LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 2 | Community Forum Area report

CFA18 | Stoneleigh, Kenilworth and Burton Green

November 2013

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ES 3.2.1.18

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Department for Transport

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

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Structure of the HS2 Phase One Environmental Statