; and
- physical impacts on Swynnerton Conservation Area.

Assessment of impacts and effects

7.4.3 Impacts on all heritage baseline assets described above have been assessed. However, only those leading to significant effects are described in the construction assessment set out below.

Temporary effects

7.4.4 Impacts would occur to heritage assets within the land required for the construction of the Proposed Scheme. In addition, the setting of heritage assets in the wider study area may be affected due to the visibility of plant, cranes and equipment, or the presence of other construction elements. The duration of construction impacts has yet to be confirmed and will be reported in the formal EIA Report.

7.4.5 The following significant effects are currently expected to occur as a result of temporary impact on the setting of designated or non-designated heritage assets.

7.4.6 The setting of the Grade II listed Swynnerton Heath Farmhouse (a designated asset of moderate value) would be affected by construction activity associated with the excavation of the Swynnerton North cutting, the construction of an overbridge immediately to the north-east of the farm across the A519 Newcastle Road and the presence of temporary material stockpile immediately opposite the farmhouse. The asset forms part of a working farm with large, modern farm buildings to the north and main roads to the east and south. During construction there would be an increase in traffic movements along the adjacent roads. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.7 The setting of Blakelow Farm, a non-designated 18th century farm of low value, would be affected by construction noise and activity associated with the Meaford North embankment. The farm's significance is supported by its relationship to the surrounding farmland, with which it has a strong historic and functional connection. While this has already been substantially affected by the presence of the M6 immediately to the north, the construction activity associated with the Proposed Scheme immediately to the south would affect more of these historic relationships. This would constitute a high adverse impact and a moderate adverse effect.

7.4.8 The setting of Shelton under Harley Farm, a non-designated 18th - 19th century farmhouse of moderate value on the likely site of a medieval settlement, would be affected by the noise and movement associated with the construction of the Proposed Scheme. The farmhouse faces south-west across Bent Lane to the farmland in the valley to the west. It has strong historical and functional links with this area which form a part of its heritage significance. Construction works associated with the Stableford embankment immediately to the south of the farm, the realignment of Bent Lane and the demolition of one of the farm's historic barns, would affect its historic character. This constitutes a high adverse impact and a moderate adverse effect.

Permanent effects

7.4.9 The following significant effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme.

7.4.10 Darlaston Pool, a non-designated potential medieval manorial fish pond or mill complex of moderate value, would be directly affected by the construction of the Stone railhead and associated compound and would require its partial or full removal. This would constitute a high adverse impact and a major adverse effect.

7.4.11 The possible medieval enclosure south-west of Swynnerton Grange, a non-designated asset of moderate value, would be directly affected by the realignment of an overhead power line and would be removed. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.12 Swynnerton Conservation Area, a designated asset of moderate value, would be directly affected by the engineering earthworks required to for the realignment of the Tittensor Road for a length of approximately 100m within the northern part of the conservation area. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.13 The Common Lane Cold War bunker complex at Hatton Rough, a non-designated asset of low value, would be directly affected by the construction of Hatton cutting. Construction of a cutting in this location would require the demolition of one of the bunkers and the severance of the remaining bunkers from each other by the route of the Proposed Scheme. This would constitute a high adverse impact and a moderate adverse effect.

7.4.14 Shelton under Harley Farm, a non-designated asset of moderate value, would be directly affected by the realignment of Bent Lane. The earthworks associated with the re-alignment of Bent Lane would require the demolition of a 19th century barn and construction within the historic core of the farmstead. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.15 The following significant effects would occur as a result of permanent impact on the setting of designated or non-designated heritage assets.

7.4.16 The significance of Blakelow Farm, a non-designated 18th century farm of low value, resides partly in its agrarian country setting, although this has been substantially modified by the construction of the M6 immediately to the north-east. The farm would be affected as a result of the construction of the Proposed Scheme, which would permanently isolate the farm complex between the Meaford North embankment for the railway and the M6, largely severing its visual links with the surrounding farmland. This would constitute a high adverse impact and a moderate adverse effect.

7.4.17 The setting of Shelton under Harley Farm, a non-designated 18th - 19th century farmhouse of moderate value on the site of a much older settlement, would be substantially changed as the result of the construction of Stableford embankment, and the realignment of Bent Lane immediately to the south-west. The farmhouse faces onto Bent Lane looking across the WCML in the valley to the west. The most significant elements of its setting are the adjacent historic farm buildings, and its rural, agrarian surroundings. The construction of the Proposed Scheme adjacent to the farm would have a substantial effect on these relationships, including the demolition of a historic barn. This constitutes a high adverse impact and a moderate adverse effect.

7.4.18 The setting of the Grade II listed Water Tower, a designated asset of moderate value, approximately 120m north of Swynnerton village would be affected by the realignment of the Tittensor Road, bringing it to within 70m of the asset. The water tower is a significant historic feature in views looking westwards towards Swynnerton, particularly for those travelling towards the village along Tittensor Road. The realignment of Tittensor Road closer to the water tower, combined with the construction and permanent presence of the Swynnerton embankment to the north, would considerably alter this rural view. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.19 The setting of the Grade II listed Swynnerton Heath Farmhouse, a designated asset of moderate value, would be affected by the construction of the Swynnerton North cutting, as well as the A519 Newcastle Road overbridge approximately 250m to the north. The asset forms part of a working farm with large modern farm buildings to the north and busy main roads to the east and south. Its significance lies substantially in

its historic relationship to the surrounding farmland and other elements of the historic landscape including the network of country lanes. The cutting and overbridge would be located on rising ground and would be visible from the rear of the farmhouse, permanently and adversely changing these historic relationships. This would constitute a medium adverse impact and a moderate adverse effect.

Other mitigation measures

7.4.20 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme and the draft CoCP will continue to be made through the development of the design to seek to reduce further the significant effects described above. These refinements will include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and
- locations where the physical impact on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

7.4.21 The temporary effects of construction activity on the setting of heritage assets are largely reversible in nature and last for the duration of the construction works, and therefore are not considered to result in residual significant effects. The physical impacts of construction on heritage assets are permanent and not reversible where heritage assets would be removed. This would result in significant effects on archaeological remains at Darlaston Pool; the medieval enclosure south-west of Swynnerton Grange; the Swynnerton Conservation Area; the historic farmstead at Shelton under Harley; and on the Common Lane Cold War bunkers at Hatton Rough. There would be permanent residual effects on the setting of the non-designated historic buildings at Blakelow Farm and Shelton under Harley and two Grade II listed buildings - the Water Tower on Stab Lane and Swynnerton Heath Farmhouse.

7.5 Effects arising from operation

Avoidance and mitigation measures

7.5.1 The following measures, as shown on the CT-06 maps within the Volume 2, CA3 Map Book, have been incorporated into the design of the Proposed Scheme to reduce the impacts and effects on heritage assets:

- noise mitigation measures (including noise barriers) have been included within the Proposed Scheme to reduce potential impacts on identified assets; and
- landscape planting, as it matures, would increasingly reduce impacts on the setting of the designated assets within the study area.

Assessment of impacts and effects

7.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent. There would be no physical impacts on buried archaeological remains or other heritage assets arising from the operation of the Proposed Scheme. Impacts on the setting of heritage assets arising from the physical

presence of the Proposed Scheme are described as permanent occurring within the construction phase and are not repeated in detail here, although they would endure through the operation of the Proposed Scheme. Where there is a combined effect on the setting of an asset from the presence of the constructed Proposed Scheme and its operation, this is reported in the assessment of operation.

7.5.3 It is expected that significant effects would occur as a result of permanent changes to the setting of the following assets arising from the impacts of railway operation.

7.5.4 The setting of Shelton under Harley Farm, a non-designated 18th - 19th century farmhouse of moderate value, would be substantially changed as the result of the operation of the Proposed Scheme. The farmhouse faces south-west onto Bent Lane looking across the WCML in the valley to the west. The most significant elements of its setting are the adjacent historic farm buildings, and its rural, agrarian surroundings. The operation of the Proposed Scheme immediately to the west of the farm, with the noise and movement of the trains, would adversely affect these elements of the farm's historic significance. This would result in a high adverse impact resulting in a moderate adverse effect.

7.5.5 The significance of Blakelow Farm, a non-designated 18th century farm complex of low value, resides partly in its agrarian country setting, although this has been substantially modified by the construction of the M6 immediately to the north-east. The operation of the Proposed Scheme to the south-west would add new noise and movement of the trains to the west of the farm. This would result in a high adverse impact resulting in a moderate adverse effect.

7.5.6 The setting of the Grade II listed Water Tower, a designated asset of moderate value, approximately 800m north of Swynnerton village would be affected by noise and movement from the trains passing by in the valley below. This would result in a medium adverse impact resulting in a moderate adverse effect.

Other mitigation measures

7.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. No additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified at the current time, although potential opportunities for further mitigation will continue to be considered through the design process.

Summary of likely residual significant effects

7.5.8 The settings of Shelton under Harley and Blakelow historic farms and the Grade II listed Water Tower on Stab Lane would be significantly and permanently affected once the Proposed Scheme becomes operational. This would be the result of their heritage significance being adversely affected by noise and visual impacts on their settings. In due course, some visual effects would reduce as planting matures and the new railway assimilates into the landscape, although the overall residual effect on these heritage assets is likely to remain significant.

8 Ecology

8.1 Introduction

8.1.1 This section of the report provides a summary of the predicted impacts and significant effects upon species and habitats in the Stone and Swynnerton area as a consequence of the construction and operation of the Proposed Scheme. This includes effects upon sites recognised or designated on the basis of their importance for nature conservation.

8.1.2 Engagement with stakeholders including Natural England, the Environment Agency, the Forestry Commission, Staffordshire Wildlife Trust, the Royal Society for the Protection of Birds, Woodland Trust, SBC, SCC and landowners has been undertaken. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme.

8.1.3 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in Volume 2, CA3 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, methodology and key assumptions for the ecological assessment are set out in the draft SMR and Volume 1. The assessment methodology is summarised in Section 8 of Volume 1, along with route-wide assumptions and limitations. In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a precautionary basis.

8.2.2 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. These include broad habitat and detailed plant surveys, plus surveys for great crested newts, wintering and breeding birds, bats, dormice, otters and water voles. The findings from these ongoing surveys will be reported in the formal EIA Report.

8.3 Environmental baseline

Existing baseline

8.3.1 This section presents the environmental baseline that is relevant to the consideration of impacts and effects reported in Sections 8.4 and 8.5.

8.3.2 Land within and adjacent to the Proposed Scheme consists of arable farmland, pasture fields, intact and species-rich hedgerows, woodland and villages. The Proposed Scheme would cross the M6 corridor to the west of Stone. The Proposed Scheme in the Stone and Swynnerton area would pass through 12 woodlands. Filly Brook is the only named watercourse that would intersect with the route of the Proposed Scheme, as well as a number of unnamed minor watercourses, ponds and ditches.

8.3.3 There are no statutory designated sites of international importance within 2km of the Proposed Scheme, and no other statutory designated sites located within 500m of the

Proposed Scheme. Non-statutory designated sites are shown on CT-10 Map Series, Volume 2, CA3 Map Book.

8.3.4 The nearest internationally important site is the Pasturefields Salt Marsh Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI). This site is considered in the Volume 2, CA2 Report: Colwich to Yarlet.

8.3.5 Six local wildlife sites (LWSs) are considered to be potentially subject to significant effects. Due to the habitats and species present, these sites are considered to be of up to county/metropolitan value:

- Poolhouse Wood LWS, which is designated for damp deciduous woodland, comprises two areas of woodland, both of which lie entirely within the land required for construction of the Proposed Scheme.
- Closepit Plantation LWS, which is designated for deciduous woodland dominated by sycamore. Part of the site lies within the land required for construction of the Proposed Scheme.
- Clifford's Wood LWS, which is designated for deciduous oak - beech woodland, would be bisected by the construction of the Proposed Scheme.
- Highlow Meadows LWS, which is designated for its range of semi-natural habitats, including semi-improved grassland, species-rich marshy grassland and broadleaved woodland. Part of the site lies within the land required for construction of the Proposed Scheme.
- Hatton Common LWS, which is an area of mixed, broadleaved-dominated woodland that lies adjacent to the land required for construction of the Proposed Scheme.
- Lodge Covert LWS, which is an area of broadleaved woodland located approximately 50m north of the land required for construction of the Proposed Scheme and is separated from it by the M6.

8.3.6 A review of woodlands not currently listed on the Ancient Woodland Inventory, but that lie within the land that would be required for construction of the Proposed Scheme or within 500m of it, has been undertaken based on historical mapping. The review found the following woodland sites to be potentially ancient woodland, all of which would be partially within the land required for construction of the Proposed Scheme:

- Clifford's Wood;
- Closepit plantation; and
- Birchwood.

8.3.7 The review findings and any further ecology field surveys undertaken to assess this woodland will be provided in the formal EIA Report. On a precautionary basis pending the findings of field surveys, these woodlands are considered to be of up to county/metropolitan value.

8.3.8 In addition to the aforementioned woodlands, there are six other areas of semi-natural lowland deciduous woodlands (which may qualify as habitats of principal importance, and local biodiversity action plan (BAP) habitats[41]), which would be within, or partly within, the land that would be required for construction of the Proposed Scheme. They are woodland areas near Filly Brook; north of Eastwood; Cash's Pit; Stabhill Plantation; a cluster of small interconnected woods north-west of Clifford's Wood; and woodland to the south of the M6 near Lodge Covert, where the route of the Proposed Scheme would cross the motorway. On a precautionary basis pending the findings of field surveys, these woodlands are considered to be of up to district/borough value.

8.3.9 Other habitats located outside of the designated sites identified above and which are relevant to the assessment include Filly Brook, and a number of smaller watercourses which would be crossed by the route of the Proposed Scheme. The main watercourses are considered likely to be habitats of principal importance and local BAP habitats. On a precautionary basis in the absence of survey information these are considered to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value. These require compliance assessment under the Water Framework Directive (WFD)[42] and relevant surveys, such as fish, invertebrate and invasive plant species will be undertaken.

8.3.10 There are 44 existing ponds that would be located within the land that would be required for construction of the Proposed Scheme and a further 88 ponds within 250m of the Proposed Scheme. It is assumed that all ponds are of district/ borough value unless they are found to be habitats of principal importance or local BAP habitats, in which case, on a precautionary basis, they would be assumed to be of up to county/metropolitan value.

8.3.11 Many hedgerows are likely to qualify as habitats of principal importance and a local BAP habitat. Some also meet the wildlife and landscape criteria for important hedgerows specified in the Hedgerows Regulations 1997[43]. In addition they could also provide commuting corridors for wildlife and nesting and feeding habitat. On a precautionary basis, in the absence of surveys, the hedgerow network is considered to be of up to district/borough value.

8.3.12 Extensive areas of improved grassland occur throughout the area, reflecting the prominence of dairy and livestock production. Areas of floodplain grazing marshes associated with ponds and drainage ditches occur adjacent to Swynnerton Grange. On a precautionary basis these grasslands may qualify as a habitat of principal importance and local BAP habitat. Unless the field surveys identify unimproved grasslands, these grasslands are considered to be of up to district/borough value.

8.3.13 Swynnerton Heath Orchard is located adjacent to the Proposed Scheme, and may qualify as a habitat of principal importance. It is considered to be of up to district/borough importance.

8.3.14 A summary of the likely value of protected and/or notable species is provided in Table 4.

[41] Staffordshire Biodiversity Action Plan (BAP).
[42] EU Water Framework Directive. Available online at: http://ec.europa.eu/environemt/water/water-framework/index_en.html
[43] *"Statutory Instrument 1997 No. 1160"* Hedgerow Regulations 1997.

Table 4: Species potentially relevant to the assessment within the Stone and Swynnerton area

Resource/receptor	Value	Rationale
Bats	Up to county/metropolitan for the majority of bat species, with potential for up to regional for some rarer species	There are records of four maternity roosts from three locations that are within 2km of the land required for construction of the Proposed Scheme: soprano pipistrelle in Stone; unidentified bat species in Stone, Coldmeece, and between Upper and Lower Hatton near Clifford's Wood. The woodland, hedgerows and arable fields are likely to be used by a range of bat species for foraging and commuting. Trees and buildings have been identified with potential to support roosting at numerous locations within 100m of the land required for construction of the Proposed Scheme. Records confirm there are at least seven species of bat throughout the Stone and Swynnerton area: brown long-eared bat; common and soprano pipistrelle; Whiskered/Brandt's; noctule, Leisler's; Daubenton's bat; and unidentified Myotis species.
Otter and water vole	Up to county/metropolitan	Populations of otter are rare in Staffordshire. Habitat suitable for this species is present along the watercourses and drainage ditches. There is one record of otter within 100m of land that would be required for construction of the Proposed Scheme. Populations of water vole are rare in Staffordshire and are declining. Habitat suitable for water vole is present along the watercourses and drainage ditches. There are records of water vole in the area near the Trent and Mersey Canal within 2km of land required for construction of the Proposed Scheme.
Hazel dormouse	Up to county/metropolitan	Populations of hazel dormice are rare in Staffordshire. However, a record exists for dormouse within a woodland in the adjacent area (Whitmore Heath to Madeley (CA4)). It is therefore considered possible that dormice are present within suitable areas of broadleaved woodland and networks of established hedgerows within the Stone and Swynnerton area.
Polecat	Up to county/metropolitan	Populations of polecat are rare in Staffordshire. Habitat suitable for this species is present including hedgerows, farmland and woodland, and there are records of presence within this area.
Great crested newt	Up to county/metropolitan	There are records of great crested newt in two areas within 1km of the land required for construction of the Proposed Scheme. Both are approximately 700m south near the village of Yarnfield and is likely to be present within the land required for construction of the Proposed Scheme.
Birds	Up to county/metropolitan	Records indicate the presence of barn owl within 100m of the land required for construction of the Proposed Scheme and throughout the area, with confirmed

Resource/receptor	Value	Rationale
		breeding records near Clifford's Wood. Records indicate that other species associated with farmland, such as: lapwing; skylark; tree sparrow; yellow wagtail; linnet and yellowhammer are breeding within the land required for the Proposed Scheme. Records also indicate the presence of other notable species, such as the common kingfisher and marsh harrier, within 2km of the land required for construction of the Proposed Scheme. A population of wintering linnets was recorded near Swynnerton Grange, approximately 250m from land required for construction of the Proposed Scheme.
Aquatic and terrestrial invertebrates	Up to district/borough	Aquatic invertebrates may be present in suitable areas of habitat (particularly in watercourses including Filly Brook), and may occur in areas of wet habitat in the floodplain grazing marsh. Habitat that may contain terrestrial invertebrates of interest is present within the area including woodland rides and edges, dead wood resource in mature trees, hedgerows and less intensively managed tracts of grassland and scrub.
Fish	Up to district/borough	Fish may be present in Filly Brook and other unnamed smaller watercourses[44].
Reptiles	Up to district/borough	Suitable habitat for reptiles is present throughout the land required for the construction of the Proposed Scheme in the area, including less intensively managed field margins, ditches, ponds and residential gardens. Records suggest presence of slow worm and grass snake on the north edge of Swynnerton Old Park and adder near Tittensor Chase.
Badger	Up to local/parish	Suitable habitat for badgers is present within the land required for construction of the Proposed Scheme. There are records of badger throughout the area and, in particular, near Swynnerton Heath Farm/Clifford's Wood and a number of woodland areas north of the Proposed Scheme.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 The following measures have been included as part of the design of the Proposed Scheme and avoid or reduce impacts to features of ecological value:

[44] The EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, Available online at: http://eur-lex.europa.eu/eli/dir/1992/43/2013-07-01)

- construction of a viaduct over the Filly Brook would avoid direct effects to the watercourse and allow free passage for wildlife beneath it, including along the river and its banks;
- new woodland planting would help towards offsetting the losses of semi-natural broadleaved woodland (e.g. Poolhouse Wood, Cash's Pit and Hatton Common) and to enhance connectivity between remaining woodlands;
- provision of new ponds for those lost if they support great crested newts, (for example, between Yarlet and Green Lane, between Green Lane and the B5026 Eccleshall Road, either side of Yarnfield Lane, either side of the M6 north-east of Swynnerton Grange, between Blakelow and Lodge Covert, south of Sandyford Farm, near Whitehouse and Long Compton Farm, and near Cash's Pit and Swynnerton Heath Farm), which would form part of the mitigation measures required to reduce the effects on great crested newts to not significant;
- provision of some new species-rich hedgerows, using appropriate native species, to help towards offsetting the loss of hedgerows, re-connecting the ecological network in the surrounding areas, including along the margins of the route of the Proposed Scheme and along road realignments/diversions, and linking new ponds in locations described above; and
- provision of new grassland habitats, including species-rich grasslands to help towards offsetting the losses from the Proposed Scheme.

8.4.2 The assessment assumes implementation of the measures set out within the draft CoCP, which include translocation of protected species where appropriate.

Assessment of impacts and effects

8.4.3 The following section considers the impacts and effects on ecological features as a consequence of construction of the Proposed Scheme. At this time, all assessments are on a precautionary basis in the absence of survey information, and take account of the baseline value as presented in Section 8.3 of this report.

8.4.4 Construction of the Yarnfield North embankment would result in the permanent loss of approximately 3ha (100%) of two woodlands that form Pool House Wood LWS, a site designated for its damp deciduous woodland. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

8.4.5 Construction of the Swynnerton North cutting would result in the permanent loss of approximately 0.01ha (2%) of Closepit Plantation LWS. Given the relatively small area lost it has no significant adverse effect on site integrity.

8.4.6 The Proposed Scheme would bisect Clifford's Wood LWS, resulting in the loss of approximately 1ha (6%) of the woodland and severance of the remaining woodland. This would have a permanent and significant adverse effect on site integrity at up to county/metropolitan level.

8.4.7 Construction of the M6 Meaford viaduct and Meaford North embankment would result in the permanent loss of approximately 1.5ha (23%) along the northern edge of

Highlow Meadows LWS, a site designated for its range of semi-natural habitats, including semi-improved grassland, species-rich marshy grassland and broadleaved woodland. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

8.4.8 The land required for construction of the Proposed Scheme would result in the permanent loss of approximately 0.01ha (2%) of Closepit Plantation, 1ha (6%) of Clifford's Wood and the entirety of Birchwood (approximately 0.6ha), all potential ancient woodlands. This would result in effects that would be significant up to county/metropolitan level.

8.4.9 Construction would result in the loss of approximately 7ha of other lowland broadleaved woodland in this area. The permanent loss of these woodlands would result in an effect that would be significant at up to the district/borough level.

8.4.10 The design includes a viaduct across Filly Brook. This watercourse would not be directly affected, and indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP. However, the Proposed Scheme would result in the loss of sections of other smaller watercourses and severance of river corridors due to culverts, which would result in a permanent effect that would be significant at up to the district/borough level.

8.4.11 Forty-four ponds would be lost due to the Proposed Scheme. The loss of these ponds could result in an impact that would be significant at up to county/metropolitan level depending on the findings of field surveys (for example, if they support great crested newts), otherwise up to district/borough level.

8.4.12 The Proposed Scheme would cross approximately 193 hedgerows that are located throughout the area, and some may be important hedgerows. The land required for construction of the Proposed Scheme would result in the permanent loss of up to 28km of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The Proposed Scheme includes new hedgerow planting which would help offset losses. Further hedgerow planting would be proposed as part of the design development. In the absence of this additional mitigation, the impact would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

8.4.13 Construction of the Proposed Scheme would result in the loss of grassland outside designated sites, including approximately 0.2ha of floodplain grazing marsh at Highlow Meadows and Swynnerton Grange. In the absence of field survey information, it has been assumed that none of the grassland lost would be unimproved, and hence the loss would be significant at up to the district/borough level.

8.4.14 Habitat loss may have impacts on bats, as it would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. This could particularly affect breeding populations of at least seven bat species within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP. On a precautionary basis in the absence of mitigation there could be

impacts on significant populations of bats, which may be up to regional level. However, the majority of impacts on bats would be expected to be at a lower level.

8.4.15 If surveys find otters and water voles to be present, the loss of water-margin habitat along watercourses such as Filly Brook and indirect effects from construction activities such as increased light and noise, may result in disturbance to these species during the construction period, and prevent them from moving along them. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. There would be a loss of habitat associated with several smaller watercourses crossed by the Proposed Scheme. On a precautionary basis in the absence of survey findings, impacts to otters and water voles would result in an adverse effect on the conservation status of these species that would be significant up to the county/metropolitan level.

8.4.16 The loss of deciduous woodland and hedgerows in particular could affect the hazel dormouse if surveys show this species to be present. On a precautionary basis in the absence of survey information, the effects of permanent habitat loss on these species are assumed to be of up to county/metropolitan significance.

8.4.17 The land that would be required for construction of the Proposed Scheme would result in the loss of suitable habitat for polecats should they be confirmed to be present. On a precautionary basis in the absence of survey information, it has been assumed that the loss of habitat could result in an impact that would be significant at up to county/metropolitan level.

8.4.18 It has been assumed that all 44 ponds and (surrounding terrestrial habitat) within the land required for construction of the Proposed Scheme may support great crested newts, and would be lost during construction. The loss of ponds supporting great crested newts could result in the isolation and severance of breeding populations of great crested newts across this area. The design incorporates the creation of some new ponds at this stage, but additional ponds would also be required subject to the outcome of surveys. Suitable terrestrial habitat would also be required to fully mitigate the effects. In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/metropolitan level.

8.4.19 The Proposed Scheme would result in the loss of nesting and foraging habitat for a range of farmland and woodland birds. These are likely to include barn owl, a Schedule 1[45] species which has been recorded adjacent (within 100m) of the land required for construction of the Proposed Scheme. On a precautionary basis in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

8.4.20 The land required for construction of the Proposed Scheme would result in loss of habitat suitable for aquatic and terrestrial invertebrates (including Section 41

[45] The Wildlife and Countryside Act 1981 (1981 Chapter 69) – Schedule 1 – Birds which are Protected by Special penalties, HMSO London. Available online at: http://www.legislation.gov.uk/ukpga/1981/69

[46]species). On a precautionary basis in the absence of survey, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

8.4.21 The Proposed Scheme would pass over main watercourses on viaducts, and any indirect impacts to fish living in the watercourses would be controlled through measures set out in the draft CoCP and will be assessed for compliance with the WFD[47]. However, other smaller watercourses would still be affected and may require assessment under the WFD. On a precautionary basis in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect on fish that would be significant.

8.4.22 Records indicate the presence of common reptiles within 2km of the Proposed Scheme and suitable habitats for these species are present in the land required for construction of the Proposed Scheme. This includes marginal aquatic habitats suitable for grass snake associated with Filly Brook and ponds within the land required for the construction of the Proposed Scheme. Other common species such as slow worm and common lizard are likely to be present within marginal grassland and scrub habitats. On a precautionary basis in the absence of survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

8.4.23 Effects on all other habitats and species would be likely to be significant at the local/parish level during construction. These effects and consideration of the potential cumulative effects will be described in the formal EIA Report.

8.4.24 Indirect effects from changes in air quality, from increased levels of construction traffic, will be considered for sites within 200m of construction routes where habitats are considered to be sensitive to air quality changes. These effects will be reported in the formal EIA Report.

Other mitigation measures

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

- provision of additional broadleaved woodland to replace those lost, and/or enhancement of remaining woodlands;
- provision of additional hedgerows which would offset the losses and maintain the connectivity of the network;
- options to create new species-rich grasslands (including translocation where appropriate) to offset grassland losses, including at Highlow Meadows and Swynnerton Grange to offset losses of floodplain grazing marsh;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;

[46] Species listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.
[47] The other elements of the WFD are assessed in the water resources and flood risk section.

- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction;
- design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats;
- provision of additional ponds outside of the area of construction, on a two-for-one basis as required, and suitable terrestrial habitat around all ponds created with habitat links to allow dispersal; and
- provision of suitable terrestrial habitat around ponds which would be created to support great crested newts and habitat links to allow dispersal.

8.4.26 Some of the above may also be achieved through strategic mitigation in locations outside of the land required for the Proposed Scheme, which are currently being discussed with relevant stakeholders and are subject to agreement.

Summary of likely residual significant effects

8.4.27 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, anticipated significant residual ecological effects during construction are detailed in Table 5.

Table 5: Anticipated significant residual ecological effects during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Poolhouse Wood LWS	Permanent adverse effects from the loss of approximately 3ha (100%) of the site.	County/metropolitan
Clifford's Wood LWS	Permanent adverse effect on site integrity due to loss of approximately 1ha (6%) of LWS woodland and severance of the remaining woodland.	County/metropolitan
Highlow Meadows LWS	Permanent adverse effect in site integrity due to the loss of approximately 1.5ha (23%) of semi-improved habitats.	County/metropolitan
Potential ancient woodland sites (Closepit Plantation, Clifford's Wood, Birchwood)	Permanent loss of approximately 5ha of woodland	Up to county/metropolitan
Broadleaved woodland	Permanent loss of approximately 7ha of woodland.	Up to district/borough
Watercourses	Permanent adverse effect to the smaller watercourses, due to habitat loss and severance of the river corridors.	Up to district/borough

Resource/feature	Residual effect	Level at which the effect would be significant
Ponds	Permanent loss of 44 ponds	Up to county/metropolitan
Hedgerows	Permanent loss of sections of approximately 193 hedgerows, some of which may be Important, and approximately 28km of hedgerows. Adverse effect on connectivity within the wider area.	Up to district/borough
Grassland	Permanent loss of grassland including approximately 0.2ha of floodplain grazing marsh.	Up to county/metropolitan
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to county/metropolitan for the majority of bat species, with potential for up to regional for some rarer species
Otter and water vole	Permanent adverse effect due to construction activities and disturbance along the main river, and loss of habitat and habitat fragmentation on smaller watercourses.	Up to county/metropolitan
Hazel dormouse	Loss of habitat suitable for dormouse.	Up to county/metropolitan
Polecat	Loss of habitat suitable for polecat.	Up to county/metropolitan
Great Crested Newts	Loss of 44 ponds and surrounding terrestrial habitat, which may support great crested newts	Up to county/metropolitan
Birds	Loss of nesting and foraging habitat for a range of breeding birds, especially of farmland and woodland. Barn owl, a Schedule 1 species, may be affected.	Up to county/metropolitan
Aquatic and terrestrial invertebrates	Permanent loss of suitable habitat.	Up to district/borough
Fish	Permanent loss of habitat from smaller watercourses.	Up to district/borough
Reptiles	Permanent loss of habitat suitable for reptiles.	Up to district/borough

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Within this section of the Proposed Scheme the following element of the design would avoid or reduce impacts on features of ecological value during operation: construction of a viaduct over the Filly Brook would avoid direct effects to the watercourse and allow free passage for wildlife beneath it, including along the river and its banks.

Assessment of impacts and effects

8.5.2 The following section considers the impacts and effects on ecological features during operation of the Proposed Scheme. All assessments have been made on a precautionary basis in the absence of survey information and take account of the baseline value presented in Section 8.3 of this report.

8.5.3 Bats are at risk of mortality from passing trains, particularly at frequently used commuting/foraging routes across the Proposed Scheme. On a precautionary basis in the absence of mitigation there could be significant impacts on populations of bats which may be up to regional level. However, the majority of impacts on bats would be expected to be at a lower level.

8.5.4 Barn owls are slow moving and often hunt low over rough grassland habitats that occur along road and railway corridors. As a result they may be killed by cars and trains. Mortality could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

8.5.5 Effects on all other habitats and species would be likely to be significant at no more than local/parish level. These effects and consideration of the potential cumulative effects will be described in the formal EIA Report.

Other mitigation measures

8.5.6 Additional mitigation measures currently being considered include:

- the development of a barn owl action plan to provide off-site mitigation at a safe distance from the line (informed by species dispersion modelling being undertaken for HS2 Ltd by the British Trust for Ornithology); and
- green bridges, culverts and/or other structures to reduce the likelihood of bats foraging in proximity to, or attempting to cross, the railway and to facilitate their safe passage when the Proposed Scheme is operational.

Summary of likely residual significant effects

8.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 6.

Table 6: Residual significant effects on ecological resources/features during operation

Resource/feature	Residual effect	Level at which the effect would be significant
Bats	Potential permanent adverse effect on conservation status due to collision with trains	Up to county/metropolitan for the majority of bat species, with potential for up to regional for some rarer species
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan

9 Health

9.1 Introduction

9.1.1 This section identifies the communities within the Stone and Swynnerton area that would be subject to environmental impacts from the Proposed Scheme and describes how the changes may affect the health and wellbeing of people within these communities.

9.1.2 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

9.1.3 A socio-economic model of health is adopted for this assessment in which the health status of a population, or changes to the health status, is attributed to a series of health determinants. An individual's health may be determined by genetics and lifestyle factors, but for a large enough population many other factors are known to be important and these factors may be affected by the Proposed Scheme.

9.1.4 No engagement has been undertaken with key public health bodies to date. Engagement with key public health bodies will be undertaken as part of the development of the Proposed Scheme. The purpose of the engagement will be to increase the understanding of health issues that may not be identified solely through a review of publicly available data.

9.2 Scope, assumptions and limitations

9.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the draft SMR.

9.2.2 This section deals specifically with impacts that occur at a local level within the Stone and Swynnerton area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3, Route-wide effects.

9.2.3 The health determinants of relevance within the Stone and Swynnerton area are:

- social capital;
- neighbourhood quality;
- access to green space, recreation and physical activity; and
- access to services.

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

9.2.5 The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information will be presented in a literature review and included in the formal EIA Report. The evidence that relates health outcomes to changes in determinants varies in its strength. For example, the evidence relating to health effects of physical activity is strong, whereas that relating

to social capital is considered weak. The strength of evidence does not necessarily determine the importance of the health effect in the assessment.

9.2.6 The certainty that can be attached to any conclusion regarding effects on health will depend on the strength of the evidence for a given determinant and also the confidence attached to the prediction of an impact on a determinant. There will be greater certainty for the existence of an impact than a consequent effect on health.

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

9.3 Environmental baseline

9.3.1 The Stone and Swynnerton area has a relatively small population, commensurate with the rural nature of the land use. Data provided by the Office of National Statistics[48] and the Association of Public Health Observatories[49] show that this population is, by comparison with national (England) averages, in good health and experiences low levels of deprivation.

9.3.2 The population as a whole is considered to be more resilient than the national average with regard to changes in the relevant health determinants, and with relatively few vulnerabilities. One such vulnerability is a slightly higher than average proportion of older people (the 65 – 84 years category). Another is that an area close to the urban centre of Stone has slightly above national average crime, health and disability deprivation levels, falling into the 50% most deprived nationally[50]. In common with many other rural areas, most communities in the Stone and Swynnerton area are ranked in the 10% most deprived in the country for access to affordable housing and good quality services.

9.3.3 The available data permits a profile to be made of the whole population of approximately 26,000 in the Stone and Swynnerton area and provides detail down to ward level[51]. The description of the whole population and the populations within wards does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile. Stakeholder engagement will be undertaken and this will provide further information of relevance to the community profile.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 Consideration of potential health issues has been an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Adverse effects on health determinants have been reduced as far as reasonably practicable through embedded mitigation measures to

[48] The Office of National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services',' crime' and 'living environment'. These data are based on the 2011 census and available by Lower Super Output area.
[49] http://www.apho.org.uk/
[50] Department for Communities and Local Government, 2015. English Indices of Deprivation, 2015.
[51] Electoral wards are the spatial units used to elect local government councillors. National Census data are published at ward level.

reduce adverse effects on people. Examples of the mitigation measures incorporated into the Proposed Scheme include the following:

- reducing the loss of property and community assets as far as reasonably practicable;
- reducing visual intrusion and noise as far as reasonably practicable; and
- incorporating landscape design and screening into the Proposed Scheme.

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

9.4.3 Within the Stone and Swynnerton area, a diversion of Bent Lane (North) has been amended to reduce the number of demolitions of residential properties in Shelton under Harley.

9.4.4 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which includes the following core documents:

- the draft CoCP, which provides a generic basis for route-wide construction environmental management; and
- the LEMPs, which apply the management strategies at a local level.

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

Assessment of impacts and effects

Social capital

9.4.6 The connections between the individuals within communities, and the inclination that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other, is important for health and wellbeing. A measure of the effectiveness of these connections within communities is termed 'social capital' and is a recognised determinant of health. Impacts on social capital can arise from changes to community facilities and community connectivity, and from changes in community demographics. Adverse effects on health from changes in social capital can be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

9.4.7 When homes are lost from within a community, there is a potential for the remaining community to experience changes to their social environment and loss of social networks. A total of six residential properties would be demolished as a result of land requirements within the Stone and Swynnerton area. This includes demolition of five residential properties for the construction of the Yarnfield North embankment east of the M6 and the Stone railhead, and one in Shelton under Harley, for the construction of the Hatton North cutting and the Bent Lane (North) diversion. Shelton under Harley is a small hamlet with only four residences, and it is considered that the loss of one property could potentially adversely affect social capital within the hamlet.

9.4.8 Road closures and diversions temporarily required for the construction of the Proposed Scheme have the potential to reduce community connectivity by increasing journey times between rural communities. At this stage, no effects on social capital as a result of increased journey times affecting individual properties or specific locations have been identified.

9.4.9 The temporary construction workforce could comprise a mixture of local people and workers from further afield. The Stone railhead and associated compound, located adjacent to the M6 on Yarnfield Lane, could provide accommodation for up to 240 workers for approximately seven years. Other workers who live outside commuting distance of the site may choose to seek accommodation within the local community. This could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial effect these changes would have on social capital will be undertaken and reported on in the formal EIA Report. There is potential for the presence of the temporary workforce to have a beneficial effect on local communities through increased spending, thereby increasing income and employment opportunities.

Neighbourhood quality

9.4.10 The term 'neighbourhood quality' is used in this assessment to describe a combination of aspects that have the potential to affect residents' feelings about their local environment and thereby affect their quality of life and mental health and wellbeing. Communities could experience a number of effects during the construction of the Proposed Scheme, including construction traffic, construction noise and dust, and visual effects of the temporary and permanent works. The environmental and community impacts of these changes are assessed in the relevant sections of this report. This section assesses how changes to neighbourhood quality may affect people's levels of satisfaction with their local environment and perceptions about issues such as personal safety and security, and considers how these issues may in turn affect wellbeing.

9.4.11 The link between health and the aesthetic value of the public realm is not well understood, but there is moderate evidence to suggest that an attractive environment can improve people's enjoyment and sense of wellbeing. Conversely, poor quality environments have been shown to have negative effects on people's health. There is moderate evidence that people have a preference for views of natural environments over man-made environments, and that exposure to views of natural environments is associated with wellbeing. The construction works and permanent structures would be visible from a large number of locations due to the scale of the Proposed Scheme. Section 11, Landscape and visual identifies locations that would experience changes in existing views, including country roads, PRoW and views from properties close to the Proposed Scheme. Visibility of the Proposed Scheme would be low from towns and village centres. Effects on views of the rural landscape may have negative effects on residents' perceptions of the quality and character of their local environment, which could lead to a reduction in wellbeing.

9.4.12 Traffic and transport impacts would include:

- construction vehicle movements to and from the various worksites;

- temporary and permanent road closures and associated diversions/realignments; and
- temporary and permanent alternative routes for PRoW.

9.4.13 At this stage, it is not anticipated that construction traffic emissions (NO_2, NOx, PM10 and PM2.5) would have adverse health effects. However, the presence of additional HGV traffic on the road network could raise concerns about potential health effects, and perceived concerns about safety and frustration resulting from increased journey times. These perceptions could have a negative effects on people's satisfaction with their local environment.

9.4.14 Noise from construction traffic and construction activities can cause annoyance and disturbance and lead to temporary effects on quality of life. Section 13, Sound, noise and vibration, has identified locations where residential communities may be adversely affected by construction traffic noise. In the Stone and Swynnerton area the B5026 Eccleshall Road through Walton has been identified on a precautionary basis as having the potential for an adverse noise effect on occupants of residential communities along this road.

9.4.15 Noise from construction sites could also cause annoyance and disturbance and contribute to a perceived reduction in neighbourhood quality. Section 13, Sound, noise and vibration identifies communities that may be affected by construction noise, on the basis of their proximity to the proposed works. These include areas within the following settlements: North Pirehill, Walton Heath, Swynnerton, Swynnerton North and Stableford.

9.4.16 Construction sites have the potential to give rise to emissions of dust and particulate matter. Section 5, Air quality, identifies no adverse effects with respect to the effects of construction activities on dust soiling and human health within the Stone and Swynnerton area, taking account of mitigation measures contained in the draft CoCP. Therefore it is not expected that any direct health and wellbeing effects would arise as a result of air quality around construction sites.

9.4.17 Construction sites are sometimes perceived as having the potential to attract activities such as vandalism, fly-tipping and theft of materials. Those living close to construction compounds may experience increased fear of crime and antisocial behaviour associated with the presence of the sites. Additionally, the diversion of PRoW around construction sites has the potential to affect actual or perceived personal safety, both in terms of road safety and environmental changes, such as sight lines and lighting. Fear of crime has been linked to health effects such as anxiety, and changes in behaviour, such as reduced participation in activities that are beneficial to health. The effects of increased crime and antisocial behaviour resulting from the Proposed Scheme are likely to be extremely low, as construction sites would be appropriately fenced and secured. The potential for crime and anti-social behaviour would be minimised through measures set out in the draft CoCP, such as worksite security, site lighting, hoarding, fencing and screening.

9.4.18 Overall, it is considered that the construction of the Proposed Scheme has the potential to affect wellbeing through changes to neighbourhood quality for the duration of the works. This will be assessed in the formal EIA Report.

Access to green space, recreation and physical activity

9.4.19 Environmental factors have been shown to influence participation in physical activity, which in turn affects health. This includes issues such as opportunities for active travel, the accessibility of facilities for physical exercise, perceived safety, and amenity of outdoor areas and parks. At this stage, no areas of green space have been identified as being affected by the Proposed Scheme in the Stone and Swynnerton area.

9.4.20 Fear of traffic is identified as the most common barrier to cycling, although the level of fear is often exaggerated in comparison with the likelihood of injury. Fear of walking on footways and crossing roads with increased HGV traffic is also likely to deter walkers, particularly those with young children. It is expected that the M6, the A34 Stafford Road/The Fillybrooks, the A51 Stone Road and the A519 Newcastle Road would provide the primary access routes for construction vehicles, from which HGVs would access construction compounds via the B5026 Eccleshall Road, Yarnfield Lane, Tittensor Road, the A519 Newcastle Road and Bent Lane. Where reasonably practicable, HGVs would use the haul road along the route of the Proposed Scheme to reduce the impact on the local road network. There may be some reduction in the number of active travel journeys (cyclists and pedestrians) during construction as a result of increased volumes of HGV traffic on parts of the road network. These issues have the potential to reduce levels of active travel during the construction period, particularly in rural areas where there are fewer alternative routes available. Any effects arising will be reported in the formal EIA Report. There would be temporary alternative routes for a number of PRoW during construction. Users would be re-routed around construction compounds, which is likely to increase travel distances. Reduced amenity on these routes due to the presence of construction sites may result in a temporary reduction in their use, leading to some reduction in levels of physical activity. These effects will be reported in the formal EIA Report.

Access to services, health and social care

9.4.21 Impacts on access to services may arise as a result of increased demand for services (for example, from the construction workforce), direct impacts on local services and facilities, and changes in journey times due to road closures and diversions, which have the potential to affect access to services and emergency vehicle access. There is strong evidence linking access to healthcare facilities with health outcomes, and there is also evidence to suggest that transport problems are a key barrier to people's ability to access these services. Therefore, changes in journey times to healthcare services have the potential to result in adverse health effects, if the delays are sufficient to deter people from attending appointments or seeking advice. These effects will be reported in the formal EIA Report.

9.4.22 In the event that construction workers from outside the local area reside in the vicinity of the Proposed Scheme it is considered likely that the majority would continue to be registered with their existing GPs, rather than registering with a GP in the local area. The small minority who may choose to relocate to the area and register with a GP would be accommodated within the existing healthcare funding systems, which allocates funds to local health authorities on the basis of population size. Workers choosing to live in the local area for the purpose of accessing construction employment would remain in the area on a temporary basis for the duration of the works, and would not contribute to long-term population growth.

9.4.23 As set out in the draft CoCP, HS2 Ltd or the nominated undertaker would provide occupational health care to temporary workers, including health assessment, health monitoring, preventative treatment where necessary, and first aid. This is expected to help reduce additional demand for local services, including A&E services.

9.4.24 HS2 Ltd would work with emergency services to ensure that effects on emergency response times are reduced as far as reasonably practicable. This would include consideration of strategies for temporary and permanent traffic arrangements and construction routes, to reduce any potential effects.

9.4.25 There is weak to moderate evidence to suggest that access to shops and other local services can affect health. This is based on a range of factors affecting quality of life, and includes issues such as reducing feelings of isolation and enabling participation in society (see assessment of social capital), as well as accessing basic needs, such as food shopping. The Stone and Swynnerton area is a rural area, where communities rely on shops and services in nearby towns and villages, and where opportunities for short alternative routes are limited, resulting in longer diversions. There is a potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. These effects will be reported in the formal EIA Report.

Other mitigation measures

9.4.26 Other mitigation identified to reduce impacts on health determinants during the construction of the Proposed Scheme in this area will be described in the formal EIA Report.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 As described in Section 9.4, consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Mitigation measures of relevance to the operation of the Proposed Scheme will be described in the formal EIA Report.

Assessment of impacts and effects

9.5.2 Any health effects of operational train noise will be reported in the formal EIA Report. No other operational effects additional to the permanent construction effects have been identified at this stage.

Other mitigation measures

9.5.3 Other mitigation identified to reduce impacts on health determinants during the operation of the Proposed Scheme in this area will be described in the formal EIA Report.

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Stone and Swynnerton area in relation to land quality, and reports the impacts and likely significant effects resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mining, mineral exploitation or mineral resources point of view, including geological SSSI, local geological sites (LGS), areas of current or permitted underground or opencast mining and areas of designated mineral resources. Mitigation measures are presented and any residual effects are summarised.

10.1.2 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (for example, contaminated soils may need to be removed or the construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment. The potential effects from operation of the Proposed Scheme are expected to be mitigated by operational and management controls.

10.1.3 Engagement with the BGS, SCC, SBC, Environment Agency and FERA has been undertaken. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

10.1.4 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1 and the draft SMR. This report follows the standard assessment methodology.

10.2.2 In accordance with the draft SMR, a risk-based approach is being undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, an initial desk-based assessment has been undertaken for the study area, defined as the land required for the Proposed Scheme plus a 250m buffer from the edge of proposed construction activities, but in the case of groundwater data, this is increased up to 1km. Selected site visits will be used to supplement desk-based information.

10.2.3 A conceptual site model (CSM) approach has been used to provide an initial understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of

impacts that existing contamination may be having at present and may have during and after construction.

10.2.4 Baseline data collection is ongoing and the results of that work, in conjunction with ongoing design development and further surveys, will inform the formal EIA Report and provide refinement, where necessary, to the assessment of effects during construction and operation.

10.3 Environmental baseline

Data collection

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

Field surveys

10.3.2 A familiarisation visit to the study area was made in March 2016, where the route of the Proposed Scheme was viewed from points of public access only.

10.3.3 Following the familiarisation visit and review of the baseline data, it was apparent that for many historical infill areas identified from the data, there are few obvious signs of these features on the ground when viewed from publicly accessible areas. On this basis, further surveys are likely to be needed to confirm the exact location and condition of the identified infill areas.

Geology

10.3.4 This section describes the underlying ground conditions within the Stone and Swynnerton area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[52].

Made ground

10.3.5 'Made ground' is a term used to denote man-made deposits such as landfill, spoil heaps or earthworks associated with construction or ground improvement. These deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled. There is evidence of historical and authorised landfilling within the area, which may comprise more significant deposits of made ground.

Superficial geology

10.3.6 Superficial glacial deposits from several glacial phases are present beneath parts of the area. Post-glacial sediments within this area include alluvium, river terrace deposits and peat.

[52] British Geological Survey, (2014), Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01. Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904

10.3.7 Glacio-fluvial sheet deposits (glacial till) with particle sizes ranging from clay to boulders are indicated to be present to the south-west of Walton and to the north and north-west of Swynnerton. Areas of alluvium possibly overlying terrace gravels are indicated in the vicinity of Filly Brook, between Swynnerton and Yarnfield. Alluvium is also indicated in the vicinity of Common Lane (North), near Clifford's Wood. Peat is present east of Yarnfield.

Bedrock geology

10.3.8 The bedrock immediately north of the boundary of the Colwich to Yarlet area (CA2) and in the Stone and Swynnerton area comprises the Stafford Halite Member for a distance of approximately 200m, which is part of the Mercia Mudstone Group. This consists of mudstone and halite stone. Halite stone is a sedimentary rock comprising greater than 50% rock salt.

10.3.9 The bedrock further north to Blakelow (comprising mainly of Blakelow Farm) comprises the Mercia Mudstone Group, described as red, less commonly green-grey, mudstones and subordinate siltstones. The Mercia Mudstone Group is reported to be in excess of 1.4km thickness. Halite, gypsum/anhydrite and sandstones may also be present within this thickness.

10.3.10 Dissolution of the halite-rich horizons can give rise to highly saline springs and ground subsidence. Surface depressions formed by the dissolution of halite are typically infilled by peat or alluvial sediments.

10.3.11 The bedrock between Blakelow and the A519 Newcastle Road comprises the Chester Formation and Tarporley Siltstone Formation, with the latter including bands of the Helsby Sandstone Formation. The Chester Formation and Helsby Sandstone Formation are part of the Sherwood Sandstone Group. The Tarporley Siltstone Formation is part of the Mercia Mudstone Group. Igneous dykes comprising micro-gabbro, known as the Butterton-Swynnerton Dykes, have intruded into these sedimentary rocks.

10.3.12 Between the A519 Newcastle Road and the northern boundary of this area the bedrock comprises sandstone of the Wildmoor Sandstone Member, part of the Sherwood Sandstone Group.

Radon

10.3.13 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The section of the route of the Proposed Scheme north of Swynnerton and south-east of Stableford lies within a radon-affected area, as defined on Public Health England's UK Radon online maps[53].

10.3.14 The maps show that between 1% and 3% of homes have radon levels above the action level of 200 becquerels per cubic metre (Bq/m^3) of air for residential properties. For the remainder of the area between Stone and Swynnerton, radon levels are reported to be less than 1% of homes above action level.

[53] www.ukradon.org/information/ukmaps

Groundwater

10.3.15 Four categories of aquifer have been identified within the Stone and Swynnerton area, as defined by the Environment Agency.

10.3.16 The Sherwood Sandstone is classified as a Principal aquifer. The igneous dyke is classified as a Secondary A aquifer. The Mercia Mudstone is classified as a Secondary B aquifer. Superficial deposits, where present, are classified as Secondary A aquifers, with the exception of peat which is classified as an unproductive strata. Aquifer classifications regarding the availability and use of groundwater are determined by the Environment Agency.

10.3.17 There are two licensed groundwater abstractions for public water supply protected by groundwater SPZ[54] within 1km of the route of the Proposed Scheme within the Stone and Swynnerton area, both are assumed to be abstracting from the Sherwood Sandstone Group:

- located north of Blakelow and adjacent to the A51 Stone Road. The land required for the construction activities of the Proposed Scheme crosses the associated SPZ1, SPZ2 and SPZ3; and
- located near Lower Hatton. The land required for the construction of the Proposed Scheme crosses the associated SPZ3.

10.3.18 There is one further licensed public water source, which is also protected by a SPZ, located in the Whitmore Heath to Madeley area (CA4), with the SPZ extending into the Stone and Swynnerton area.

10.3.19 There is one licensed groundwater abstraction for a private water supply within 1km of the Proposed Scheme.

10.3.20 BGS data indicates that there are eight groundwater wells within 250m of the route of the Proposed Scheme in the Stone and Swynnerton area.

10.3.21 According to local authority records, there are six private water supplies from groundwater which do not require a permit within 1km of the Proposed Scheme.

10.3.22 Groundwater bodies in the Stone to Swynnerton area are described in more detail in Section 15, Water resources and flood risk.

Surface water

10.3.23 Filly Brook is the only named surface water feature that would intersect with the Proposed Scheme, to be crossed by a viaduct in the vicinity of Pool House Farm approximately 1.5km west of Walton. The main channel of Meece Brook would not intersect with the Proposed Scheme but tributaries of Meece Brook would pass beneath.

[54] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate from the potable source.

10.3.24 There are further unnamed minor watercourses that would intersect the Proposed Scheme through the area. These include tributaries of the River Trent and unclassified surface water flowpaths, field drains and numerous ponds.

10.3.25 There are four licensed abstractions from surface water sources within 1km of the Proposed Scheme in the study area. Local authority provided data has confirmed that there are no unlicensed private water supplies from surface water within 1km of the Proposed Scheme.

10.3.26 Surface water bodies in the Stone and Swynnerton area are described in more detail in Section 15, Water resources and flood risk.

Current and historical land use

10.3.27 Current potentially contaminative land uses within the study area include a petrol filling station on the northbound side of the Stafford motorway service area, existing railways (including the WCML) and a number of farms along the route.

10.3.28 Furthermore, existing Common Lane Cold War bunkers may have historically been used by the military.

10.3.29 Other historical land uses identified within the study area with the potential to have caused contamination include several localised small-scale, possibly infilled sand, clay and gravel extraction pits. The infilled pits and ponds may have been filled with a variety of waste materials.

10.3.30 Historical mapping also shows a gasworks within Swynnerton village in 1901, south-west of the Proposed Scheme. An historical garage and petrol filling station in Stableford is indicated on the 1994 historical map, south of the Proposed Scheme. There are three historical licensed landfill sites within the study area at Cold Norton Farm, Eccleshall Road (licensed to accept household waste from 1960, closure date unknown), near Micklow House, B5026 Eccleshall Road (licensed to accept household waste from 1963, closure date unknown) and Pool House Farm, Yarnfield Lane (licensed to accept household waste from 1958, closure date unknown).

10.3.31 Contaminants commonly associated with landfills could include metals, semi-metals, asbestos, and organic and inorganic compounds. Infilled pits could also give rise to landfill gases, such as methane or carbon dioxide, and leachate.

Other regulatory data

10.3.32 The regulatory data reviewed include pollution incidents, radioactive and hazardous substances consents and environmental permits (previously landfill, Integrated Pollution Control (IPC) and Integrated Pollution Prevention and Control (IPPC) licences). Notable data are as follows:

- two significant and one minor pollution incidents. The significant incidents affected watercourses and involved pesticides and oils. The minor incident related to burning tyres; and
- two currently permitted or authorised Local Authority Pollution Prevention and Controls for animal feed compounding and a petrol filling station.

10.3.33 There are no ecological designations[55], as defined in the land quality section of the draft SMR, located within the 250m land quality study area.

Mining/mineral resources

10.3.34 SCC is responsible for the overall mineral and waste local plans for the county. The new Minerals Local Plan for Staffordshire 2015 to 2030 (final draft 2015)[56] is currently being reviewed and is expected to replace the current Staffordshire and Stoke-on-Trent Minerals Local Plan in 2016. It will set out the Council's policies aimed at controlling mineral related developments within Staffordshire up to the year 2030.

10.3.35 There are three mineral safeguarding areas (MSA) in the new Minerals Local Plan within the area. These are an area to the north of Yarnfield, an area north of Swynnerton, and at the northern boundary of the Stone and Swynnerton area. These MSA relate to sand and gravel resources.

10.3.36 Data available on the SCC website indicates that there are no operational mineral extraction sites in the study area.

10.3.37 There are no allocated sites, preferred mineral sites or proposed areas of search, as identified in the Minerals Local Plan, in the study area.

10.3.38 The Proposed Scheme would cross an area underlain by coal at depth. This has been extensively mined until recent times. The Coal Authority has informed that the Proposed Scheme would not cross any areas of surface coal. The new Minerals Local Plan identifies the coal reserves as an area of hydrocarbon resources, particularly as a potential source of gas.

10.3.39 Planning permission has been issued for the exploration, testing and appraisal of coal bed methane and the subsequent development and operation of a hub for methane gas production at land on the Swynnerton Estate near Blakelow, Staffordshire.

10.3.40 The Proposed Scheme would cross a 'Licence to Search and Bore For and Get Petroleum' area on the boundary between the Stone and Swynnerton area and the Whitmore Heath to Madeley area (CA4).

Geo-conservation resources

10.3.41 The lower southern slopes of Hanchurch Hills north of Swynnerton are within the study area. These are identified as a LGS of local importance at a county level. This is a historically important site associated with Charles Darwin and his recognition of an igneous dyke. The route would cut across the Butterton-Swynnerton Dykes north-west of Swynnerton.

Receptors

10.3.42 The sensitive receptors that have been identified within this study area are summarised in Table 7.

[55] National designations such as SSSI.
[56] Staffordshire County Council, 2015. The new Minerals Local Plan for Staffordshire 2015 to 2030. Final Draft June 2015.

Table 7: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties	High
		Workers and visitors at nearby facilities	Moderate
		Public using PRoW	Low
	Groundwater	Inner Zone 1, Outer Zone 2 and Outer Zone 3 – Groundwater SPZ at two groundwater abstractions for public water supply	High
		Principal aquifer	High
		Secondary A aquifer	Moderate
		Secondary B aquifer	Low to moderate
	Surface waters	Filly Brook and tributaries of Meece Brook and tributaries of the River Trent	Moderate
		Ponds and field drains	Low to moderate
	Built environment	Buildings and properties	Low to high
		Underground services and structures	Low
Impacts on geoconservation	Natural environment	Hanchurch Hills and Butterton-Swynnerton Dykes	Moderate to high
Impacts on mining/mineral sites (severance and sterilisation of mineral sites)	Mining/mineral sites	MSA for sand and gravels	Moderate
		Licenced petroleum areas	Low
		Coal deposits	Low
		Coal bed methane	Low

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft CoCP. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of the work in contaminated areas.

10.4.2 The draft CoCP requires that prior to and during construction, a programme of further detailed investigations, which may include both desk-based and site-based work, would take place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site-specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency guidance CLR11[57] and British Standards BS 10175[58] and BS 8576[59].

10.4.3 With the application of measures in the draft CoCP during the construction phase, no significant adverse effects on land quality are likely to result from the Proposed Scheme.

10.4.4 If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term.

10.4.5 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. This appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[60]. The preferred option would then be developed into a remediation strategy.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme through the Stone and Swynnerton area would require earthworks (cuttings, embankments), site compounds, utility diversions, deep foundations, balancing ponds, temporary dewatering and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown in the CT05 Map Series in Volume 2, CA3 Map Book.

Land contamination

10.4.7 In line with the assessment methodology as set out in the draft SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might present potential risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the process. Any moderate to higher-risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas undergoing the more detailed risk assessments are historical or current landfills and infilled pits/ponds.

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

- whether the site is within the land required for the construction of the Proposed Scheme;

[57] Environment Agency, (2004), CLR11 Model Procedures for the Management of Land Contamination.
[58] British Standard, (2011), BS10175+A1:2013 Investigation of Potentially Contaminated Sites.
[59] British Standard, (2013) BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)
[60] Sustainable Remediation Forum UK, (2010), A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.

- the vertical profile of the route of the Proposed Scheme;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary), nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

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

10.4.10 A summary of the baseline CSM is provided in Table 8. The impacts and baseline risks represent those before any mitigation is applied. Further sites may be included in the formal EIA Report.

Table 8: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[61]	Area name	Main potential impacts	Main baseline risk
CA3-50	Near Micklow House Historical Landfill Site	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low to moderate/low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Low to moderate/low
CA3-57	Petrol filling station within the Stafford motorway service area on the northbound side of the M6	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low to moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low

[61] Each area is assigned a unique identification number

Area reference[61]	Area name	Main potential impacts	Main baseline risk
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Very low to moderate/low
CA3-70	Existing railway (Norton Bridge to Stone Railway)	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater).	Moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater).	Low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water).	Very low
CA3-118	Historical gasworks Swynnerton	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Moderate/low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low

Area reference[61]	Area name	Main potential impacts	Main baseline risk
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Very low
CA3-123 and CA3-124	Common Lane Cold War bunkers and historical tank	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low to moderate/low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Moderate/low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Low to moderate/low
CA3-130	Existing railway (WCML)	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater).	Moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater).	Low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Moderate
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Very low
CA3-138	Historic Stableford garage/petrol filling station	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low to moderate/low

Area reference[61]	Area name	Main potential impacts	Main baseline risk
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Very low to low
Various identified infilled pits and ponds within the land required to construct the Proposed Scheme (CA3-31, CA3-32, CA3-41, CA3-44, CA3-46, CA3-83, CA3-96, CA3-107 and CA3-120)	Infilled pits and ponds	Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Moderate/low
		Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases).	Low
		Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water).	Moderate/low
		Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site).	Very low
		Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases).	Low to moderate/low

10.4.11 A screening assessment of the effects of contamination has been completed by comparing the CSM developed for potential contaminated areas at baseline, construction and post-construction stages.

Temporary effects

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

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes mitigation by both the application of the draft CoCP and any necessary site-specific remediation.

10.4.14 Table 9 presents a summary of the resulting temporary construction effects. This shows that based upon assessment, no significant effects have been identified during the construction phase in relation to potential land contamination. The adoption of the draft CoCP makes it unlikely that there would be adverse consequences, but is it considered that there may still be temporary minor adverse effects (non-significant) during the construction period particularly from ground disturbance in areas of localised backfilling.

Table 9: Summary of temporary (construction) effects

Area reference[62]	**Main baseline risk**	**Main construction risk**	**Temporary effect and significance (Y/N)**
CA3-50 near Micklow House Historical Landfill Site	Potential impact on human health on-site = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on human health off-site = low to moderate/low	Moderate/low	Minor adverse effect (N)
	Potential impact on groundwater quality = low	Moderate/low	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Low	Minor adverse effect (N)
	Potential impact on property receptors on-site and off-site = low to moderate/low	Moderate/low to moderate	Minor adverse effect (N)
CA3-57 Petrol filling station within the Stafford motorway service area on the northbound side of the M6	Potential impact on human health on-site = low to moderate/low	Low to moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = low	Moderate/low	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = very low to moderate/low	Very low to moderate	Minor adverse effect (N)
	Potential impact on human health on-site = moderate/low	Moderate/low	Neutral effect (N)

[62] Each area is assigned a unique identification number

Area reference[62]	Main baseline risk	Main construction risk	Temporary effect and significance (Y/N)
CA3-70 Existing Railway (Norton Bridge to Stone Railway)	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = low	Moderate/low	Minor adverse effect (N)
	Potential impact on surface water quality = low	Moderate/low	Minor adverse effect (N)
	Potential impact on property receptors on-site and off-site = very low	Low	Minor adverse effect (N)
CA3-118 Historical gasworks Swynnerton	Potential impact on human health on-site = moderate/low	Moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Moderate/low	Minor adverse effect (N)
	Potential impact on groundwater quality = moderate/low	Moderate	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = very low	Low	Minor adverse effect (N)
CA3-123 and CA3-124 Common Lane Cold War bunkers and historical tank	Potential impact on human health on-site = moderate/low	Moderate	Minor adverse effect (N)
	Potential impact on human health off-site = low to moderate/low	Moderate/low	Minor adverse effect (N)
	Potential impact on groundwater quality = moderate/low	Moderate	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = low to moderate/low	Moderate/low to moderate	Minor adverse effect (N)
CA3-130 Existing Railway (WCML)	Potential impact on human health on-site = moderate/low	Moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)

Area reference[62]	Main baseline risk	Main construction risk	Temporary effect and significance (Y/N)
	Potential impact on groundwater quality = moderate	High	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Low	Minor adverse effect (N)
	Potential impact on property receptors on-site and off-site = very low	Very low	Neutral effect (N)
CA138 Historic Stableford Garage/Petrol Station	Potential impact on human health on-site = low to moderate/low	Low to moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = low	Moderate/low	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = low to very low	Low to very low	Neutral effect (N)
Various identified infilled pits and ponds within the land required to construct the Proposed Scheme (CA3-31, CA3-32, CA3-41, CA3-44, CA3-46, CA3-83, CA3-96, CA3-107 and CA3-120)	Potential impact on human health on-site = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on human health off-site = low	Moderate/low	Minor adverse effect (N)
	Potential impact on groundwater quality = moderate/low	Moderate	Minor adverse effect (N)
	Potential impact on surface water quality = very low	Low	Minor adverse effect (N)
	Potential impact on property receptors on-site and off-site = low to moderate/low	Moderate/low to moderate	Minor adverse effect (N)

Permanent effects

10.4.15 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSMs to assess the permanent (post-construction) effects. As noted above, a worsening risk would result in negative effects and an improvement would result in positive effects.

10.4.16 Table 10 provides the summary of the permanent (post-construction) effects obtained from a comparison of the baseline and post-construction impacts and whether these

are significant. It also shows the receptors to be subjected to detailed risk assessment in the formal EIA Report.

Table 10: Summary of permanent (post construction) effects

Area reference[63]	**Area name**	**Main potential impacts**	**Main baseline risk**
CA3-50 near Micklow House Historical Landfill Site	Potential impact on human health on-site = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on human health off-site = low to moderate/low	Low	Minor beneficial effect (N)
	Potential impact on groundwater quality = low	Very low	Minor beneficial effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = low to moderate/low	Low to moderate/low	Neutral effect (N)
CA3-57 Petrol filling station within the Stafford motorway service area on the northbound side of the M6	Potential impact on human health on-site = low to moderate/low	Low to moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = low	Low	Neutral effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = very low to moderate/low	Very low to moderate/low	Neutral effect (N)
CA3-70 Existing Railway (Norton Bridge to Stone Railway)	Potential impact on human health on-site = moderate/low	Moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = low	Low	Neutral effect (N)
	Potential impact on surface water quality = low	Low	Neutral effect (N)

[63] Each area is assigned a unique identification number

Area reference[63]	Area name	Main potential impacts	Main baseline risk
	Potential impact on property receptors on-site and off-site = very low	Very low	Neutral effect (N)
CA3-118 Historical gasworks Swynnerton	Potential impact on human health on-site = moderate/low	Moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = moderate/low	Moderate/low	Neutral effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = very low	Very low	Neutral effect (N)
CA3-123 and CA3-124 Common Lane Cold War bunkers and historical tank	Potential impact on human health on-site = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on human health off-site = low to moderate/low	Low	Minor beneficial effect (N)
	Potential impact on groundwater quality = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = low to moderate/low	Low to moderate/low	Neutral effect (N)
CA3-130 Existing Railway (WCML)	Potential impact on human health on-site = moderate/low	Moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = moderate	Moderate	Neutral effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = very low	Very low	Neutral effect (N)

Area reference[63]	Area name	Main potential impacts	Main baseline risk
CA138 Historic Stableford Garage/Petrol Station	Potential impact on human health on-site = low to moderate/low	Low to moderate/low	Neutral effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = low	Low	Neutral effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = very low to low	Very low to low	Neutral effect (N)
Various identified infilled pits and ponds within the land required to construct the Proposed Scheme (CA3-31, CA3-32, CA3-41, CA3-44, CA3-46, CA3-83, CA3-96, CA3-107 and CA3-120)	Potential impact on human health on-site = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on human health off-site = low	Low	Neutral effect (N)
	Potential impact on groundwater quality = moderate/low	Low	Minor beneficial effect (N)
	Potential impact on surface water quality = very low	Very low	Neutral effect (N)
	Potential impact on property receptors on-site and off-site = low to moderate/low	Low to moderate/low	Neutral effect (N)

10.4.17 Following remediation of sites located within the study area, there would generally be overall negligible or minor beneficial effects (non-significant). Depending on the type of remediation undertaken, the beneficial effect could include an improvement in groundwater quality or a reduction in risk to human health as a result of removal of impacted material or the breaking of migration pathways.

Mining/mineral/gas resources

10.4.18 Construction of the Proposed Scheme has the potential to impact existing mining/mineral resources and proposed areas of mining/mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[64] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation. Construction of the Proposed Scheme has the potential to impact areas of petroleum (gas) exploration and/or production. This could potentially occur due to reduced opportunity of access for

[64] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate access would be required to work the whole site.

exploration and/or possible production activities, including geophysical surveys and/or the installation of wells. It is unlikely that the resource itself would be impacted.

Temporary effects

10.4.19 The majority of effects on mining and mineral sites would be permanent. However, temporary adverse effects (non-significant) would occur where construction compounds are proposed within MSAs. In such cases there may be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect. Similarly, construction works may temporarily limit access to potential petroleum (gas) exploration sites located within 'Licence to Search and Bore For and Get Petroleum' areas.

Permanent effects

10.4.20 The Proposed Scheme would cross or pass alongside the boundary of three MSAs for sand and gravel extraction. It is possible that mineral extraction could be undertaken either in advance or as part of the works for the Proposed Scheme. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, SCC and the mineral owner.

10.4.21 The Proposed Scheme would cross an area underlain by coal reserves. This has been extensively mined until recent times. The new Minerals Local Plan identifies the coal reserves as an area of hydrocarbon resources, particularly as a potential source of gas. Construction of the Proposed Scheme may require the sterilisation of a strip of land in which future coal mining or gas extraction could be constrained.

10.4.22 Planning permission to drill boreholes for the exploration, testing and appraisal of coal-bed methane and the subsequent development and operation of a hub for methane gas production was granted for an area of land on the Swynnerton Estate in September 2010. The development was permitted to commence within three years of the date of permission. The development has not been implemented and there is no current application to extend the expiry timescale.

10.4.23 The Proposed Scheme crosses a 'Licence to Search and Bore For and Get Petroleum' area on the boundary of the Stone and Swynnerton area and the Whitmore Heath to Madeley area (CA4). It is possible that the Proposed Scheme could impact on future gas exploration and/or production activities. Similarly, opportunity for access to possible future coal-bed gas exploration and/or production (subject to appropriate licensing) could be affected.

10.4.24 Table 11 presents the assessment of effects from construction on the mining and mineral resources identified.

Table 11: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance (Y/N)
MSA – sand and gravel	MSA	MSA for sand and gravel extraction defined by SCC	Moderate	Minor	Minor adverse (N)

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance (Y/N)
PEL56	Licenced by UK Oil and Gas Authority	Licence to Search and Bore For and Get Petroleum	Low	Minor	Negligible (N)
Pennine Coal Measures	Unknown	Coal seams	Likely to be low sensitivity	Negligible	Negligible (N)
Coal-bed methane Swynnerton Estate	Planning permission granted in 2010 but now lapsed	The drilling of boreholes for the exploration, testing and appraisal of coal-bed methane and the subsequent development and operation of a hub for methane gas production	Low	Minor	Negligible (N)

10.4.25 On this basis there are anticipated to be no significant permanent effects with respect to mining and mineral resources.

Geo-conservation resources

10.4.26 The route and highway diversions would be located on the lower southern slopes of Hanchurch Hills north of Swynnerton. This is identified as a LGS of local importance at a county level. It is a historically important site associated with Charles Darwin and his recognition of an igneous dyke. It is possible that the construction of the Proposed Scheme would have an impact on the LGS, since the route crosses the igneous dyke through the Swynnerton North cutting between approximately 650m and 1km south-east of Clifford's Wood.

Other mitigation measures

10.4.27 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and instigated as part of the site-specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant.

10.4.28 In addition to the excavation and/or treatment of contaminated soils, as described above, it may also be necessary to install ground (landfill) gas and leachate control systems within affected old landfill sites, on a temporary or permanent basis, to ensure that ground (landfill) gas and leachate migration pathways are controlled and do not adversely affect the Proposed Scheme or the wider environment as a consequence of the Proposed Scheme.

10.4.29 Mitigation of the effects on mineral resources within the proposed MSAs could include extraction of the resource, for use within the Proposed Scheme, or elsewhere.

Extraction may be limited to landscaping areas within the Proposed Scheme adjacent to rather than beneath the trackbed, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at SCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MSA.

Summary of likely residual significant effects

10.4.30 Based on the information currently available and with the application of the mitigation measures detailed above, no likely significant residual effects are anticipated with respect to land quality.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers), whilst within trains, are at all routine times within a controlled environment and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those outlined in the draft COCP would be established for all high-risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area includes two auto-transformer stations, which would be located at Yarnfield Lane and Swynnerton, plus a mid-point auto-transformer station, which would be located at Stableford. An auto-transformer station can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern substations, secondary containment appropriate to the level of risk would be included in the installed design.

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

10.5.5 It is unlikely that there would be any cumulative effects on land quality receptors due to the environmental controls that would be placed on operational procedures.

Other mitigation measures

10.5.6 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area. No significant residual effects associated with operation of the Proposed Scheme are anticipated.

Summary of likely residual significant effects

10.5.7 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects within the Stone and Swynnerton area, based on known scheme information to date. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and potential significant effects that may arise during construction and operation on landscape and visual receptors.

11.1.2 In this section, the operational assessment section refers not just to the running of the trains, vehicles on roads and associated lighting, but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Principal landscape and visual issues in this area include:

- potential temporary effects to landscape and visual receptors during construction arising from the presence of construction plant and compounds, construction of viaducts, embankments, overbridges and underbridges, road diversions and realignments, the removal of existing trees and vegetation, excavation of cuttings and pedestrian diversions; and
- potential permanent landscape and visual effects during operation arising from moving trains and vehicles and the presence of new structures in the landscape including the viaduct over Filly Brook and the M6, embankments and noise barriers, as well as overbridges, auto-transformer stations, overhead line equipment, PRoW and highway realignments and diversions.

11.1.4 A separate, but related, assessment of effects on the setting of heritage assets is included in Section 7, Cultural heritage. Winter surveys for the landscape and visual assessment were undertaken from January 2016 to March 2016 to inform the draft assessment. Further surveys will be undertaken to inform the assessment reported in the formal EIA Report.

11.1.5 Engagement with SCC has been undertaken. The purpose of this engagement has been to discuss the extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages[65]. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

11.1.6 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the LV-11 Map Series in the Volume 2, CA3 Map Book.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in Volume 1 and the draft SMR.

[65] The working draft EIA Report does not contain photomontages, these will be produced to inform the formal EIA Report.

11.2.2 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTVs have been produced in line with the methodology described in the draft SMR, and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover would mean the actual visibility is substantially less than that shown in the ZTV and professional judgement on site has been used to refine the study area to focus on likely significant effects. Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment is excluded from the ZTV for the operational phase as inclusion indicates widespread visibility; however, this rarely gives rise to significant effects if it is the only element visible. Overhead line equipment is described and taken into account in the assessment of effects on landscape character areas (LCA) and visual receptors. With the exclusion of overhead line equipment, the operational phase ZTV gives a better indication of the possible spread of significant effects and therefore better informs the assessment.

11.2.3 Landscape and visual receptors within approximately 500m of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 1km have been considered at settlement edges, such as Stone, Cranberry and Beech.

11.2.4 Trees would be retained where reasonably practicable, in line with the draft CoCP, and disturbance minimised.

11.2.5 This assessment is based on preliminary design information and makes reasonable worst-case assumptions on the likely nature of potentially significant effects where these can be substantiated, and based on information known at present. The assessment covers the situation in winter and summer of year 1 and summer of year 15. Likely significant effects for year 60 will be reported in the formal EIA Report.

11.2.6 The assessment in this report does not consider cumulative impacts or future baseline. These will be addressed in the formal EIA Report. This will also be the case for consideration of night time visual effects, although where general night time visual effects can be substantiated, they are discussed in the relevant part of this section. The findings from the night time surveys will be included in the formal EIA report.

11.2.7 Professional judgements on landscape value are summarised in the baseline descriptions. The draft assessment of sensitivity is summarised for each LCA; however, the judgements on susceptibility have been excluded from this report due to incomplete baseline survey data at the time. Full judgement on susceptibility and the resulting sensitivity assessment for each LCA will be provided in the formal EIA Report.

11.3 Environmental baseline

Landscape baseline

11.3.1 The study area extends from Stone in the south beyond Swynnerton to Swynnerton Old Park in the north and includes the 18th century parkland of Swynnerton Park. The study area encompasses a lowland riverine landscape associated with the Trent Valley north of Stone, and woodland blocks overlaid upon a gently undulating farmed landscape with rectilinear fields, winding rural lanes associated with Meece Brook Valley and the wooded skyline and escarpment of Swynnerton Old Park.

11.3.2 The LCAs have been determined with reference to published landscape character assessments, supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork to confirm the appropriateness of area boundaries and subdivisions. Landscape character assessments reviewed include the relevant National Character Areas[66] (NCA) and Staffordshire Landscape Guidelines[67].

11.3.3 For the purposes of this assessment, the study for the Stone and Swynnerton area has been subdivided into 11 LCAs. A summary of these is provided below.

Yarnfield Settled Farmlands

11.3.4 This LCA is an undulating rural landscape, which includes the village of Yarnfield. The arable landscape surrounding the village consists of poorly maintained and gappy hedgerow field boundaries, surrounding medium-sized fields. The area has a few isolated settlements and a number of woodland blocks within the LCA including Darlaston Wood. Yarnfield village comprises a series of cul-de-sacs connected by Yarnfield Lane. The Yarnfield Park Training and Conference Centre is a large complex of accommodation and conference facilities that dominate the northern end of the village. The M6 corridor, which cuts through the middle of the LCA, is an intrusive, prominent feature, which degrades the landscape character and divides the LCA. This LCA is assessed as having a low landscape value due to these reasons.

Stone (Urban)

11.3.5 This LCA consists of the market town of Stone. The town is linear in formation due to its relationship with the adjacent Trent Valley Coalfield Farmlands LCA. The river valley defines the landscape character of the town, with the associated riverine landscape features, including tree lines, following the watercourses and wetland pastures. The centre of Stone is a small-scale, fine-grained urban environment, based on a historic redbrick town core, consisting primarily of small-scale streets and residential properties. The edge of the LCA is characterised by modern development, which is not well integrated with the landscape and therefore degrades the landscape character. This LCA is assessed as having a medium landscape value for these reasons.

Walton (Urban)

11.3.6 This LCA consists of the town of Walton. The town has a linear relationship to the Trent Valley Coalfield Farmlands LCA but also consists of modern development expanding to the west, which is partly integrated into the landscape by hedgerows, hedgerow trees and small woodland blocks, including the vegetation associated with Stone Golf Club in the adjacent character area. The river valley and associated riverine landscape features, including tree lines following the watercourses and wetland pastures, define the landscape character of the eastern edge of the town. Walton is a small-scale, fine-grained urban environment, consisting primarily of two-storey semi-detached residential properties. However, the southern extent of the town is degraded by a large industrial area, including a sewerage works. These large-scale structures are poorly integrated with the landscape and have degraded the rural

[66] Natural England (2013, 2014), *National Character Area profiles*. Available online at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles

[67] Staffordshire County Council, Development Services Department (2000), *Planning for Landscape Change*. Available online at: https://www.staffordshire.gov.uk/environment/eLand/planners-developers/landscape/NaturalEnvironmentLandscapeCharacterTypes.aspx

landscape setting of the town. This LCA is assessed as having a medium landscape value due to these reasons.

Trent Valley Coalfield Farmlands

11.3.7 This LCA is a lowland riverine landscape associated with the Trent Valley west of the settlement of Stone. The landscape is defined by a broad valley landform through which the River Trent follows a meandering course. The landscape is partly overlaid with rough grassland, primarily pastoral farmland and a golf course. A number of detracting features are apparent, notably overhead power lines, the A34 Stafford Road/The Fillybrooks and prominent settlement edges of Stone and Walton, although woodland blocks associated with Barlaston Park and the riparian landscape of the River Trent are scenic and distinctive features within this LCA. This LCA is assessed as having a medium landscape value for these reasons.

Swynnerton Park Sandstone Hills and Heaths

11.3.8 This LCA is defined by a planned estate landscape associated with the 18th century parkland of Swynnerton Park. The parkland forms the setting to the Grade I listed 18th century Swynnerton Hall, at the edge of the historic estate village of Swynnerton, and marks the northern extent of the LCA.

11.3.9 The wider landscape of the LCA is defined by small-scale field patterns and woodland blocks overlaid upon a rolling topography. The remnants of the original 18th century designed Capability Brown[68] landscape, and the presence of numerous historic buildings and features associated with the park and garden, establish a high value of historic landscape interest. The landscape is largely intact, albeit marginally cut by the route of the M6 on the eastern edge. There is also an overhead power line through its centre. An extensive network of PRoW, including the Stone Circles Challenge long-distance path, fall within the LCA linking the villages of Swynnerton and Yarnfield. This LCA is assessed as having a high landscape value due to these reasons.

Swynnerton Training Area (Sandstone Hills and Heaths)

11.3.10 This LCA is located west of the M6. It encompasses a large, inaccessible Ministry of Defence Training Area, which represents a fundamental departure in terms of character from the wider rural/pastoral and parkland landscape and is to a large extent screened from view by mixed wooded edges. Numerous huts and structures are apparent throughout the LCA but it is not possible to determine their function from the available data. The southern extent of the LCA consists of large industrial style buildings and expanses of parking and storage. The western edge is characterised by a riverine/wetland landscape defined by the presence of the Meece Brook. Based on the available data the activities associated with the Ministry of Defence Training Area have degraded the natural landscape character, eroding the historic character and woodland blocks. This LCA is assessed as having a low landscape value for these reasons.

[68] Capability Brown was a leading landscape and garden designer of the 18th century.

Swynnerton Village Sandstone Hills and Heaths

11.3.11 This LCA is a gently undulating farmed landscape with rectilinear fields of variable scale, originally of medieval date and overlaid with 18th and 19th century field boundaries, interspersed with occasional small-scale woodland blocks and historic ponds. With the exception of the hamlet of Cranberry, settlement is dispersed and comprising occasional cottages and a small industrial estate. The character area is crossed by an extensive network of PRoW including the Stone Circles Challenge, which often follow historic field boundaries. This LCA is assessed as having a medium landscape value in view of the above.

Tittensor Chase Sandstone Hills and Heaths

11.3.12 This LCA is a rolling rural landscape with rectilinear fields of variable scale, framed by wooded hillsides. Historic landscape features are evident, including the remnant earthworks of the scheduled monument Burybank hillfort dating to the Iron Age, while the woodland, open pastures and assarted fields[69] that once formed a part of the medieval hunting chase. The presence of a modern housing development at the edges of villages to the northern parts of the LCA is at odds with the surrounding farmland and detracts from the overall rural character of the LCA. The field pattern has become somewhat degraded, and agricultural intensification has led to the loss of some field boundaries and the enlarging of fields. Despite these changes this LCA is assessed as having a medium to high landscape value due to its surviving historic landscape elements.

Trentham Park

11.3.13 This LCA is located at the southern edge of Stoke on Trent. It comprises the designed landscape and wider parkland of the Trentham Estate, a registered park and garden dating to the 18th and 19th centuries, comprising an extensive parkland, formal gardens and pleasure grounds associated with the largely destroyed Trentham Hall. The LCA includes an extensive ornamental lake with work by Capability Brown, designed parkland and Italianate ornamental gardens by Sir Charles Barry[70], as well as a golf course on part of the parkland footprint. The landscape has a considerable historic landscape interest and is assessed as having a medium-high landscape value due to the above.

Meece Brook Valley Sandstone Hills and Heaths

11.3.14 This LCA comprises a rural river valley landscape of undulating landform and winding rural lanes. Distinctive mixed woodland blocks often define the valley sides and skylines and the Victorian pumping station at Lower Hatton is a prominent feature in the landscape. The LCA is intersected by the A51 Stone Road and more prominently by the WCML. Recreational and PRoW access is limited. This LCA is assessed as having a low landscape value due to the above.

[69] Fields which have been created from forest clearings.
[70] A leading architect and garden designer of the 19th century.

Swynnerton Old Park Sandstone Hills and Heaths

11.3.15 The wooded escarpment of this LCA forms a highly prominent feature in the landscape. A large part of the LCA is covered by Swynnerton Old Park forest, which is an extensive tract of ancient woodland and heathland containing a network of publicly accessible tracks. The site has been extensively re-planted with mixed plantation woodland since the Forestry Commission's ownership from the 1920s. A strong sense of remoteness is imparted by expansive areas of remnant heathland and woodlands which dominate the skyline. This LCA is assessed as having a medium-high landscape value due to the above.

Visual baseline

11.3.16 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the landscape character areas and viewpoint locations maps (see LV-11 Map Series, Volume 2, CA3 Map Book). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area); 2: Residential; 3: Recreational[71]; 4: Transport; 5: Hotels/Healthcare Institutions (none within this area) and 6: Employment (none within this area).

11.3.17 Residential visual receptors within the area are located within large settlements, notably Stone and Walton and at smaller villages and hamlets, such as Yarnfield and Swynnerton. Residential viewpoints are also located at numerous farmsteads and isolated properties.

11.3.18 A range of recreational visual receptors are associated with Swynnerton Old Park, users of the golf course near Barlaston and users of Butterton Fisheries near Whitmore Hall, plus users of the extensive local path network.

11.4 Effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible in many locations and would have the potential to give rise to significant temporary effects that cannot be mitigated practicably. Such effects are temporary and vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the establishment of compounds, tunnelling, main earthworks and structural works.

11.4.2 The potential effects associated with the peak construction phase in this area are generally considered to be medium term, given the anticipated length of the construction programme. The majority of the main and satellite compounds are assumed to be in place for this phase. Further information will be provided in the formal EIA Report.

[71] Reference to specific civil parish numbers for footpaths is provided where available; otherwise, the adjacent road name is used as a reference to the footpath.

11.4.3 The construction works that have been taken into account in determining the potential effects on landscape and visual receptors include, ordered from south to north:

- construction of the route of the Proposed Scheme and associated overhead line equipment;
- construction and use of the haul route alongside the route of the Proposed Scheme for construction traffic and plant;
- construction and operation of the Stone railhead, and associated compound, including levelling, earthmoving and re-grading, construction of an overbridge and connecting into the existing Network Rail infrastructure, plus realignment of Yarnfield Lane. Lighting will be required for the night time operation of the railhead for the duration of the construction of the Proposed Scheme;
- watercourse diversions at Peasley Bank Drop Inlet culvert, Pirehill culvert, unnamed watercourse diversion from south of B5026 Eccleshall Road to Filly Brook viaduct, Unnamed watercourse diversion adjacent to the M6, crossing at the M6 Meaford viaduct, Lodge Covert underbridge, Swynnerton culvert, Clifford's Wood underbridge (incorporating culvert), Plantation culvert, Dog Lane drop inlet culvert and Shelton culvert;
- construction of the Filly Brook viaduct and M6 Meaford viaduct;
- construction of embankments;
- construction of auto-transformer stations at Yarnfield Lane and Swynnerton and mid-point auto-transformer station at Stableford;
- construction of the A519 Newcastle Road main compound;
- construction of satellite compounds: Stone Rural Bridleway, Eccleshall Road, Yarnfield Lane, M6 East viaduct, M6 West viaduct, Tittensor Road, Swynnerton Footpath 52 and Dog Lane;
- construction of transfer nodes;
- construction of balancing ponds and ecological mitigation ponds;
- construction of overbridges to Stone Rural Footpath 28, Stone Rural Bridleway 0.1135 and accommodation access, Stone Rural Footpath 32, B5026 Eccleshall Road, Tittensor Road, A519 Newcastle Road, Swynnerton (North), Plantation and Dog Lane;
- construction of underbridges to Yarnfield Lane, Swynnerton (South), Swynnerton Footpath 27, Lodge Covert, Sandyford, Clifford's Wood and Swynnerton Footpath 52;
- construction of utility diversions including: a high-pressure gas diversion and overhead power line diversions;

- highway realignments and diversions to Pirehill Lane B5026 Eccleshall Road, Yarnfield Lane, Tittensor Road, A51 Stone Road, Stab Lane, A519, Common Lane (North), Dog Lane, Bent Lane (North) and Bent Lane (South);
- PRoW realignment and diversion of Stone Rural Footpath 28, Bridleway 0.1135, Stone Rural Footpath 32, Stone Rural Footpath 33, Swynnerton Footpath 27, Swynnerton Footpath 17, Swynnerton Bridleway 54, Swynnerton Footpath 52, Swynnerton Footpath 15 and Swynnerton Footpath 10;
- demolition of six residential properties; and
- lighting of construction works.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction include the following:

- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds;
- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS5837: Trees in relation to design, demolition and construction[72];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles and machinery;
- designing lighting to avoid unnecessary intrusion on adjacent buildings and other land uses; and
- replacement of any trees intended to be retained, which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of impacts and effects

Introduction

11.4.6 The most apparent changes to landscape and visual receptors during construction would relate to the presence of construction plant, the excavation of cuttings, pile driving and erection of viaducts, construction of embankments, soil and material storage and stockpiling and the removal of existing landscape elements, including trees and hedgerows, as well as the realignment and diversion of existing roads, lanes and PRoW. Other key changes would be the construction of over- and underbridges, compounds and transfer nodes, plus property demolitions.

[72] British Standard 5837 Trees in relation to design, demolition and construction, sets out a logical sequence of events to achieve a harmonious relationship between trees and structures that can be sustained in the long term.

11.4.7 Effects in relation to landscape and visual receptors are summarised below.

Landscape assessment

11.4.8 The following section describes the likely significant effects on LCAs during construction.

11.4.9 Based on current scheme design it is anticipated that potentially significant effects on landscape character would occur to the following LCAs:

- Potentially moderate adverse significant effects on landscape character would occur in relation to the Yarnfield Settled Farmlands LCA a landscape of medium susceptibility and medium overall sensitivity to change. This would be due to the potential severance caused by the construction of the Filly Brook and M6 Meaford viaducts, Yarnfield South, Yarnfield North and Meaford South embankments and the construction and operation of the Stone railhead and associated compound. This would potentially introduce a locally large degree of change to the open rural landscape character. The effect would be due to the associated earthworks, erection of viaduct piers and spans, presence of equipment, movement of construction vehicles, movement of material, stock piles, levelling, earthmoving, re-grading and construction of an overbridge, and connecting into the existing Network Rail infrastructure, plus the diversion of Yarnfield Lane;

- It is anticipated that potentially major adverse significant effects on landscape character would occur in relation to the Swynnerton Park Sandstone Hills and Heaths LCA a landscape of medium susceptibility and high overall sensitivity to change. This would be due to the potential severance caused by the construction of the M6 Meaford viaduct and Meaford North and Swynnerton embankments, which would potentially introduce a locally large degree of change to open rural landscape character. The effect would be due to the associated earthworks and erection of viaduct piers and spans, presence of equipment, movement of construction vehicles, movement of material and presence of stock piles;

- It is anticipated that potentially moderate adverse significant effects on landscape character would occur in relation to the Swynnerton Village Sandstone Hills and Heaths LCA, a landscape of medium susceptibility and medium overall sensitivity to change. This would be due to the severance caused by the construction of Tittensor Road, A519 Newcastle Road, Swynnerton (North) overbridge, Plantation overbridge, Swynnerton Footpath 52 accommodation underbridge and Dog Lane overbridge and Swynnerton, Hatton and Stableford North embankments. Additionally, the construction of A51 Stone Road, Stab Lane, Common Lane (North), Dog Lane and Bent Lane (North) road diversions and realignments which would potentially introduce a locally large degree of change to the open landscape character due to the associated earthworks, presence of equipment, movement of construction vehicles, movement of material and presence of stock piles. Significant effects are also anticipated due to road diversions and associated alterations to landform and relationships to existing landscape structure;

- Additionally, it is anticipated that moderate adverse significant effects to landscape character would occur in the Meece Brook Valley Sandstone Hills and Heaths LCA, a landscape of medium susceptibility and medium overall sensitivity to change. This would be due to the severance caused by the construction of Dog Lane, Bent Lane (South) diversion and Stableford North embankments, which would potentially introduce a locally large degree of change to the rural river valley landscape of undulating landform and winding rural lanes. This effect would be due to the associated earthworks, presence of equipment, movement of construction vehicles, movement of material and presence of stock piles.

Visual assessment

Introduction

11.4.10 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf. Where residential receptors experience significant effects at night time arising from additional lighting, these are also presented in this section.

11.4.11 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.12 In most cases, additional lighting is not considered to give rise to significant effects due to the anticipated nature of the construction programme, except in areas in which 24-hour working is anticipated to take place (see paragraph 11.4.35 and 11.4.36 for further detail of construction lighting effects). Where there would be no direct foreground visibility of additional lighting, no further assessment has been undertaken.

Views west from Stone Rural Footpath 29 and adjacent residences at Pirehill

11.4.13 From viewpoints 014.02.001 and 014.03.002 (Map LV-11-114b in Volume 2, CA3 Map Book), there would be medium-range views of the Stone Rural Bridleway 0.1135 accommodation overbridge and Stone Rural Bridleway satellite compound. Earthworks and material stockpiles, the presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the open rural landscape and interrupt the undeveloped horizon. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

Views west from residences on the A34 Stafford Road/The Fillybrooks

11.4.14 From viewpoints 014.02.003 and 014.02.006 (Map LV-11-114b in Volume 2, CA3 Map Book) there would be medium-range views of the Stone Rural Bridleway 0.1135 accommodation overbridge and the Stone Rural Bridleway satellite compound. Earthworks and material stockpiles, the presence of construction equipment and the movement of construction vehicles would result in new features that are

uncharacteristic of the existing views across the open rural landscape and interrupt the undeveloped horizon. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

View east from Stone Rural Bridleway 0.1135 and adjacent residences at Pirehill Grange Farm

11.4.15 From viewpoint 014.03.009 (Map LV-11-114b in Volume 2, CA3 Map Book) there would be medium-range views of the Stone Rural Bridleway 0.1135 accommodation overbridge and the Stone Rural Bridleway satellite compound. Earthworks and material stockpiles, the presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the rural landscape and interrupt the distinctive undulating topographic character relating to Peasley Bank. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon this receptor.

Views west from residences to the west of Walton

11.4.16 From viewpoints 015.02.002, 015.02.004, 015.02.009 and 015.04.008 (Map LV-11-115 in Volume 2, CA3 Map Book), there would be close to medium-range views of the Stone Rural Bridleway 0.1135 accommodation overbridge, Stone Rural Bridleway satellite compound, Stone Rural Footpath 32 accommodation overbridge, Stone railhead main compound, B5026 Eccleshall Road overbridge, Eccleshall Road satellite compound and transfer node and Filly Brook viaduct. Earthworks and material stockpiles, erection of the viaduct piers and spans, and the presence of construction equipment and movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the medium-scale arable/pastoral landscape and interrupt the characteristic hedgerow field boundaries, small blocks of woodland and the rural character. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

View east from Chebsey Footpath 7 and the B5026 Eccleshall Road

11.4.17 From viewpoints 015.04.011 and 015.03.012 (Map LV-11-115 in Volume 2, CA3 Map Book) there would be medium-range views of the B5026 Eccleshall Road overbridge and the Yarlet North cutting, Eccleshall Road satellite compound and transfer node, Filly Brook viaduct, Yarnfield Lane underbridge, and the Stone railhead main compound. Earthworks and material stockpiles, the presence of construction equipment and the movement of construction vehicles would result in substantial change to the views across the gently sloping arable landscape, interrupting the horizon and introducing elements which are out of scale with the landscape. These activities are anticipated to give rise to a medium magnitude of visual change to Chebsey Footpath 7 at viewpoint 015.03.12 and potentially moderate adverse visual effects upon these receptors. However, views from Chebsey Footpath 7 will potentially be partially screened by intervening vegetation.

View west from residences at Darlaston Grange

11.4.18 From viewpoint 016.02.002 (Map LV-11-116 in Volume 2, CA3 Map Book) there would be medium-range views of the B5026 Eccleshall Road overbridge, Eccleshall Road satellite compound and transfer node, Filly Brook viaduct, Yarnfield Lane underbridge, Yarnfield Lane Satellite compound and transfer node, the M6 Meaford viaduct, M6 East viaduct satellite compound, and the Stone railhead and main compound. Earthworks and material stockpiles, the presence of equipment and the movement of construction vehicles would result in a noticeable change to the characteristics of the sloping rural landscape and result in a potential loss of the rural character. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

View east from Swynnerton Footpath 42 and adjacent residences at Whitemoor Farm and Moss House

11.4.19 From viewpoints 016.03.012, 016.02.013 and 016.02.014 (Map LV-11-116 in Volume 2, CA3 Map Book) there would be medium-range views of the Filly Brook viaduct, Yarnfield Lane underbridge, Yarnfield Lane satellite compound and transfer node and the Stone railhead and main compound. Earthworks and material stockpiles, viaduct piers and spans, the presence of equipment and the movement of construction vehicles would result in noticeable change to the existing rising landform and woodland belts. However, views would be partially screened by intervening vegetation, including hedgerow field boundaries and mixed woodland shelter belts. In view of this, these activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

View east from Swynnerton Footpath 39 and adjacent residences at The Highlows

11.4.20 From viewpoint 016.03.009 (Map LV-11-116 in Volume 2, CA3 Map Book) there would be filtered, medium-range views of the construction of the Stone railhead main compound, M6 Meaford viaduct, the M6 East viaduct satellite compound, Swynnerton (South) underbridge and the M6 West viaduct satellite compound. Earthworks and material stockpiles, erection of viaduct piers and spans, the presence of equipment and the movement of construction vehicles would result in uncharacteristic changes to the existing visual setting of wooded belts and fields. However, views would be partially screened by intervening vegetation, including woodland shelter belts. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

View east from Stone Rural Footpath 33

11.4.21 From viewpoints 016.03.008 and 017.03.002 (Map LV-11-116 in Volume 2, CA3 Map Book) there would be close-range views of the Stone railhead main compound, M6 Meaford viaduct, the M6 East viaduct satellite compound, Swynnerton (South) underbridge and the M6 West viaduct satellite compound. Earthworks and material stockpiles, erection of viaduct piers and spans, presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views of the pastoral landscape. These activities would potentially dominate the foreground of the view, particularly as the

existing shelter belt partially screening the M6 would be removed. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

View south west from residences at Blakelow and Swynnerton Footpath 27

11.4.22 From viewpoint 017.02.04 (Map LV-11-117 in Volume 2, CA3 Map Book) there would be close-range views of the Stone railhead main compound, M6 Meaford viaduct, M6 East viaduct satellite compound, Swynnerton (South) underbridge and the M6 West satellite compound. Earthworks and material stockpiles, erection of viaduct piers and spans, presence of construction equipment and the movement of construction vehicles would result in substantial changes in proximity to the receptor, which are incongruous with the existing rural arable landscape and will potentially cause visual severance of the woodland shelter belts associated with Swynnerton Park. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

View west from Stone Rural Footpath 34 and A51 Stone Road

11.4.23 From viewpoints 017.02.05 and 017.04.007 (Map LV-11-117 in Volume 2, CA3 Map Book) there would be medium-range views of the Stone railhead main compound, M6 Meaford viaduct, M6 East viaduct satellite compound, Swynnerton (South) underbridge and the M6 West satellite compound. Earthworks and material stockpiles, erection of viaduct piers and spans, presence of equipment and the movement of construction vehicles would result in changes within a relatively short distance, which would potentially be viewed as one of a series of components in the middle ground causing severance of the woodland shelter belts associated with Swynnerton Park on the horizon. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

View east from Swynnerton Footpath 37, Stone Circles Challenge and from residences at Grange Cottage

11.4.24 From viewpoints 017.03.001, 017.02.03, 017.03.014 and 017.03.016 (Map LV-11-117 in Volume 2, CA3 Map Book) there would be medium-range views of the Stone railhead main compound, M6 Meaford viaduct, M6 East viaduct satellite compound, Swynnerton (South) underbridge, M6 West satellite compound the Tittensor Road satellite compound, Tittensor Road overbridge, A51 Stone Road diversion and Stab Lane diversion. Earthworks and material stockpiles, pile driving and erection of viaduct piers and spans, presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the parkland landscape. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

Views north-west from residences at Chase Lane

11.4.25 From viewpoint 017.02.10 (Map LV-11-117 in Volume 2, CA3 Map Book) there would be medium range views of the Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road satellite compound, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in

new features in the view within a relatively short distance, which would interrupt the characteristic hedgerow field boundaries and mature woodland shelter belts associated with Swynnerton Park. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

Views north-west from residences at Sanford Cottage, A51 Stone Road

11.4.26 From viewpoint 017.02.13 (Map LV-11-117 in Volume 2, CA3 Map Book) there would be medium-range views of the Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road satellite compound, Tittensor Road overbridge, and A51 Stone Road and Stab Lane road diversions. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the rolling rural landscape and will potentially cause visual severance of the woodland shelter belts associated with Swynnerton Park. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon this receptor.

Views west from Swynnerton Footpath 49 and residences at Cumberstone Wood Farm

11.4.27 From viewpoints 017.02.011 and 17.03.012 (Map LV-11-117 in Volume 2, CA3 Map Book) there would be long-range views of the Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road satellite compound, Tittensor Road overbridge, and A51 Stone Road and Stab Lane road diversions. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in substantial change to the filtered views of the sloping pastoral landscape and interrupt the prominent wooded ridge. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

Views north-east from residences and Swynnerton, Main Street

11.4.28 From viewpoint 017.02.017, (LV-11-117 in Volume 2, CA3 Map Book) there would be close to medium-range views of the Tittensor Road overbridge. There would also be filtered medium-range views from the upper floors of properties of the Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road satellite compound, and A51 Stone Road and Stab Lane road diversions. Earthworks and material stockpiles, presence of equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views along the village street. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

Views east from residences and Swynnerton Footpath 23 and Stone Circles Challenge north of Swynnerton

11.4.29 From viewpoints 017.03.020, 018.02.001 and 018.03.003 (Map LV-11-118 in Volume 2, CA3 Map Book) there would be close-medium range views of the Sandyford Underbridge, Swynnerton auto-transformer station, Tittensor Road satellite compound, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions

and A519 Newcastle Road overbridge. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the sloping arable fields interrupting the characteristic dense woodland and hedgerow field boundaries. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

Views east from Swynnerton Footpath 21, Swynnerton Footpath 55 and residences east of Cranberry

11.4.30 From viewpoints 018.02.002, 018.03.004, 018.02.006 and 018.03.007 (Map LV-11-118 in Volume 2, CA3 Map Book) there would be medium-range views of the construction of the A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road main compound, A519 Newcastle Road overbridge and the Swynnerton (North) overbridge and the. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in the removal of a section of Clifford's Wood and new features that form prominent, incongruous elements in the views across the undulating pastoral landscape. These activities are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

Views west from A519 Newcastle Road and Swynnerton Footpath 53 and Swynnerton Bridleway 0.1148A

11.4.31 From viewpoints 018.04.009, 018.03.010 and 018.03.013 (Map LV-11-118 in Volume 2, CA3 Map Book) there would be medium-range views of the A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road main compound, A519 Newcastle Road overbridge and the Swynnerton (North) overbridge. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in noticeable changes to the views across the large-scale agricultural landscape. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

Views west and east from Stone Circles Challenge and residences north of Swynnerton including Cranberry and Beech

11.4.32 From viewpoint 018.02.008 (Map LV-11-118 in Volume 2, CA3 Map Book) there would be long-range views of the construction of the A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road main compound, A519 Newcastle Road overbridge and the Swynnerton (North) overbridge. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in noticeable change to views across the rural landscape of arable fields and interruption of the woodland shelter belts. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

Views west from Swynnerton Footpaths 11, 13, 15 and residences on Dog Lane adjacent to Swynnerton Old Park

11.4.33 From viewpoints 019.03.002, 019.03.003, 019.03.004, 019.02.005, 019.02.006 and 019.03.007 (Map LV-11-119a in Volume 2, CA3 Map Book) there would be medium-range views of the Plantation overbridge, Swynnerton Footpath 52 accommodation overbridge, Swynnerton Footpath 52 satellite compound, the Dog Lane overbridge, Bent Lane (North) diversion, Dog Lane satellite compound, Bent Lane (South) realignment and the Stableford mid-point auto-transformer station. Earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in new features that form prominent, incongruous elements in the views across the sloping agricultural landscape. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

View east from Chapel and Hill Chorlton Footpath 12, Dog Lane and Bent Lane adjacent to Stableford

11.4.34 From viewpoint 019.04.009, 019.03.010 and 019.04.011 (Map LV-11-119a in Volume 2, CA3 Map Book) there would be close to medium-range views of the Plantation overbridge, Swynnerton Footpath 52 accommodation overbridge, Swynnerton Footpath 52 satellite compound, the Dog Lane overbridge, Bent Lane (North) diversion, Dog Lane satellite compound, Bent Lane (South) realignment, the Stableford mid-point auto-transformer station and the Dog Lane satellite compound and Meece Brook viaduct satellite compound (within the Whitmore Heath and Madeley area (CA4). Associated earthworks and material stockpiles, presence of construction equipment and the movement of construction vehicles would result in a substantial change to the views across the rural, pastoral landscape and interruption of the undulating rural skyline. These activities are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

Night time effects

11.4.35 Night time surveys will be undertaken and reported in the formal EIA Report. Potential visual impacts arising from additional lighting at night during construction within the Stone and Swynnerton area may arise from continuous working and/or overnight working at the Stone railhead and main compounds.

11.4.36 The addition of lighting could give rise to significant effects in relation to a number of receptors. More detail will be provided in the formal EIA report on completion of the night time assessment.

Other mitigation measures

11.4.37 To further reduce the significant effects described above, consideration of where planting can be established early in the construction programme will be given during the detail design stage. This may include consideration of early planting in ecological mitigation sites, which would have the additional benefit of providing some visual screening. However, not all landscape and visual effects can be practicably mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. Therefore, no other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

11.4.38 These effects would be temporary and reversible in nature lasting only for the duration of the construction works. Any significant effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed from surrounding residential receptors, and users of PRoW and main roads within the study area. It is anticipated that the following significant effects would remain after implementation of construction phase mitigation:

- major adverse effects in relation to Swynnerton Park Sandstone Hills and Heaths LCA;
- moderate adverse effects in relation to Yarnfield Settled Farmlands LCA, Swynnerton Village Sandstone Hills and Heaths LCA, Meece Brook Valley Sandstone Hills and Heaths LCA;
- major adverse visual effects for receptors using Stone Rural Footpath 29 and residences at Pirehill; residential receptors west of Walton; receptors using Stone Rural Bridleway 0.1135 and residences at Pirehill Grange Farm; receptors using Stone Rural Footpath 33; residential receptors at Blakelow; residential receptors at Sanford Cottage; Stone Circles Challenge and residence north of Swynnerton; users of Swynnerton Footpath 21 and 55; and residences east of Cranberry; and
- moderate adverse visual effects for residential receptors on the A34 Stafford Road/The Fillybrooks; users of Chebsey Footpath 7 and the B5026 Eccleshall Road; residential receptor at Darlaston Grange; receptors using Swynnerton Footpath 42; residential receptors at Whitemoor Farm and Moss House; receptors using Swynnerton Footpath 39 and residences at The Highlow; receptors using Stone Rural Footpath 34 and A51 Stone Road; receptors using Swynnerton Footpath 37, Stone Circles Challenge; residential receptors at Grange Cottage; residential receptors at Chase Lane; receptors using Swynnerton Foorpath 49; residential receptors at Cumberstone Wood Farm; residential receptors at Swynnerton, Main Street; receptors using Swynnerton Footpath 23; receptors using A519 Newcastle Road, Swynnerton Footpath 53 and Swynnerton Bridleway 0.1148A; residential receptors at Cranberry and Beech; receptors using Swynnerton Footpaths 11, 13 and 15; residential receptors on Dog Lane; and receptors using the Chapel and Hill Chorlton Footpath 12, Dog Lane and Bent Lane.

11.5 Effects arising from operation

11.5.1 The specific elements of the Proposed Scheme that have been taken into account in determining the effects on landscape and visual receptors in this area include:

- the presence of embankments at Yarlet, Yarnfield South, Yarnfield North, Meaford South, Meaford North, Swynnerton, Hatton and Stableford North;
- the permanent realignment or diversion of Stone Rural Footpath 28, 32, 33, Swynnerton Footpath 27, 17, 52, 15, 10 and Stone Rural Bridleway 0.1135.and associated earthworks;

- the permanent highway realignment or diversion of Pirehill Lane, B5026 Eccleshall Road, Yarnfield Lane, Tittensor Road, A51 Stone Road, Stab Lane, A519 Newcastle Road, Common Lane (North), Dog Lane, Bent Lane (North) and Bent Lane (South);
- the presence of Stone Rural Footpath 28 overbridge, Stone Rural Bridleway 0.1135 accommodation overbridge, Stone Rural Footpath 32 accommodation overbridge, B5026 Eccleshall Road overbridge, Tittensor Road overbridge, A519 Newcastle Road overbridge, Swynnerton (North) overbridge, Plantation overbridge and Dog Lane overbridge and associated earthworks;
- the presence of Yarnfield Lane underbridge, Swynnerton (South) underbridge, Swynnerton Footpath 27 accommodation underbridge, Lodge culvert underbridge, Sandyford underbridge, Clifford's Wood underbridge and Swynnerton Footpath 52 accommodation underbridge and associated earthworks;
- the presence of Filly Brook viaduct and the M6 Meaford viaduct plus associated earthworks and embankments;
- the visual presence of overhead line equipment, most prominently from the proposed viaducts and overbridges;
- the presence of trains, track and supporting infrastructure such as the Yarnfield Lane auto-transformer station, Swynnerton auto-transformer station and Stableford mid-point auto-transformer station; and
- loss of structural vegetation.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2027), and year 15 (2042) of the Proposed Scheme. Operational impacts and effects for year 60 (2087) of the Proposed Scheme will be assessed and reported in the formal EIA Report.
A process of iterative design and assessment has been employed to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures incorporated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments and cuttings into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors where reasonably practicable. Earthworks also consider the relationship to surrounding land uses and management such as agriculture;
- compensatory woodland planting in areas of loss using the same species composition and planting types and to provide enhanced landscape and green infrastructure connectivity, as well connectivity of historic designed landscape features where reasonably practicable;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern where reasonably practicable and to tie Proposed Scheme mitigation into wider landscape character; and

- compensation for loss of field ponds with new wetlands, water balancing and biodiversity wetland features.

Assessment of impacts and effects

Introduction

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including viaducts, embankments, overbridges, underbridges, road and PRoW realignments and diversions and auto transformer stations.

Landscape assessment

11.5.4 Based on the current scheme design it is assessed that, in both summer and winter of year 1 of operation, there is the potential for moderate adverse significant effects on landscape character in relation to the Yarnfield Settled Farmlands LCA. This would be due to the presence of Filly Brook and M6 Meaford viaducts and Yarnfield South, Yarnfield North and Meaford South embankments, which would potentially introduce a locally large degree of change to open rural landscape character.

11.5.5 Major adverse significant effects on landscape character, in both summer and winter of year 1 of operation, would occur in relation to the Swynnerton Park Sandstone Hills and Heaths LCA. This is due to the presence of M6 Meaford viaduct and Meaford North and Swynnerton embankments, which would potentially introduce a locally large degree of change to open rural landscape.

11.5.6 It is anticipated that moderate adverse significant effects on landscape character, in both summer and winter of year 1 of operation would occur in relation to the Swynnerton Village Sandstone Hills and Heaths LCA. This is due to the presence of Tittensor Road, A519 Newcastle Road, Swynnerton (North), Plantation and Dog Lane overbridges and Swynnerton, Hatton and Stableford North embankments, noise barriers plus elevated overhead line equipment, all of which would potentially introduce a locally large degree of change to open landscape and horizon character. Significant effects are also anticipated due to A51 Stone Road, Stab Lane, A519, Common Lane, Dog Lane and Bent Lane (North) road diversions and associated alterations to landform and relationships to existing landscape structure.

11.5.7 Additionally, it is anticipated that moderate adverse significant effects to landscape character, in both summer and winter of year 1 of operation would occur in the Meece Brook Valley Sandstone Hills and Heaths LCA. This is due to the Dog Lane, Bent Lane (South) road diversions and Stableford North embankments and also noise barriers at the top of cuttings, which would potentially introduce a high magnitude of change to parts of the rural river valley landscape of undulating landform and winding rural lanes.

11.5.8 By summer of year 15, due to the establishment of landscape planting, the above landscape effects would potentially be slightly reduced although they would still be significant (moderate adverse) due to the level of severance created by the Proposed Scheme.

Visual assessment

Introduction

11.5.9 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf. Likely significant effects on residential receptors from additional lighting at night time are also identified.

11.5.10 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.5.11 In most cases, additional lighting is not considered to give rise to significant effects due to the operational nature of the Proposed Scheme. Where there would be no direct foreground visibility of additional lighting, no further assessment has been undertaken.

11.5.12 Visual receptor groups that would experience significant construction phase effects and are not likely to experience significant effects at year 1 of operation include residences to the west of Walton, views from B5026 Eccleshall Road, views east from Swynnerton Footpath 42 and adjacent residences at Whitemoor Farm and Moss House, views from Swynnerton Footpath 39 and adjacent residences at The Highlows, and views west and east from Stone Circles Challenge and residences north of Swynnerton including Cranberry and Beech.

Views west from Stone Rural Footpath 29 and adjacent residences at Pirehill

11.5.13 In winter and summer of year 1 from viewpoints 014.02.001 and 014.03.002 (LV-11-114b in Volume 2, CA3 Map Book) there would be medium-range views of the Yarlet embankment, Stone Rural Bridleway 0.1135 accommodation overbridge, and overhead line equipment, which would result in new features that are uncharacteristic of the existing views across the open rural landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.14 It is likely that effects would reduce to non-significant at year 15, due to the Proposed Scheme being integrated by mitigation planting to tie the abutments and embankments into their context.

Views west from Stone Rural Footpath 29 and adjacent residences at Pirehill and Aston by Stone

11.5.15 In winter and summer of year 1 from viewpoints 014.02.003 and 014.02.006 (LV-11-114b in Volume 2, CA3 Map Book) there would be close to medium-range views of the Yarlet embankment, Stone Rural Bridleway 0.1135 accommodation overbridge and overhead line equipment. These elements would be partially filtered by hedgerow field boundaries and the group of mature trees at Pirehill Cottages and Pirehill House but would result in new features that are uncharacteristic of the existing views across the open rural landscape and topography and would interrupt the undeveloped rural character.

These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.16 It is likely that effects would reduce to non-significant at year 15, due to the Proposed Scheme being integrated by mitigation planting to tie the abutments and embankments into their context.

View east from Stone Rural Bridleway 0.1135 and adjacent residences at Pirehill Grange Farm

11.5.17 In winter and summer of year 1 from viewpoints 014.03.009 (LV-11-114b in Volume 2, CA3 Map Book) there would be medium-range views of the Yarlet embankment, Stone Rural Bridleway 0.1135 accommodation overbridge and overhead line equipment, which would be uncharacteristic of the existing views across the rural landscape and interrupt the distinctive undulating topography relating to Peasley Bank. These views would be partially filtered by hedgerow field boundaries and vegetation associated with Pirehill Grange Farm. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

11.5.18 It is likely that effects would reduce to non-significant at year 15, due to the Proposed Scheme being integrated by mitigation planting to tie the abutments and embankments into their context.

Views west from residences to the west of Walton

11.5.19 In winter and summer of year 1 from viewpoints 015.02.009 and 015.04.008 (LV-11-115 in Volume 2, CA3 Map Book) there would be close to medium-range views of the Yarlet embankment, Stone Rural Bridleway 0.1135 accommodation overbridge , the B5026 Eccleshall Road overbridge, Yarlet North embankment, Filly Brook viaduct and associated embankments and overhead line equipment. These elements would be partially filtered by hedgerow field boundaries and field trees but would introduce new features that are uncharacteristic of the existing views across the flat rural landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.20 It is likely that effects would reduce to non-significant at year 15, due to the Proposed Scheme being integrated by mitigation planting to tie the abutments and embankments into their context.

View east from Chebsey Footpath 7

11.5.21 In winter and summer of year 1 from viewpoint 015.03.012 (LV-11-115 in Volume 2, CA3 Map Book) there would be medium range views of the B5026 Eccleshall Road overbridge, Filly Brook viaduct, Yarnfield South embankment, Yarnfield North embankment, Yarnfield Lane underbridge and overhead line equipment. These elements would be partially filtered by hedgerow field boundaries, hedgerow trees and mixed woodland shelter belts, which would result in substantial change to the views across the gently sloping arable landscape, interrupting the horizon and introducing elements, which are out of scale with the landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

11.5.22 It is likely that significant visual changes in relation to the B5026 Eccleshall Road overbridge, Filly Brook viaduct, Yarnfield South embankment, Yarnfield North embankment, Yarnfield Lane underbridge and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

View west from residences at Darlaston Grange

11.5.23 In winter and summer of year 1 from viewpoint 016.02.002 (LV-11-116 in Volume 2, CA3 Map Book) there would be close to medium-range views of the B5026 Eccleshall Road overbridge, Filly Brook viaduct, Yarnfield South embankment, Yarnfield North embankment, Yarnfield Lane underbridge, Meaford South embankment, the M6 Meaford viaduct, and overhead line equipment. These elements would be partially screened by property boundaries and woodland shelter belts but would result in noticeable change to the characteristics of the sloping rural landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

11.5.24 It is likely that significant visual changes in relation to the B5026 Eccleshall Road overbridge, Filly Brook viaduct, Yarnfield South embankment, Yarnfield North embankment, Yarnfield Lane underbridge, Meaford South embankment, M6 Meaford viaduct, and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

View east from Stone Rural Footpath 33

11.5.25 In winter and summer of year 1 from viewpoints 016.03.008 and 017.03.002 (LV-11-116 in Volume 2, CA3 Map Book) there would be close-medium range views of the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment, Swynnerton (South) underbridge and overhead line equipment, which would potentially dominate the foreground and middle ground, despite the hedgerow field boundaries partially filtering the view. This would result in substantial alterations due to the loss of the existing shelter belt partially screening the M6 in the previous construction phase. These elements are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon these receptors.

11.5.26 It is likely that significant visual changes in relation to the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment, Swynnerton (South) underbridge and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

View south west from residences at Blakelow and Swynnerton Footpath 27

11.5.27 In winter and summer of year 1 from viewpoints 017.02.04 (LV-11-117 in Volume 2, CA3 Map Book) there would be close range views of the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment, Swynnerton (South) underbridge and overhead line equipment, which would potentially dominate the foreground despite the intervening hedgerows and belts of mature trees. These elements would result in new features that form prominent, incongruous elements in the views across the rural landscape and would potentially cause visual severance of the woodland shelter belts associated with Swynnerton Park. These elements are anticipated to give

rise to a high magnitude of visual change and potentially major adverse visual effects upon this receptor.

11.5.28 It is likely that significant visual changes in relation to the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment, Swynnerton (South) underbridge and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

View west from Stone Rural Footpath 34 and the A51

11.5.29 In winter and summer of year 1 from viewpoints 017.02.05 and 017.04.007 (LV-11-117 in Volume 2, CA3 Map Book) there would be medium-range views of the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment, Swynnerton (South) underbridge and overhead line equipment, partially filtered by mature hedgerows and belts of mature trees. These elements would potentially be viewed as one of a series of components in the middle ground causing severance of the woodland shelter belts associated with Swynnerton Park on the horizon. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.30 It is likely that significant visual changes in relation to the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment, Swynnerton (South) underbridge and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

View east from Swynnerton Footpath 37, Stone Circles Challenge and from residences at Grange Cottage

11.5.31 In winter and summer of year 1 from viewpoints 017.03.001, 017.02.03, 017.03.014 and 017.03.016 (LV-11-117 in Volume 2, CA3 Map Book) there would be medium-range views of the M6 Meaford viaduct, Meaford North embankment, Swynnerton embankment, Swynnerton (South) underbridge, Tittensor Road overbridge, A51 Stone Road diversion and Stab Lane diversion and overhead line equipment. These elements would be partially filtered by hedgerow field boundaries, parkland trees and groups of trees but would potentially result in uncharacteristic changes to the existing views of the parkland landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects on these receptors.

11.5.32 It is likely that significant visual changes in relation to M6 Meaford viaduct, Meaford North embankment, Swynnerton embankment, Swynnerton (South) underbridge, Tittensor Road overbridge, A51 Stone Road and Stab Lane diversions and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

Views west and east from residences at Chase Lane

11.5.33 In winter and summer of year 1 from viewpoint 017.02.10 (LV-11-117 in Volume 2, CA3 Map Book) there would be medium-range views of the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, noise barriers and overhead line equipment, partially filtered by hedgerow field boundaries and blocks of

mature woodland. These elements would form new features in the view within a relatively short distance, which would interrupt the characteristic hedgerow field boundaries and mature woodland shelter belts associated with Swynnerton Park. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon this receptor.

11.5.34 It is likely that significant visual changes in relation to the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, noise barriers and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Views west and east from residences at Sanford Cottage, A51 Stone Road

11.5.35 In winter and summer of year 1 from viewpoint 017.02.13 (LV-11-117 in Volume 2, CA3 Map Book) there would be close-range views of the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, noise barriers and overhead line equipment. These elements would add new features that form prominent, incongruous elements in the views across the rolling rural landscape and would potentially cause visual severance of the woodland shelter belts associated with Swynnerton Park. These elements are anticipated to give rise to a high magnitude of visual change and potentially major adverse visual effects upon this receptor.

11.5.36 It is likely that significant visual changes in relation to the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, noise barriers and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Views west from Swynnerton Footpath 49 and residences at Cumberstone Wood Farm

11.5.37 In winter and summer of year 1 from viewpoints 017.02.011 and 017.03.012 (LV-11-117 in Volume 2, CA3 Map Book) there would be long-range views of the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, noise barriers and overhead line equipment. These elements would be partially filtered by maintained hedgerows and blocks of woodland but would result in a substantial change to the filtered views of the sloping pastoral landscape and interrupt the prominent wooded ridge. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.38 It is likely that significant visual changes in relation to Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, noise barriers and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Views north-east from residences and Swynnerton, Main Street

11.5.39 From viewpoint 017.02.017, (LV-11-117 in Volume 2, CA3 Map Book) there would be close to medium-range views of the Tittensor Road overbridge. There would also be filtered medium-range views from the upper floors of properties of the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, A51 Stone Road and Stab Lane road diversions and overhead line equipment. These elements would be filtered by hedgerow field boundaries and blocks of woodland. Due to the limited views of these elements, they are anticipated to give rise to a low magnitude of visual change and potentially minor visual effects upon these receptors.

11.5.40 It is likely that effects would reduce to non-significant at year 15, due to the Proposed Scheme being integrated by mitigation planting to tie the abutments and embankments into their context.

Views east from residences and Swynnerton Footpath 23 and Stone Circles Challenge north of Swynnerton

11.5.41 In winter and summer of year 1 from viewpoints 017.03.020, 018.02.001 and 018.03.003 (LV-11-118 in Volume 2, CA3 Map Book) there would be close to medium-range views of the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road overbridge and overhead line equipment. These elements would be partially filtered by hedgerow field boundaries and blocks of woodland but would add new features that form prominent, incongruous elements in the views across the sloping arable fields interrupting the characteristic dense woodland and hedgerow field boundaries. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.42 It is likely that significant visual changes in relation to the Swynnerton embankment, Sandyford underbridge, Swynnerton auto-transformer station, Tittensor Road overbridge, A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road overbridge and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Views east from Swynnerton Footpath 21, Swynnerton Footpath 55 and residences east of Cranberry

11.5.43 In winter and summer of year 1 from viewpoints 018.02.002, 018.03.004, 018.02.006 and 018.03.07 (LV-11-118 in Volume 2, CA3 Map Book) there would be close-medium range views of the A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road overbridge and the Swynnerton (North) overbridge, Hatton embankment and overhead line equipment. These elements would be partially filtered by hedgerow field boundaries, large specimen field trees and mature blocks of woodland but would add new features that form prominent, incongruous elements in the views across the undulating pastoral landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.44 It is likely that significant visual changes in relation to the A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road overbridge and the Swynnerton (North)

overbridge, Hatton embankment and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Views west from the A519 and Swynnerton Footpath 53 and Swynnerton Bridleway 0.1148A

11.5.45 In winter and summer of year 1 from viewpoints 018.04.009, 018.03.010 and 018.03.013 (LV-11-118 in Volume 2, CA3 Map Book) there would be medium-range views of the A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road overbridge, Swynnerton (North) overbridge, Hatton embankment and overhead line equipment. These elements would be partially filtered by intervening vegetation but would form noticeable changes to the views across the large scale agricultural landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.46 It is likely that significant visual changes in relation to A51 Stone Road and Stab Lane road diversions, A519 Newcastle Road overbridge, Swynnerton (North) overbridge, Hatton embankment and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Views west from Swynnerton Footpaths 11, 13, 15 and residences on Dog Lane adjacent to Swynnerton Old Park

11.5.47 In winter and summer of year 1 from viewpoints 019.03.002 019.03.003, 019.03.004, 019.02.005, 019.02.006 and 019.03.007 (LV-11-118 and LV-11-119a in Volume 2, CA3 Map Book) there would be medium-range views of the Hatton embankment, Plantation overbridge, Swynnerton Footpath 52 accommodation overbridge, Dog Lane overbridge, Bent Lane (North) diversion, Bent Lane (South) realignment, the Stableford mid-point auto-transformer station and overhead line equipment. These elements would be partially filtered by mature hedgerows and blocks of woodland but would result in new features that form prominent, incongruous elements in the views across the sloping agricultural landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.48 It is likely that significant visual changes in relation to the Hatton embankment, Plantation overbridge, Swynnerton Footpath 52 accommodation overbridge, Dog Lane overbridge, Bent Lane (North) diversion, Bent Lane (South) realignment , the Stableford mid-point auto-transformer station and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

View east from Chapel and Hill Chorlton Footpath 12, Dog Lane and Bent Lane adjacent to Stableford

11.5.49 In winter and summer of year 1 from viewpoint 019.04.009, 019-03-010 and 019.04.011 (LV-11-119a in Volume 2, CA3 Map Book) there would be open medium-range views of the Hatton embankment, Plantation overbridge, Swynnerton Footpath 52 accommodation overbridge, Dog Lane overbridge, Bent Lane (North) diversion, Bent Lane (South) realignment , the Stableford mid-point auto-transformer station and overhead line equipment, which would result in a substantial change to the views

across the rural, pastoral landscape. These elements are anticipated to give rise to a medium magnitude of visual change and potentially moderate adverse visual effects upon these receptors.

11.5.50 It is likely that significant visual changes in relation to the Hatton embankment, Plantation overbridge, Swynnerton Footpath 52 accommodation overbridge, Dog Lane overbridge, Bent Lane (North) diversion, Bent Lane (South) realignment , the Stableford mid-point auto-transformer station and overhead line equipment would remain at year 15, albeit partly integrated by mitigation planting to tie the embankments into their context.

Night time effects

11.5.51 Night time surveys will be undertaken for the formal EIA Report. Potential visual impacts arising from additional lighting at night in operation in the Stone and Swynnerton area may arise at Yarnfield Lane and Swynnerton auto-transformer stations and Stableford mid-point auto-transformer station.

11.5.52 In most instances lighting is not considered to give rise to significant effects. Where the addition of lighting could give rise to significant effects in relation to a number of receptors, more detail will be provided in the formal EIA Report on completion of the night time assessment.

Other mitigation measures

11.5.53 The permanent effects of the Proposed Scheme on landscape and visual receptors have been substantially reduced through incorporation of the measures described previously. Effects in year 1 of operation may be further reduced by establishing planting early in the construction programme. Additional planting will be considered as part of the ongoing development of the design. This would provide additional screening and greater integration of the Proposed Scheme into the landscape. However, no other mitigation measures are considered practicable due to the high visibility of elements of the Proposed Scheme and the sensitivity of the surrounding receptors.

Summary of likely residual significant effects

11.5.54 In most cases, significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following significant residual effects would remain following year 15 of operation.

- major significant effects on landscape character would persist beyond year 15 in relation to the Swynnerton Park Sandstone Hills and Heaths LCA. This is due to the presence of the M6 Meaford viaduct and Meaford North and Swynnerton embankment, which would continue to introduce a potentially large degree of change to open rural landscape and skyline character;
- moderate adverse effects, which would be at variance with the existing character of the Yarnfield Settled Farmlands, Swynnerton Village Sandstone Hills and Heaths and Meece Brook Valley Sandstone Hills and Heaths beyond year 15 of operation of the Proposed Scheme. This would be due to the presence of viaducts, embankments and associated elevated overhead line

equipment and noise barriers continuing to form a locally large degree of change to the open rural landscape and skyline character;

- moderate adverse effects, which would result in a deterioration in the existing views from residences at Darlaston Grange and users of Chebsey Footpath 7 and Stone Rural Footpath 34, would persist beyond year 15 (015.03.012, 016.02.002 017.02.05 and 017.04.007) This is due to intermittent visibility of the Filly Brook viaduct and M6 Meaford viaduct and adjoining embankments, noise barriers and overhead line equipment;
- major adverse effects which would result in a deterioration in the existing views from residences at Blakelow and Sanford Cottage, users of the Stone Rural Footpath 33 and Swynnerton Footpath 27 beyond year 15 due to views of the Proposed Scheme, in which the M6 Meaford viaduct and Swynnerton (South) underbridge and embankments would be highly visible within the foreground (016.03.008, 017.03.002, 017.02.013 and 017.02.04). Additionally, moderate-major effects would be experienced by users of Swynnerton Footpath 37, Stone Circles Challenge and from residences at Grange Cottage (017.03.001, 017.02.03, 017.03.014 and 017.03.016) due to the aforementioned reasons;
- moderate adverse effects, which would result in a deterioration in the existing views from residences adjacent to Swynnerton and east of Cranberry, at Chase Lane and Cumberstone Wood Farm, and for users of Swynnerton Footpaths 49, 23, 21, 55, 53, Swynnerton Bridleway 0.1148A and Stone Circles Challenge, would persist beyond year 15 (017.02.13, 017.02.10, 017.02.011, 017.03.012, 017.02.017, 017.03.020, 018.02.001, 018.03.003, 018.02.002, 018.03.004, 018.02.006, 018.03.07, 018.04.009, 018.03.010 and 018.03.013). This is due to the intermittent visibility of the A51 Stone Road and Stab Lane road diversions, and the A519 Newcastle Road overbridge and associated embankments and overhead line equipment; and
- moderate adverse effects, which would result in a deterioration in the existing views from residences on Dog Lane and for users of Swynnerton Footpaths 11, 13, 15, Chapel and Hill Chorlton Footpath 12, Dog Lane and Bent Lane adjacent to Stableford, would persist beyond year 15 (019.03.002, 019.03.003, 019.03.004, 019.02.005, 019.02.006, 019.03.007, 019.04.009, 019-03-010 and 019.04.011).This is due to the intermittent visibility of the Swynnerton Footpath 52 accommodation overbridge, the Dog Lane overbridge, Bent Lane (North) diversion, Bent Lane (South) realignment and associated embankments, noise barriers and overhead line equipment.

12 Socio-economics

12.1 Introduction

12.1.1 This section provides a summary of the environmental baseline and likely significant economic and employment impacts and significant effects during construction and operation of the Proposed Scheme within the Stone and Swynnerton area.

12.1.2 The need for a socio-economic assessment results from the potential for the Proposed Scheme to affect:

- existing businesses and community organisations and thus the amount of local employment;
- local economies, including employment; and
- planned growth and development.

12.1.3 The beneficial and adverse socio-economic effects of the Proposed Scheme and its construction are reported at two different levels: route-wide and by community area. Effects on levels of employment are reported at a route-wide level in Volume 3 Route-wide effects. Localised effects on businesses and observations on potential local economic effects (including local employment) for the Stone and Swynnerton area are reported within this section.

Construction

12.1.4 The proposed construction works would have the following relevance in terms of socio-economics:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme; and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Operation

12.1.5 The operation of the Proposed Scheme would have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

12.2 Scope, assumptions and limitations

12.2.1 The assessment scope, key assumptions and limitations for the socio-economics assessment are set out in the draft SMR and Volume 1.

12.3 Environmental baseline

Introduction

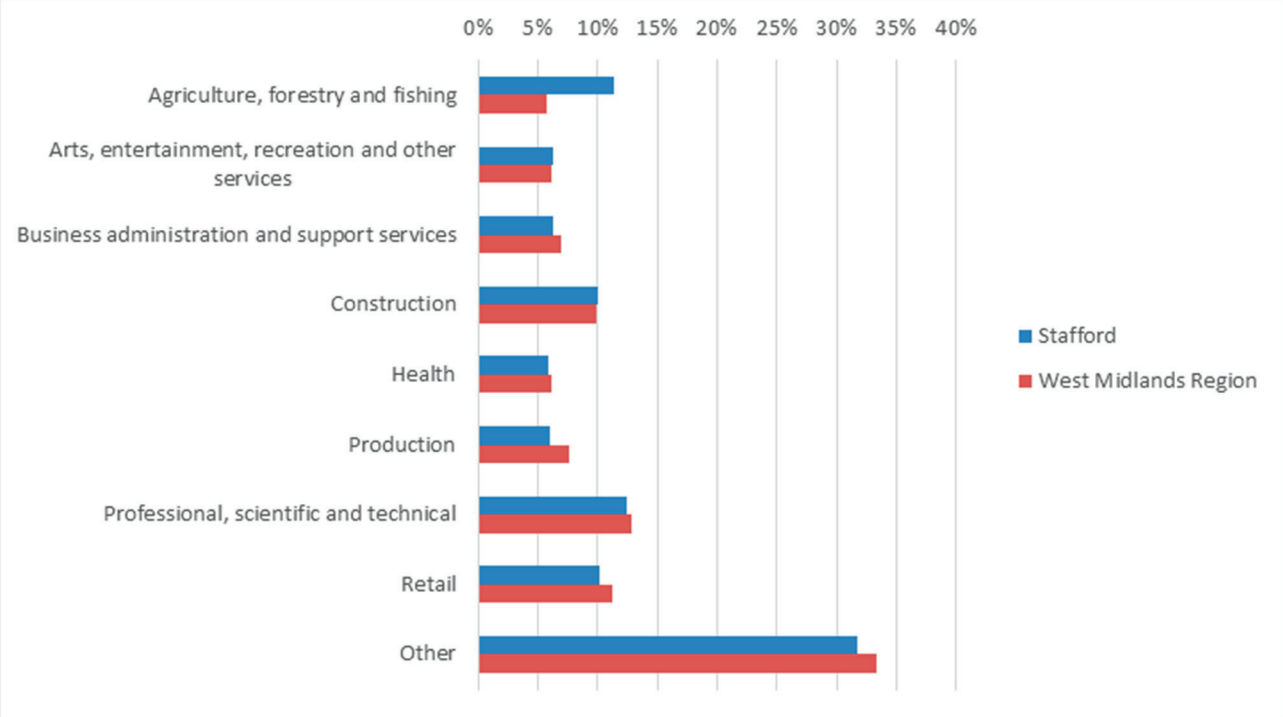
12.3.1 This section provides a brief overview in terms of employment, economic structure, labour market, and business premises availability within the area.

12.3.2 The Stone and Swynnerton area lies within the administrative area of Stafford Borough within the County of Staffordshire. The area also falls within the Stoke-on-Trent and Staffordshire Local Enterprise Partnership area[73].

Business and labour market

12.3.3 Within the SBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (12%), with agriculture, forestry and fishing as second largest (11%), followed by retail (10%). This is shown in Figure 6. For comparison within the West Midlands region, the largest sectors were: professional, scientific and technical (13%), followed by retail (11%) and construction (10%)[74].

Figure 6: Business sector composition in SBC and the West Midlands[75]



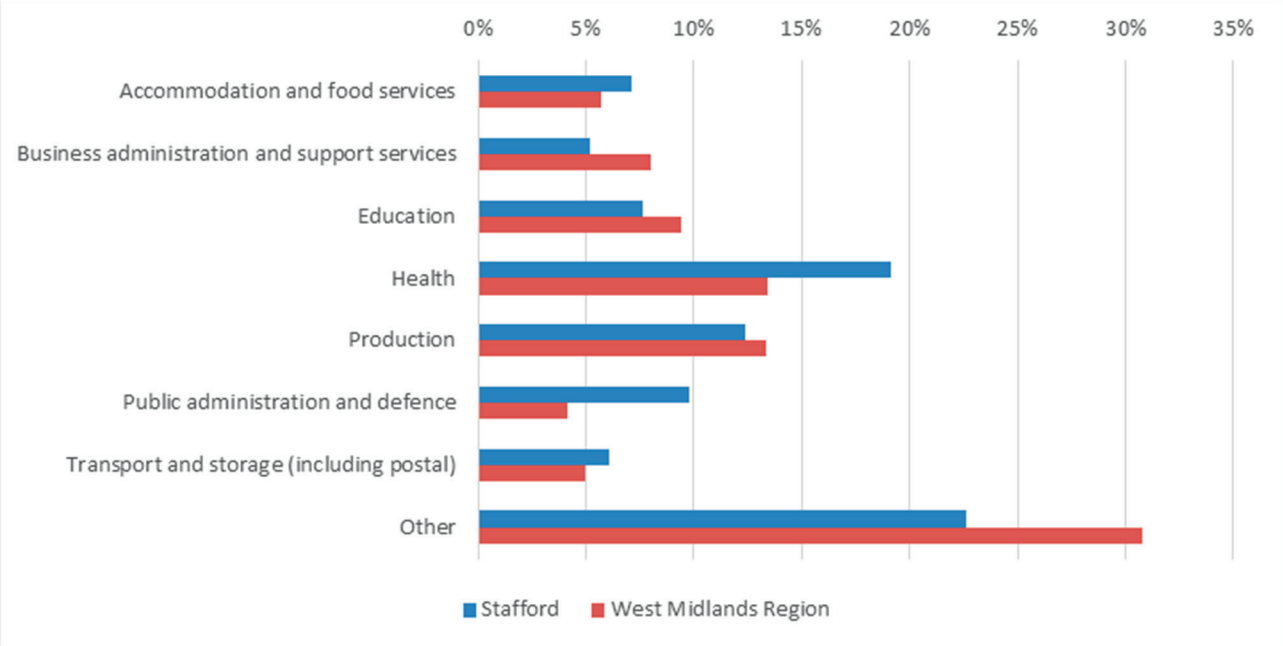
Source: Office for National Statistics (ONS), (2014), UK Business: Activity, Size and Location 2014; Accessed: 11 January 2016.

12.3.4 In 2014[76], approximately 58,000 people worked in the SBC area. According to the Office for National Statistics Business Register and Employment Survey 2014, the top five sectors in terms of share of employment in the SBC area are: health (19%), reflecting the ageing population; production (12%), which is still important despite the decline in low-value added manufacturing; retail (10%); public administration and defence (10%) and education (8%). These compare with the top five sectors for employment in the West Midlands region, which are: health (13%); production (13%);

[73] Stoke-on-Trent and Staffordshire Local Enterprise Partnership, (2014), *Strategic Economic Plan Summary March 2014*
[74] Office for National Statistics (ONS), (2014), UK Business: Activity, Size and Location 2014; Accessed: 11 January 2016. Please note 2014 BRES companies data has been presented to provide an appropriate comparison with BRES Employment 2014 data.
[75] "Other" includes: motor trades; transport and storage; finance and insurance; public administration and defence; and education sectors.
[76] Office of National Statistics, (2014), *Business Register and Employment Survey*; Available online at: http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/businessregisterandemploymentsurveybresprovisionalresults/previousReleases . Accessed: 11 January 2016.

retail (10%); education (9%) and business administration and support services (8%)[77]. This is shown in Figure 7.

Figure 7: Employment by industrial sector in SBC and the West Midlands[78]



Source: Office of National Statistics, (2014), Business Register and Employment Survey; Accessed: 11 January 2016.

12.3.5 According to the Annual Population Survey (2016)[79], the employment rate[80] within the SBC area was 75% (61,200 people), which is higher than that recorded for both the West Midlands (70%) and England (74%). In 2016, unemployment[81] in the SBC area was 3%, which was lower than the West Midlands (6%) and England (5%).

12.3.6 According to the Annual Population Survey (2015)[82], 41% of SBC's residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the West Midlands and 37% in England, while 5% of residents had no qualifications, which was lower than that recorded both for West Midlands (13%) and England (8%).

Property

12.3.7 A review of employment land in 2012 identified a need for 8.9ha per year to 2026 for general business land in the SBC area. It is not clear whether the borough experienced a historic shortfall or surplus of employment land provision up to 2012[83].

[77] Office of National Statistics, (2014), *Business Register and Employment Survey*; Accessed: 11 January 2016.
[78] "Other" includes retail, construction, wholesale, information and communication, motor trades, public administration and defence, property, financial and insurance, and agriculture, forestry and fishing sectors.
[79] Annual Population Survey, (2015), NOMIS, Accessed: 25 July 2016.
[80] The proportion of working age (16-64 year olds) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment'.
[81] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.
[82] Annual Population Survey, (2015), NOMIS, Accessed: 26 April 2016.
[83] Stafford Borough Council (2012) Employment Land Review 2012. Based on 10 year average build rate projected forward for 2012-2036. Based on 10 year average build rate projected forward for 2012-2036.

Key employment sites for growth have been identified north of Stafford, at Beacon Hill (west and south of Stone) and through an extension to Stone Business Park[84].

12.3.8 Average vacancy rate for industrial and warehousing property in the SBC area in May 2016 has been assessed as 10% based on marketed space against known stock.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 Businesses displaced by the Proposed Scheme would be compensated in accordance with the National Compensation Code. HS2 Ltd recognises the importance of displaced businesses being able to relocate to alternative premises and would therefore provide additional support over and above statutory requirements to facilitate this process.

12.4.2 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining training and employment. HS2 Ltd is committed to working with its suppliers to build a skilled workforce that fuels further economic growth across the UK.

Assessment of impacts and effects

12.4.3 Businesses directly affected, comprising those that lie within land which would be used for the construction of the Proposed Scheme, are reported in groups where possible to form defined resources, based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses/resources are clustered together.

12.4.4 No significant direct effects on non-agricultural employment have been identified within the area. The Proposed Scheme is not anticipated to result in the displacement or possible loss of jobs within this area. Effects on agricultural businesses are reported separately in Section 4, Agriculture, forestry and soils, and their total employment effects are reported in Volume 3, Route-wide effects.

12.4.5 The Proposed Scheme would include a main compound for civil engineering works off the A519 Newcastle Road, a main compound for railway systems at the Stone railhead, and eight satellite construction compounds within the Stone and Swynnerton area.

12.4.6 These sites could result in the creation of up to 3,900 person years of construction employment[85] opportunities, equivalent to 390 full-time equivalent permanent jobs[86], which depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been assessed as part of the route-wide assessment (Volume 3).

[84] Stafford Borough Council (2014), The Plan for Stafford Borough, 2011-2031.
[85] Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days.
[86] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

12.4.7 Direct construction employment created by the Proposed Scheme could also lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been assessed as part of the route-wide assessment (see Volume 3, Route-wide effects).

12.4.8 The combined effects of noise, vibration, visual, air quality or HGV congestion impacts and isolation on businesses are currently being assessed and will be reported in the formal EIA Report.

Other mitigation measures

12.4.9 No mitigation measures during construction of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

12.4.10 Any likely residual significant socio-economic effects are currently being assessed and will be reported in the formal EIA Report.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Assessment of impacts and effects

12.5.2 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.3 The Proposed Scheme would create direct and wider operation employment opportunities across the route. These are considered unlikely to be accessed by residents of this area.

12.5.4 Operational effects are captured and assessed at a route-wide level in Volume 3. Any in-combination effects of noise, vibration, visual, air quality or HGV congestion impacts and isolation on businesses are currently being assessed and will be reported in the formal EIA Report.

Other mitigation measures

12.5.5 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

12.5.6 Any likely residual significant socio-economic effects are currently being assessed and will be reported in the formal EIA Report.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the potential likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme within the Stone and Swynnerton area on:

- people, primarily where they live ('residential receptors') in terms of individual dwellings and on a wider community basis, including any shared community open areas[87]; and
- community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas'[88].

13.1.2 In this assessment, 'sound' is used to describe the acoustic conditions which people experience as a part of their everyday lives. The assessment considers how those conditions may change through time and how sound levels and the acoustic character of an area is likely to be modified through the introduction of the Proposed Scheme. 'Noise' is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.1.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.1.4 Consistent with Government noise policy[89] and the approach taken to the environmental impact assessment of HS2 Phase One this working draft EIA Report reports how, in the context of Government sustainable development policy, the Proposed Scheme, through the effective management and control of noise, would:

- avoid significant adverse impacts on health and quality of life from the Proposed Scheme;
- mitigate and minimise adverse impacts on health and quality of life from the Proposed Scheme; and
- where possible, contribute to the improvement of health and quality of life.

13.1.5 Engagement with SBC has been undertaken. The purpose of this engagement has been to obtain relevant information regarding residential and non-residential

[87] 'Shared community open areas' are those that the National Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either: a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings; or b) a relatively quiet, external, publicly accessible amenity space (e.g. park or local green space) that is nearby.
[88] Quiet areas are defined in the draft Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity.
[89] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf

resources and existing baseline information. Engagement with SBC will continue as part of the development of the Proposed Scheme.

13.1.6 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Map Series CT-10 in the Volume 2, CA3 Map Book. Map Series SV-01 shows areas of impact and proposed noise mitigation in the Stone and Swynnerton area.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and appropriate mitigation are outlined in Volume 1. The scope and methodology is defined in the draft SMR.

13.2.2 The effects of construction sound, noise and vibration are assessed qualitatively, based on construction worksite locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken at this stage. The quantitative assessment will be reported in the formal EIA Report.

13.2.3 The effects on operational sound, noise and vibration are assessed quantitatively. As baseline information is limited at this stage, the quantitative assessment will be reported in the formal EIA Report.

13.3 Environmental baseline

13.3.1 The area is characterised by a mix of small towns, villages, hamlets and isolated residential properties in a predominantly rural setting. It also includes the Walton Industrial Estate and sewage works. There are several major roads within this area: the A34 Stafford Road/The Fillybrooks that runs through Aston-by-Stone; the M6; the B5026 Eccleshall Road that runs east to west through Walton; and the A51 Stone Road. The M6 is a major contributor to the sound environment for many assessment locations within this area. Trains on the WCML also contribute to the sound environment, along with other local sound sources.

13.3.2 Sound levels close to these main transportation routes are high during the daytime and, with the exception of locations in proximity to the M6, are lower at night. Further away from the roads, the sound levels are lower and some areas, particularly villages distant from the busy roads, experience low daytime sound levels.

13.3.3 It is likely that the majority of receptors adjacent to the Proposed Scheme are not currently subject to appreciable vibration. No baseline vibration monitoring has been undertaken as part of the assessment presented in this report. The effects of vibration at all receptors has been assessed using the absolute vibration criteria defined in the draft SMR.

13.4 Effects arising during construction

Avoidance and mitigation measures

13.4.1 The assessment assumes the implementation of the principles and management processes set out in the draft CoCP, which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which would be applied

during construction activities to minimise noise (including vibration) at neighbouring residential properties;

- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example local screening of equipment or perimeter hoarding; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered in accordance with the draft CoCP's noise insulation and temporary re-housing policy;
- lead contractors would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise, including control of working hours, and provide a further assessment of construction noise and vibration including confirmation of noise insulation / temporary re-housing provision;
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and would be made available to the local authorities; and
- contractors would be required to comply with the terms of the CoCP and appropriate action will be taken by the nominated undertaker as required to ensure compliance.

13.4.2 Noise insulation would be offered for qualifying buildings as defined in the noise insulation and temporary re-housing policy in the draft CoCP. Noise insulation - or ultimately temporary re-housing - would avoid residents being significantly affected by levels of construction noise inside their dwellings. Further work is being undertaken to provide an estimate of the buildings that are likely to qualify for such measures, which will be reported in the formal EIA Report.

13.4.3 Qualification for noise insulation and temporary re-housing would be confirmed, as required in the draft CoCP, as part of seeking prior consent from the local authorities under Section 61 of the CoPA. Qualifying buildings would be identified early, as required in the draft CoCP so that noise insulation could be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria. Noise insulation, where required, would be installed as early as possible to reduce internal sound levels from construction activities and also when the Proposed Scheme comes into operation.

Assessment of impacts and effects

13.4.4 Potential construction noise effects could occur due to the increase in noise levels around the communities closest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on the construction Map Series CT-05 (Volume 2, CA3 Map Book):

- North Pirehill, arising from construction activities such as earthworks, roadworks and track base installation;
- Walton Heath, arising from construction activities such as earthworks, roadworks and track base installation;
- Swynnerton, arising from construction activities such as earthworks, roadworks and track base installation;
- Swynnerton North, arising from construction activities such as earthworks, roadworks and track base installation; and
- Stableford, arising from construction activities such as earthworks, roadworks and track base installation.

13.4.5 Construction traffic has the potential to cause adverse noise effects on occupants of residential properties through the additional traffic generated on local roads. The B5026 Eccleshall Road through Walton has been identified on a precautionary basis as having the potential for an adverse noise effect on occupants of any residential communities along this road.

13.4.6 The Stone railhead main compound would be included in the Proposed Scheme, located north-west of Stone and immediately adjacent to the M6. This would be used during the construction of the Proposed Scheme. As there are no communities in the vicinity of the proposed railhead location, and due to the major existing noise source of the M6, no potential significant effects are likely as a result of activities from the railhead compound.

13.4.7 Track laying, power system and signalling installation works would be unlikely to result in significant construction noise effects, given the short duration close to any communities and the presence of the permanent noise barriers.

Other mitigation measures

13.4.8 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal EIA Report and will include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

13.4.9 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary effects from construction traffic. Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-

by-receptor basis. Any further assessment would be reported in the formal EIA Report.

13.5 Effects arising from operation

Avoidance and mitigation measures

13.5.1 The development of the Proposed Scheme has sought to keep the route as low as reasonably practicable and away from main communities. These avoidance measures would protect many communities in this area from likely significant noise or vibration effects.

Airborne noise

13.5.2 HS2 trains are assumed to be quieter than the relevant current European Union specifications, as assumed for the HS2 Phase One Environment Statement. Assuming quieter trains than the Technical Specification for Interoperability (TSI) Noise is consistent with Phase One and will be detailed in a technical appendix to the formal EIA Report. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia. The track would be specified to reduce noise, as would the maintenance regime. Overall, these measures would reduce noise emissions by approximately 3dB at 360kph compared to a current European high speed train operating on the new track.

13.5.3 The Proposed Scheme would incorporate noise barriers in the form of landscape earthworks and/or noise fence barriers to avoid or reduce significant airborne noise effects. The assessment has been based on the assumption of noise fence barriers that are acoustically absorbent on the railway side and are located 5m to the side of the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on the SV-01 Map Series (Volume 2, CA3 Map Book).

13.5.4 In practice, barriers may differ from this description whilst maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks they need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier because the crest of the earthwork would be further than 5m from the outer rail.

13.5.5 Noise effects are reduced in other locations along the route by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts (where noise barriers are not required).

13.5.6 Significant noise effects from the operational static sources, such as line-side equipment, would be avoided through their design and the specification of noise emission requirements.

13.5.7 Noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 (the Noise Insulation Regulations). The assessment reported in this section provides an estimate of the buildings that are likely to qualify under the Noise Insulation Regulations based upon the currently available information. Qualification for noise insulation under the Noise Insulation Regulations would be formally identified and noise insulation offered, should the Proposed Scheme become operational. Where

noise insulation is required, as well as improvements to noise insulation of windows facing the railway, ventilation would be provided so that windows can be kept closed to protect internal sound levels.

13.5.8 Noise insulation would avoid any residual significant effects on health and quality of life arising inside dwellings taking into account mitigation incorporated into the design of the Proposed Scheme.

13.5.9 Following Government's National Planning Practice Guidance[90], where the noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[91], residents are considered to be significantly affected by the resulting noise inside their dwelling. The effect on people at night due to the maximum sound level as each train passes has also been assessed[92]. The Interim Target is a lower level of noise exposure than the Regulations trigger threshold for night noise. In these particular circumstances, where night time noise levels for the use of new or additional railways authorised by the Bill are predicted following the methodology set out in the Regulations to exceed 55dB[93], or the maximum noise level (dependent on the number of train passes) as a train passes exceeds the criterion[92], noise insulation would be offered for these additional buildings.

Ground-borne noise and vibration

13.5.10 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

13.5.11 Map Series SV-01 (Volume 2, CA3 Map Book) indicate the likely long-term daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or LpAeq,day) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night time sound level (defined as the equivalent continuous sound level from 23:00 to 07:00 or LpAeq,night) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time sound level would be 40dB. This contour represents where the lowest observed community noise effects would be expected to occur during the day (with respect to annoyance) and night (with respect to sleep disturbance). It is generally unlikely that there would be any adverse noise effects outside of the area within this contour. With regard to sleep disturbance, the assessment has also taken account of the maximum sound levels generated by each train pass-by.

13.5.12 Residential receptors within the daytime 65dB contour, and therefore, the night time 55dB contour, have been identified as being likely to experience a significant adverse effect from Proposed Scheme noise alone. This is in line with the daytime threshold in

[90] National Planning Practice Guidance – Noise. Available online at: http://planningguidance.planningportal.gov.uk.
[91] World Health Organization (2010), *Night time Noise Guidelines for Europe*.
[92] During the night (2300-0700) a significant effect is also identified where the Proposed Scheme results in a maximum sound level at the façade of a building at or above: 85dB L_{pAFmax} (where the number of train pass-bys exceeding this value is less than or equal to 20); or 80dB L_{pAFmax} (where the number of train pass-bys exceeding this value is greater than 20).
[93] Equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings.

the Noise Insulation Regulations and the Interim Target defined in the World Health Organization's Night Noise Guidelines.

13.5.13 The potential for significant noise effects on communities in areas between the 50dB and 65dB daytime sound contours, or 40dB and 55dB night time contours, would be dependent on the baseline in that area and the change in sound level brought about by the Proposed Scheme.

13.5.14 The criteria used for the working draft EIA Report to assess whether an effect is potentially significant include factors such as the number and magnitude of impacts in a community as well as the existing sound environment. The further significance criteria set out in the draft SMR would be taken into account in the formal EIA Report. These include the character of the existing sound environment, any unique features of the Proposed Scheme's sound or impacts, and the potential combined impacts of sound and vibration.

13.5.15 In the case of PRoW they are by their nature transitory routes, with users not staying in any one location for long periods. Train sound from the Proposed Scheme would be intermittent and its level would vary as the PRoW moves closer to and further from the Proposed Scheme. Noise effects would generally be reduced by the landscape earthworks envisaged to reduce visual impact of the Proposed Scheme and envisaged noise mitigation to protect other receptors. No significant noise effects have therefore been identified on PRoW within the Stone and Swynnerton area.

13.5.16 A number of potential minor ground-borne noise and vibration impacts have been forecast at a small number of properties very close to the route. Taking account of the number and minor magnitude of the impacts, and the experience of HS1, no significant effects have been identified. Further assessment would be undertaken for the formal EIA Report to confirm whether the impacts currently forecast are likely to occur. Vibration from the operation of the Proposed Scheme would present no risk of any building damage.

13.5.17 It is currently expected that there would be no potentially significant noise or vibration effects arising from changes to existing roads. This will be confirmed in the formal EIA Report.

Other mitigation measures

13.5.18 Further work is being undertaken to confirm the extent of the noise mitigation included within the Proposed Scheme, which will be confirmed within the formal EIA Report.

Summary of likely residual significant effects

13.5.19 The envisaged mitigation, including landscape earthworks and noise barriers described in this chapter, and presented in Map Series SV-01 in the Volume 2, CA3 Map Book, substantially reduces the potential airborne sound impacts and noise effects that would otherwise arise from the Proposed Scheme. This initial assessment does not identify any potential significant adverse airborne noise effects due to increased noise levels at communities in the Stone and Swynnerton area.

13.5.20 The initial assessment indicates that, on a precautionary basis, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise

Insulation Regulations, the night time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the WHO (1999) Guidelines for Community Noise, at individual residential properties closest to the Proposed Scheme in the vicinity of Walton and Swynnerton. These properties are identified on Map Series SV-01 (Volume 2, CA3 Map Book).

13.5.21 Further assessment work is being undertaken to confirm operational sound and vibration significant effects, especially those at non-residential receptors and quiet areas (as necessary, on a receptor-by-receptor basis). This will be reported in the formal EIA Report, which will present baseline levels, forecasts for the Proposed Scheme and the change in sound levels brought about by the Proposed Scheme both as impact plans and tables. There would be no risk of any building damage due to vibration from the operation of the Proposed Scheme.

13.5.22 Map Series SV-01 (Volume 2, CA3 Map Book) shows the draft non-residential locations to be considered in the sound, noise and vibration assessment as part of the formal EIA Report. This will be developed further incorporating consultation feedback and ongoing stakeholder engagement.

14 Traffic and transport

14.1 Introduction

14.1.1 This section describes the likely impacts on all forms of transport and the consequential effects on transport users arising from the construction and operation of the Proposed Scheme through the Stone and Swynnerton area.

14.1.2 The main issues associated with traffic and transport are expected to be increased traffic as a result of the construction of the Proposed Scheme, road diversions and realignments, temporary and permanent road closures, and temporary alternative routes and permanent realignments of PRoW.

14.1.3 Engagement with SCC and Highways England has been undertaken. An important focus of this engagement has been to obtain relevant baseline information. Engagement with these and other relevant stakeholders will continue as part of the development of the Proposed Scheme.

14.1.4 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 and the draft SMR.

14.2.2 The study area for traffic and transport includes all roads affected by the Proposed Scheme including: the M6 between junctions 14 and 15; the A34 Stafford Road/The Fillybrooks; the A51 Stone Road between Meaford and Stableford; the A519 Newcastle Road between Eccleshall and Hanchurch; the B5026 Eccleshall Road through Stone; and local roads serving the settlements of Swynnerton, Whitgreave, Yarnfield, and Stableford.

14.2.3 The effects on traffic and transport are assessed qualitatively, based on proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.4 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal EIA report.

14.3 Environmental baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys and liaison with SCC and Highways England (including provision of information on public transport, PRoW and accident data) and desktop analysis.

14.3.2 Traffic surveys of roads crossing the route or potentially affected by the Proposed Scheme were undertaken in November 2015 and February and March 2016, comprising automatic traffic counts, junction turning counts and queue surveys. This data has been supplemented by existing traffic data from other sources where available, including from SCC and Highways England. Assessment of the data indicates that the peak hours in the area are 08:00-09:00 and 17:00-18:00. Additional traffic surveys were undertaken in June and July 2016 and further data collection is

planned for September 2016. The outcomes of these surveys will be included in the formal EIA Report.

14.3.3 PRoW surveys were undertaken in May, June and July 2016 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included all PRoW and roads that would cross the route of the Proposed Scheme and any additional PRoW and roads that it is expected would be affected by the Proposed Scheme. The majority of the surveys were undertaken during the weekend when usage is expected to be highest, but some were undertaken on a weekday where routes may be influenced by commuting or other localised uses.

14.3.4 The Proposed Scheme would intersect 10 PRoW although others in the area could also be affected. The Proposed Scheme would also cross seven roads and roadside footways including: the B5026 Eccleshall Road, Yarnfield Lane, the A51 Stone Road, Stab Lane, the A519 Newcastle Road, Dog Lane and Bent Lane.

14.3.5 There are two strategic roads that pass through the area, the M6 and the A500 Queensway. The M6 traverses the centre of the area along a north-to-south alignment and connects Stoke-on-Trent and Newcastle-under-Lyme with Stafford in this locality. The Proposed Scheme would intersect the M6 to the west of Stone. Junction 15 of the M6 is located on the northern boundary of the area, where it forms a junction with the A500 Queensway. The A500 Queensway provides a connection between the M6 and Stoke-on-Trent.

14.3.6 There are four primary 'A' roads that pass through the area: the A51 Stone Road, which connects Stone to Stableford via Swynnerton; the A34 Stafford Road/The Fillybrooks, which passes through the area along a north to south alignment, connecting Trentham in the north to Aston-by-Stone in the south; the A519 Newcastle Road, which connects Eccleshall with Newcastle-under-Lyme; and the A5182 Trentham Road, which connects the A519 Newcastle Road with the A53 Whitmore Road in the adjoining Whitmore Heath to Madeley (CA4) area to the west. The strategic and primary road network, particularly around Stone, Stoke-on-Trent and Newcastle-under-Lyme can get busy at peak times and delays can be experienced.

14.3.7 The main local roads that would be affected by the Proposed Scheme are: the B5026 Eccleshall Road, which runs in a broadly east to west alignment through the area and connects the settlements of Eccleshall, Norton Bridge and Walton to Stone in the east; and Yarnfield Lane, which also runs in a broadly east to west alignment through the area and connects Yarnfield to the A34 Stafford Road/The Fillybrooks and Stone in the east. The local road network generally operates well although some localised delays can be experienced, particularly at peak times.

14.3.8 Relevant accident data for the road network subject to assessment has been obtained from SCC. Data for the latest three-year period (2012 to 2015) has been assessed and any identified clusters have been examined. One accident cluster was identified within the Stone and Swynnerton area, located at the A500/A519 Newcastle Road junction (14 accidents over the last three years). In terms of severity, all of these accidents were reported as slight and none involved pedestrians or cyclists.

14.3.9 There are five bus corridors that would cross the route of the Proposed Scheme in this area, these are the A51 Stone Road corridor via Stone and Sandon, the A34 Stafford Road/The Fillybrooks corridor via Walton and Stone, the A519 Newcastle Road

corridor via Eccleshall and Swynnerton, the B5026 Eccleshall Road corridor and the Yarnfield Lane/Swynnerton Road corridor.

14.3.10 The A51 Stone Road corridor is served by one bus service, which provides connections to Longton, Stone, Weston, Salt and Stafford. The A34 Stafford Road/The Fillybrooks corridor is served by five bus services and provides connections to Walton, Stone, Newcastle-under-Lyme, Tittensor, Longton and Fulford. The A519 Newcastle Road corridor is served by five bus services, which provide connections to Stafford, Newport, Eccleshall and Walton. The B5026 Eccleshall Road corridor is served by four bus services, which provide connections to Stafford, Fulford, Stone, Norton Bridge and Seighford. The Yarnfield Lane/Swynnerton Road corridor is served by four bus services, which provide connections to Stone, Newport, Eccleshall, Trentham Lakes and Stoke-on-Trent.

14.3.11 The Proposed Scheme would cross the Norton Bridge to Stone Railway to the east of the M6 between B5026 Eccleshall Road and Yarnfield Lane.

14.3.12 There are pedestrian footways in the built up areas of Stone, Walton, Yarnfield and Swynnerton. In the Stone and Walton area, the Trent and Mersey canal towpath, which links with Barlaston to the north and Stafford to the south-west, provides an off-road cycle route. There are advisory cycle routes passing through Swynnerton, including Stab Lane and Cotes Lane.

14.3.13 There is one navigable waterway situated in the area, the Trent and Mersey Canal. There is also a canal boat marina located at Aston-by-Stone, known as Aston Marina, which has capacity for 200 narrow boats.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce effects on transport users:

- creation of a haul route adjacent to the route of the Proposed Scheme;
- construction materials and equipment would be transported along the haul route where reasonably practicable to reduce HGV movements on the public highway;
- the use of a railhead to transport materials to seek to reduce HGV movements;
- new highways to be constructed and operational prior to the permanent closure of any existing highways, where reasonably practicable;
- the majority of roads crossing the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversions of traffic onto alternative routes;
- restricting road closures to overnights and weekends where reasonably practicable;
- HGV routeing, as far as reasonably practicable, along the strategic and/or primary road network;

- temporary alternative routes for PRoW during construction;
- provision of worker accommodation for workers not normally based locally to reduce daily travel; and
- provision of on-site welfare facilities to reduce daily travel by site workers.

14.4.2 The draft CoCP includes measures that seek to reduce the impacts and effects of deliveries of construction materials and equipment, including where appropriate reducing construction HGV trips during peak background traffic periods. The draft CoCP includes HGV management and control measures.

14.4.3 Where reasonably practicable, the number of private car trips to and from the site (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans to be produced along with a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.4 The measures in the draft CoCP include clear controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, generic and site-specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.5 Specific measures would include:

- core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays. Site staff and workers would, therefore, generally arrive before the morning peak hour and depart after the evening peak hour; and
- excavated material reused where reasonably practicable along the route of the Proposed Scheme.

14.4.6 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced as far as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with possessions that are required and planned by Network Rail for the general maintenance of the railway;
- planning of the required construction works so that they can be undertaken in short overnight stages, so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce as far as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

14.4.7 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from construction of the Proposed Scheme.

14.4.8 The temporary traffic and transport impacts within this area would include:

- construction vehicle movements to and from the various worksites;
- road closures and associated diversions; and
- alternative routes for PRoW.

14.4.9 The construction assessment has also considered any impacts in this area that arise from construction of the Proposed Scheme in the adjoining areas.

14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.11 There are 10 construction compounds including two main compounds and eight satellite compounds. The A519 Newcastle Road main compound would also manage works in the adjoining Whitmore Heath to Madeley area (CA4). The Stone railhead main compound would manage rail systems works in all community areas across the Proposed Scheme. The railhead main compound could also support a worker accommodation site for up to 240 workers.

14.4.12 Details of proposed construction compounds are provided in Section 2.3.

14.4.13 It is expected that the M6, A34 Stafford Road/The Fillybrooks, A51 Stone Road and the A519 Newcastle Road would provide the primary access routes for construction vehicles. HGVs would access compounds via the B5026 Eccleshall Road, Yarnfield Lane, Tittensor Road and Bent Lane. Where reasonably practicable, HGVs would use the haul road alongside the proposed route to reduce the impact on the local road network.

14.4.14 Construction of the Proposed Scheme is expected to result in increases in traffic flows on parts of the following roads as a result of construction traffic, temporary closures and diversions or realignments:

- M6;
- A51 Stone Road;
- A34 Stafford Road/The Fillybrooks;
- A519 Newcastle Road;
- B5026 Eccleshall Road;
- Yarnfield Lane;
- Meece Road;
- Tittensor Road; and
- Bent Lane.

14.4.15 The expected increases in traffic have the potential to result in increased congestion and delays and, on some roads, increased traffic severance for non-motorised users. The assessment of these will be reported in the formal EIA Report.

14.4.16 The construction of the Proposed Scheme would be likely to require temporary traffic management measures in the vicinity of the works. Any lane restrictions would be scheduled to reduce as far as reasonably practicable the impacts on traffic in the peak periods, with advance notice provided to travellers.

14.4.17 The construction and operation of the railhead may require the temporary closure of Yarnfield Lane for a period of up to three years. If required, the closure of Yarnfield Lane is likely to increase traffic flows and delays on alternative routes including B5026 Eccleshall Road and Meece Road. The closure is also likely to result in an impact on non-motorised users of Yarnfield Lane. Yarnfield Lane would be reinstated on a new alignment once the railhead is removed.

14.4.18 The Proposed Scheme would require the permanent stopping-up of a short section of Swynnerton Bridleway 54. The direct impacts of this PRoW being permanently stopped up is reported under operational impacts.

14.4.19 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme (see Maps Series CT-05 in Volume 2, CA3 Map Book). The following PRoW would be temporarily diverted or realigned:

- Stone Rural Footpath 28;
- Stone Rural Bridleway 0.1135;
- Stone Rural Footpath 32;
- Stone Rural Footpath 33;
- Swynnerton Footpath 27;
- Swynnerton Footpath 17;
- Swynnerton Footpath 52;
- Swynnerton Footpath 15; and
- Swynnerton Footpath 10.

14.4.20 Non-motorised users would also be re-routed around construction compounds. The changes to PRoW are likely to result in some increases in travel distances with the potential for adverse significant effects. These will be reported in the formal EIA Report.

Other mitigation measures

14.4.21 The implementation of the draft CoCP in combination with the construction workforce travel plan would, to some degree, mitigate the transport-related effects during construction of the Proposed Scheme. In order to provide a robust assessment, the reduction in effects arising from the travel plan measures have not been included in the assessment, which means that any adverse effects may be over-stated.

14.4.22 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered as necessary based on the outcomes of the assessment. These will be reported in the formal EIA Report.

Summary of likely residual significant effects

14.4.23 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 Stone Road, A34 Stafford Road/The Fillybrooks, A519 Newcastle Road, B5026 Eccleshall Road, Yarnfield Lane, Meece Road, Tittensor Road and Bent Lane. 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. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes. These will be reported in the formal EIA Report.

14.4.24 Up to ten PRoW would be affected and users would be temporarily diverted at different times during the construction period. This could result in significant adverse effects on users. These will be reported in the formal EIA Report.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- reinstatement of most roads on or close to their existing alignments; and
- replacement, diversion or realignment of PRoW.

Assessment of impacts and effects

14.5.2 The following section describes the impacts on traffic and transport and the consequential effects resulting from the operational phase of the Proposed Scheme.

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations and currently no depots proposed within the Stone and Swynnerton area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore related to permanent diversion, realignment and stopping up of roads and the diversion and realignment of PRoW.

14.5.5 The M6 would be locally widened in order to place a supporting pillar for the M6 Meaford viaduct in the central reserve. The widening of the central reserve would require the main carriageway to be realigned. However, this is not expected to result in any permanent significant effects.

14.5.6 It is proposed to permanently realign or divert B5026 Eccleshall Road, Tittensor Road, Stab Lane, the A51 Stone Road, A519 Newcastle Road, Common Lane (North), Dog Lane, Bent Lane (North) and Bent Lane (South). Bottom Lane may be tied in with the A51 Stone Road diversion. Yarnfield Lane would be reinstated on a new alignment once the railhead is removed. These realignments and diversions are not expected to substantially change journey times or result in any significant effects.

14.5.7 A short section of Swynnerton Bridleway 54 would be permanently stopped up. This is required due to the A51 Stone Road realignment and to ensure that Swynnerton Bridleway 54 ties into the A51 Stone Road realignment. There will be no impact of the stopping up on non-motorised users' journey times.

14.5.8 The following PRoW would be either permanently realigned or diverted:

- Stone Rural Footpath 28 would be locally realigned over the Stone Rural Footpath 28 overbridge as it crosses the route of the Proposed Scheme;
- Stone Rural Bridleway 0.1135 would be locally realigned over the Stone Rural Bridleway 0.1135 accommodation overbridge as it crosses the route of the Proposed Scheme;
- Stone Rural Footpath 32 would be locally realigned over the Stone Rural Footpath 32 accommodation overbridge as it crosses the route of the Proposed Scheme;
- Stone Rural Footpath 33 would be diverted and follow the realigned Yarnfield Lane as it crosses the route of the Proposed Scheme via the realigned Yarnfield Lane underbridge before rejoining its existing alignment via the Stone Rural Footpath 33 extension;
- Swynnerton Footpath 27 would be locally realigned over the Swynnerton Footpath 27 accommodation overbridge as it crosses the route of the Proposed Scheme;
- Swynnerton Footpath 17 would be diverted to the Swynnerton Footpath 27 accommodation overbridge as it crosses the route of the Proposed Scheme before rejoining Swynnerton Byway Open to All Traffic (BOAT) 34;
- Swynnerton Footpath 52 would be diverted over the Swynnerton Footpath 52 accommodation overbridge as it crosses the route of the Proposed Scheme;
- Swynnerton Footpath 15 would be diverted to the Swynnerton Footpath 52 accommodation underbridge as it crosses the route of the Proposed Scheme before rejoining its existing alignment; and
- Swynnerton Footpath 10 would be diverted to the Swynnerton Footpath 10 underbridge, which is located in the adjoining Whitmore Heath to Madeley area as it crosses the route of the Proposed Scheme before rejoining its existing alignment.

14.5.9 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in a significant effect. These will be reported in the formal EIA Report. For Swynnerton Footpath 15, users would have an increase in travel distance of over 500m.

Other mitigation measures

14.5.10 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered as necessary based on the outcomes of the assessment. These will be reported in the formal EIA Report.

Summary of likely residual significant effects

14.5.11 The Proposed Scheme would require a number of highways to be permanently realigned or diverted, although this is not expected to change journey times substantially.

14.5.12 Nine PRoW would be permanently realigned or diverted. There could be an increase of over 500m in distance for some users on one of these routes. Any significant effects will be reported in the formal EIA Report.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Stone and Swynnerton area. The likely impacts and significant effects of the Proposed Scheme's construction and operation on surface and groundwater bodies and their associated water resources are assessed. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also considered.

15.1.2 Engagement has been undertaken with the Environment Agency; SCC (who are the Lead Local Flood Authority (LLFA)); the Canal & River Trust; and the local water and sewerage undertaker, Severn Trent Water Limited. The purpose of this engagement has been to obtain relevant baseline information and discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features and the construction and operation features of the Proposed Scheme can be found in the Volume 2, CA3 Map Book.

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in the draft SMR and Volume 1 of this working draft EIA Report.

15.2.2 Unless indicated otherwise, the spatial scope of the assessment is based upon the identification of surface water and groundwater features in the Stone and Swynnerton area that are within 1km of the centre line of the proposed route. This is the definition of the study area.

15.2.3 The assessment of surface water focuses on the River Trent and its tributaries, Meece Brook and Filly Brook.

15.2.4 The groundwater assessment focuses on the Sherwood Sandstone Group, a Principal aquifer which outcrops over the northern part of the study area, and the Mercia Mudstone Group, a Secondary B aquifer which outcrops over the southern part of the study area. The Butterton-Swynnerton Dykes, a Secondary A aquifer in the central part of the study area is also included within the assessment, as is any groundwater associated with superficial deposits.

15.2.5 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 8, Ecology and biodiversity.

15.2.6 The assessment is primarily based on desk study information due to land access limitations. However, surveys of accessible water features within the study area are currently in progress. Hydraulic modelling of rivers and watercourses is also currently being undertaken. The assessment may be updated in the formal EIA to reflect the findings of these surveys and modelling studies.

15.3 Environmental baseline

15.3.1 The Proposed Scheme would be constructed in sections of cutting or embankment, interspersed with short sections that are at ground level. The only exception to this is where the Proposed Scheme would cross Filly Brook and the M6, where the route of the Proposed Scheme would be constructed on viaducts. The Stone and Swynnerton area does not include any tunnelled sections. The proposed Stone railhead and associated compound would extend over Filly Brook and its floodplain during the construction period.

Water resources and WFD baseline

15.3.2 All water bodies in the Stone and Swynnerton area fall within the Staffordshire Trent Valley Catchment of the Humber River Basin District (RBD).

15.3.3 The River Basin Management Plan (RBMP)[94] identifies the chemical[95] and ecological[96] condition of surface water bodies, and the quantitative[97] and chemical[98] status of groundwater bodies within this RBD.

15.3.4 The statutory objective of the RBMP is to prevent deterioration of all water bodies at good or high status and to prevent water bodies at less than good status from deteriorating further. Pending the results of detailed site surveys, all surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value, sensitive to any impacts that could affect any one of the individual elements that are used to define their WFD status in the long term.

15.3.5 An indication of the water body crossing locations, current overall WFD status and future overall status objectives associated with the key surface water bodies within the Stone and Swynnerton area are summarised in Table 12.

Table 12: Key surface water bodies and their WFD status

Water body name identification number[99]	Crossing location description	Current WFD Status	WFD status objective
Trent from Tittensor to River Sow GB104028053272	Tributary watercourse crossings: - Pirehill culvert - Filly Brook viaduct	Bad	Poor by 2027

[94] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[95] The **chemical status** of surface waters reflects concentrations of priority and hazardous substances present.
[96] The **ecological status** of surface waters is determined based on the following elements:
Biological elements - communities of plants and animals (for example, fish and rooted plants), assessed in the ecology and biodiversity section;
Physio-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats.
[97] The **quantitative status** of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance.
[98] The **chemical status** of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present.
[99] The Environment Agency has attributed each surface water and groundwater body a unique water body identification number.

Water body name identification number[99]	Crossing location description	Current WFD Status	WFD status objective
Meece Brook from source to Chatcull GB104028053080	Tributary watercourse crossings: - M6 Meaford viaduct	Poor	Good by 2027

15.3.6 There are four licensed surface water abstractions located within 1km of the Proposed Scheme. Three are located at Hatton Manor, with one located at Stone Golf Club. No surface water discharge permits or private licensed water supplies from surface water sources have been identified within 1km of the Proposed Scheme.

15.3.7 Records of private unlicensed water abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. This data indicated that there are no private unlicensed surface water abstractions registered within the study area. It is however possible that unregistered supplies exist, which would also need to be protected.

15.3.8 The geology of the area is described in detail in Section 10, Land quality, and is summarised below.

15.3.9 The main bedrock geology consists of the Mercia Mudstone Group and Sherwood Sandstone Group. The Butterton-Swynnerton Dykes are also present in the central area, north of Swynnerton.

15.3.10 Head deposits that would be crossed by the route of the Proposed Scheme are classified as Secondary undifferentiated aquifers, which may supply baseflow or store and yield limited amounts of groundwater. Deposits of peat and till are classified as Unproductive in this area and therefore have low value in terms of water resources.

15.3.11 The Mercia Mudstone Group is classified as a Secondary B aquifer. This is predominantly impermeable with minor and localised permeable beds, such as skerries. Skerries can yield limited quantities of groundwater suitable for domestic or small-scale agricultural use.

15.3.12 The Sherwood Sandstone Group is classified as a Principal aquifer by the Environment Agency and is therefore a receptor of high value. The Butterton-Swynnerton Dykes are classified as a Secondary A aquifer.

15.3.13 Superficial deposits, where present, consist of alluvium, river terrace gravels and glacio-fluvial sheet deposits, all classified as Secondary A aquifers which may be capable of supporting water supplies at a local rather than strategic scale and may form an important source of baseflow to rivers.

15.3.14 There are two designated WFD groundwater bodies in the area. An indication of the groundwater body locations, current overall WFD status and future overall status objectives associated with the designated groundwater bodies within the Stone and Swynnerton area are summarised in Table 13 below.

Table 13: Groundwater bodies and their WFD status

Water body name and identification number	Location	Current WFD status	WFD status objective
Staffordshire Trent Valley - PT Sandstone Staffordshire GB40401G300500	The northern half of the study area.	Poor	Good by 2027
Staffordshire Trent Valley - Mercia Mudstone West GB40402G300400	The southern half of the study area.	Good	Good

15.3.15 There are three licensed groundwater abstractions located within 1km of the Proposed Scheme. One is a private water supply and two are for public water supply, the latter being protected by a SPZ. A separate SPZ, associated with Whitmore public water supply, extends into the Stone and Swynnerton area and could therefore potentially also be affected by the Proposed Scheme in this area.

15.3.16 The information on private unlicensed water abstractions obtained from the local authorities indicates that there are six unlicensed groundwater abstractions located within the study area. It is however possible that unregistered supplies exist, which would also need to be protected. The local authority data provided only indicates the location of the taps from which the supply is drawn. Due to the absence of nearby surface watercourses, the water from these taps is assumed to be groundwater from the Mercia Mudstone Group.

15.3.17 There are 28 features within the study area, identified from Ordnance Survey maps that have potential to be springs, all of which are likely to contribute flows to surface water bodies. In the absence of site surveys, all of these features will be assumed to comprise springs, which are high-value receptors. There are no designated groundwater-dependent terrestrial ecosystems (GWDTEs) within 1km of the study area.

Flood risk and land drainage baseline

15.3.18 The Environment Agency's Flood Maps are the principal dataset that has been used to define the baseline for river, surface water and infrastructure failure flood risks. River and surface water flood risk zones are shown on WR-01 Map Series in the Volume 2, CA3 Map Book.

15.3.19 The LLFA for the Stone and Swynnerton area is SCC. The following reports were used to help determine the baseline flood risk within the Stone and Swynnerton area:

- Staffordshire Preliminary Flood Risk Assessment (PFRA) (2011)[100];
  - whilst significant areas of flood risk are identified in the county, none of these are within the Stone and Swynnerton area;

[100] Staffordshire Preliminary Flood Risk Assessment (PFRA) (2011) Staffordshire County Council

- South Staffordshire, Cannock Chase, Lichfield and Stafford Strategic Flood Risk Assessment (SFRA) (2014)[101];
  - the principal sources of flood risk are from rivers and surface water. There are areas of floodplain (flood zones 2 and 3) in two locations within the Stone and Swynnerton area. The first is located to the east of Stone, where the route of the Proposed Scheme crosses Filly Brook, and the second is located to the west of the route of the Proposed Scheme at Hatton Farm, at the Swynnerton Footpath 52 realignment;
- Shropshire and Staffordshire Local Flood Risk Management Strategy (2015)[102]; and
  - this report identifies the key communities in urban and rural locations at risk of flooding from surface water and smaller watercourses within Staffordshire. None of these locations are located within the Stone and Swynnerton area.

15.3.20 Existing topography, soils and land drainage systems within the area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which are important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The draft CoCP[103] includes a range of mitigation measures that are suitable to reduce impacts to as low a level as is reasonably practicable. The measures that are of particular relevance to water resources and flood risk during construction are described below.

Water resources and WFD

15.4.2 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme on water bodies and their associated water resources is to avoid sensitive receptors where this is reasonably practicable, recognising the wider constraints on route selection. This strategy has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this avoidance strategy include:

- avoidance of floodplain areas: the route of the Proposed Scheme would avoid passing along river or stream valleys, such as that of the River Trent, and their associated floodplains. Instead it would pass over tributary watercourses, spanning floodplain areas on viaduct. The only permanent structures within

[101] South Staffordshire, Cannock Chase, Lichfield and Stafford Strategic Flood Risk Assessment (SFRA) (2014) Capita.
[102] Shropshire and Staffordshire Local Flood Risk Management Strategy (LFRMS) (2015) Staffordshire County Council.
[103] Volume 1, Appendix CT2a-002-000.

river floodplain areas would be where the viaducts require intermediate piers, and these would be placed so as to avoid the river channel;

- avoidance, where reasonably practicable, of GWDTEs, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 Where permanent watercourse diversions and / or realignments are proposed, the aim would be to design these with equivalent hydraulic capacity to the existing channels. The design of the Proposed Scheme would also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channel. Where such watercourses are natural channels, the design will aim, where reasonably practicable, to incorporate appropriate features to retain, and ideally enhance, their hydromorphological status. For watercourses that are not in their natural condition, the design would aim, where reasonably practicable, to incorporate measures to improve their hydromorphological status, provided this is compatible with the watercourse's flood risk and land drainage functions.

15.4.4 To protect water bodies and their associated water resources from the potential impacts of polluting materials within construction site runoff, the practices detailed in the relevant pollution prevention guidelines and Construction Industry Research and Information Association (CIRIA) publications will be adhered to as far as reasonably practicable. The draft CoCP also requires contractors to comply, as far as is reasonably practicable, with BS 6031 code of practice for earthworks regarding the general control of site drainage including, for example, all washings, dewatering, abstractions and surface water runoff, unless otherwise agreed with the Environment Agency. Specific measures referred to in the draft CoCP to protect the water environment include:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used;
- preparation of method statements for: silt management, site drainage at compounds and satellite compounds, the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, LLFA and other relevant regulators as part of the approvals process. These method statements would cover, where applicable;
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior agreement of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.5 Where watercourses would be permanently culverted under the route or beneath proposed highway realignments, or to allow maintenance access to features such as balancing ponds, temporary channel realignments may be required to allow new culverts to be constructed in dry conditions. Where such realignments are required, these would be established in advance of stopping up the existing channel. The relevant watercourses crossings include:

- Pirehill culvert;
- Filly Brook viaduct; and
- M6 Meaford viaduct.

15.4.6 Existing groundwater abstraction boreholes or monitoring points would be protected from physical damage, as far as reasonably practicable. If boreholes are to be decommissioned and replaced with alternatives, the contractors would follow the latest good practice, as far as reasonably practicable. This would also be applicable to springs potentially affected by construction works, although additional measures may be required to mitigate temporary construction impacts on springs that are to be relocated.

15.4.7 Measures would be introduced to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying stratum or zone of lower permeability;
- promoting groundwater recharge, such as discharging abstracted water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.8 In accordance with the draft CoCP, monitoring would be undertaken in consultation with the Environment Agency prior to, during and post construction, if required, to establish baseline conditions for surface water and groundwater and to confirm the effectiveness of agreed construction impact mitigation measures.

Flood risk and land drainage

15.4.9 The contractors would, as far as reasonably practicable, ensure that flood risk is managed throughout the construction period and would consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to manage impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP include:

- preparation of flood risk assessments and method statements for temporary works, including main compound and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any significant increases in flood risk.

15.4.10 In accordance with the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental permits and that impacts on existing land drainage systems are limited as far as is reasonably practicable.

15.4.11 The design of the Proposed Scheme will aim to mitigate impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy outlined above would aim to ensure that impacts on flood flows within rivers and streams, and their floodplains, would be limited to those associated with the intermediate pier structures;
- the design has made precautionary allowances for replacement floodplain storage areas to mitigate for the impact of intermediate piers situated in floodplain areas. This is in case detailed hydraulic modelling indicates that the effects of these losses of floodplain would be significant in terms of the magnitude of any increase in peak flow downstream or increase in water level upstream, and the sensitivity of receptors potentially affected;
- on watercourses, where new culverts are to be installed beneath the route of the Proposed Scheme, the culvert length would be reduced as far as is reasonably practicable, and would be designed with invert levels below the firm bed of the watercourse to mitigate impact on flows and sediment transfer. Culverts would be designed in general accordance with CIRIA and Environment Agency guidance, and in consultation with the Environment Agency. The mitigation specifically proposed for the ecology of the watercourses is considered in Section 8, Ecology and biodiversity;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that cross dry valleys. This would be achieved using interceptor drains and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;

- in locations where the route of the Proposed Scheme would cross watercourses, the design aim would be for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability storm with an allowance for climate change based on latest guidance issued by the Environment Agency[104];
- runoff from the footprint of new infrastructure may occur more rapidly post-construction due to steeper slope angles and the permeability of the newly created surfaces. The design of drainage systems would aim to ensure that there are no significant increases in downstream flood risk during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where reasonably practicable, drainage would be designed to encourage water to soak back into the ground - for example, where cuttings intercept groundwater flows;
- at cutting locations, drainage measures would be provided with the aim of preventing flow into the cutting, diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings would also be drained to the catchments to which this water would naturally drain, avoiding transfers of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could, for example, comprise a 'blanket' of permeable material such as gravel.

Assessment of impacts and effects

15.4.12 The majority of the potential temporary effects on the water environment during construction would be mitigated by the working methods outlined in the draft CoCP. Permanent effects would be mitigated by a range of measures incorporated into the design that have been informed by the environmental assessment process.

Water resources and WFD

15.4.13 Potential impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have potential to affect abstractions and the water environment more generally. However, the practices outlined in the

[104] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

draft CoCP are considered adequate to mitigate any associated effects on water quality, such that no significant effects are anticipated.

15.4.14 The proposed Stone railhead and associated compound would extend over an already culverted length of Filly Brook, to the east of the M6. The proposals have potential to reduce the scope for this watercourse to achieve its statutory objectives under WFD legislation by 2027. Pending additional investigation of the issues, this is considered a moderate adverse impact on a high value receptor. As such, this is a significant (moderate adverse) effect and further mitigation measures would need to be considered.

15.4.15 The proposed cuttings intersect the Sherwood Sandstone Group Principal aquifer, the Mercia Mudstone Group Secondary B aquifer, the Butterton-Swynnerton Dykes Secondary A aquifer and the head deposits Secondary undifferentiated aquifer. Whilst there may be minor localised impacts, the implementation of the measures defined in the draft CoCP would mean that any effects on the aquifers are unlikely to be significant. Where impacts of the cuttings on the aquifers could affect additional receptors which rely on the groundwater resource for example springs and abstractions, the impacts on these have also been assessed below.

15.4.16 Construction of cuttings, embankments, balancing ponds and road realignments in the northern section of the Stone and Swynnerton area could impact on SPZ 2 and SPZ 3 associated with a public water abstraction near Whitmore in the Whitmore Heath and Madeley area (CA4). Even with the measures defined in the draft CoCP taken into account the impact to this very high value receptor could be a significant (major adverse) effect.

15.4.17 The likely construction impacts of the Proposed Scheme on other public water abstractions are assessed as minor. However, due to the very high value of these receptors, these effects have been assessed as being of moderate adverse significance.

15.4.18 The licensed groundwater abstraction near Stone is adjacent to the Stone railhead connection to the existing Network Rail infrastructure. Details of the abstraction are not yet known, but due to the proximity of the abstraction it is possible that the quality of the abstracted groundwater may be impacted during construction. Further investigation will be undertaken and reported in the formal EIA Report. The effects on this abstraction are assessed as having potential to be of major adverse significance.

15.4.19 The construction of the Stone railhead and associated compound would result in the loss of a spring to the east of the service area close to the M6. The spring is currently assessed as a high value receptor, pending the results of a site survey and the assessment therefore identifies this as a significant (major adverse) effect.

15.4.20 The exact locations of groundwater abstractions supplying the six unlicensed private water supplies are not known. Due to the proximity of the taps to the Proposed Scheme, it has been assumed that the associated abstractions could be impacted. The assessment therefore identifies these as significant, major adverse effects.

15.4.21 Filly Brook viaduct and the viaduct crossing of the unnamed watercourse at the M6, Meaford would be designed to ensure that these structures do not prevent Filly Brook achieving good status, in line with the WFD objectives in the RBMP. No significant

effects are therefore anticipated related to the requirements of WFD legislation at these two sites.

15.4.22 Pirehill culvert is required to maintain the flow in the unnamed watercourses beneath the route of the Proposed Scheme at this location. This watercourse has been attributed a high value, pending the results of site survey, and, where a watercourse is to be culverted for more than a few metres, this is assessed as having a minor impact on its hydromorphological status. This effect is therefore assessed as being significant (moderate adverse) at this stage.

15.4.23 The culverts required at Peasley Bank, Lodge Covert underbridge, Swynnerton, Clifford's Wood underbridge, Plantation, Swynnerton Footpath 52 accommodation underbridge, Dog Lane drop inlet and Shelton would be required to maintain connectivity of existing overland flow routes. There are no existing channel features at these locations, so these structures would have no implications in terms for hydromorphology and would not result in significant effects.

Flood risk and land drainage

15.4.24 Construction of the viaduct over Filly Brook and its associated floodplain would require temporary working within a flood zone. Construction sequencing and temporary works design would need to be carefully considered and assessed in terms of impacts on flood risk. Measures defined in the draft CoCP would result in the flood risk effects of construction work being reduced as far as is reasonably practicable. These activities would be implemented in consultation with the Environment Agency. No significant effects associated with these temporary works are anticipated.

15.4.25 The construction of the culvert at Pirehill, and the channel diversions at Pirehill and Filly Brook tributary would all require temporary working within the channel. These would require careful consideration along with the implementation of the measures defined in the draft CoCP to reduce impacts on flood risk and land drainage systems as far as is reasonably practicable. No significant effects associated with these temporary works are anticipated.

15.4.26 The proposed Stone railhead and associated compound would be sited within the Filly Brook floodplain, to the east of the M6. Even though this is a temporary installation, the proposals would aim to be compatible with the Sequential Test and Exception Test, within the National Planning Policy Framework (NPPF). Given that there is a community in the western part of Stone downstream of the railhead and associated compound that is at potential risk of flooding from Filly Brook, it would be important that both of these tests be satisfied. Pending investigation of these issues, and provision of the necessary evidence and mitigation proposals, this is currently considered as having potential to result in a significant (major adverse) effect.

15.4.27 The permanent crossing of the Filly Brook and its floodplain is on viaduct. The design incorporates areas where provision can be made to compensate for the loss of floodplain storage areas associated with the footprint of any intermediate piers. The piers all avoid the channel and allow access for channel inspection and maintenance, where necessary. No significant effects associated with these permanent works are anticipated.

15.4.28 The design aim for the proposed culverts at Pirehill, Peasley Bank, Dog Lane, Clifford's Wood underbridge, Plantation, Swynnerton Footpath 52 accommodation underbridge and Shelton would be to accommodate the peak 1 in 100 (1%) annual probability flow with an explicit allowance for potential future increases caused by climate change. Provision has also been made to allow overland flows predicted in the Environment Agency's updated Flood Map for Surface Water to pass through the rail embankment. No significant effects associated with these permanent works are anticipated.

15.4.29 The five permanent realigned channels proposed reduce the number and hence the overall length of culverts and more complex cross drainage structures, would have equivalent capacity to the existing channels downstream and would aim be designed such that any existing field subsurface drainage systems can be connected-in. No significant effects associated with these permanent works are anticipated.

15.4.30 The design aim for the 10 balancing ponds would be to ensure that the quantity and peak rate of runoff from the railway is attenuated to present greenfield runoff rates, including an explicit allowance for the projected impacts of climate change on peak rainfall intensity. None of the potential effects associated with these features and their associated receptors have therefore been assessed as being significant.

Other mitigation measures

15.4.31 Additional mitigation measures may be required to further reduce the temporary and permanent impacts of construction stage activities. The precise form of these will be site specific and based on the outcome of site survey, hydraulic modelling work and ongoing consultation with the Environment Agency and LLFA.

15.4.32 These surveys will include inspection of the unnamed watercourse affected by Pirehill culvert crossing so that the relative value of this watercourse can be confirmed and an approach to mitigating the impacts of these culverts on the natural hydromorphology of these watercourses can be developed.

15.4.33 Investigations will be undertaken to assemble the evidence base required to undertake the Sequential Test and Exception Test issues in NPPF in relation to the Stone railhead and associated compound, which have potential implications for flood risk.

15.4.34 If the spring at the Stone railhead and associated compound is confirmed as being of high value during the site surveys, a mitigation strategy would need to be developed prior to construction commencing.

15.4.35 Mitigation options for the construction impacts on the public water supply abstraction borehole near Whitmore and its groundwater supply zone would be agreed with the Environment Agency, in consultation with the borehole operator.

15.4.36 Mitigation for potential impacts on the licensed groundwater abstraction near Stone and the six unlicensed abstractions will be developed, if required, following further investigation.

Summary of likely residual significant effects

15.4.37 Without the additional mitigation summarised above the potentially significant residual effects would be as follows:

- a moderate adverse significant effect on hydromorphology associated with the proposed culvert on the unnamed watercourse at Pirehill, which has potential implications for the Trent from Tittensor to River Sow water body, of which this watercourse is a tributary;
- a moderate adverse significant effect on hydromorphology associated with the proposed Stone railhead, subject to further study;
- a major adverse significant effect on flood risk associated with works within the floodplain at the Stone railhead;
- a major adverse significant effect on the private licensed groundwater abstraction near Stone during construction;
- a major adverse significant effects on the six private unlicensed groundwater abstractions throughout construction and permanently; a major adverse significant effect on the public water abstraction in the neighbouring Whitmore Heath and Madeley area during construction; and
- a major adverse significant effect to the spring on the footprint of the Stone railhead and associated compound both throughout construction and permanently.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 Generic examples of design measures that would reduce potentially significant adverse effects on the quality and flow characteristics of surface water and ground water bodies during operation and management of the Proposed Scheme are described in Volume 1. A draft operation and maintenance plan for water resources and flood risk will be prepared and included in the formal EIA Report.

Assessment of impacts and effects

15.5.2 The principal issue of concern during operation is the potential for accidental spillages to occur that result in the release of contaminants into the water environment. This issue will be reported on in the formal EIA on a route-wide basis. No adverse effects of significance related to water quality are anticipated from operation of the scheme at this stage of the assessment.

15.5.3 The design would take into account the policies in NPPF and would aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in NPPF will be provided in the formal EIA. No adverse effects of significance related to flood risk are anticipated from operation of the scheme at this stage of the assessment.

15.5.4 Sustainable drainage systems would be used where reasonably practicable. These would also help to remove any suspended material within runoff from the Proposed

Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed would ensure that the Proposed Scheme has no adverse effects of significance to the quantity and quality of water draining from the Proposed Scheme during its operational phase.

15.5.5 The operational impacts of the Proposed Scheme on surface water and groundwater bodies are unlikely to be significant, once the construction stage mitigation measures outlined above have been implemented. A route-wide WFD compliance assessment will be conducted and reported in the formal EIA Report.

Other mitigation measures

15.5.6 The route-wide assessments of accidental spillage risks, WFD compliance and alignment with the flood risk policies within NPPF will be reported in the formal EIA.

Summary of likely residual significant effects

15.5.7 It is currently not anticipated that there would be any significant residual effects on water resources and flood risk resulting from operation of the Proposed Scheme. However, until the route-wide assessments of accidental spillage risks, WFD compliance and alignment with the flood risk policies in NPPF have been completed the risk of the scheme resulting in significant effects cannot be discounted. The results of these assessments will be reported in the formal EIA.

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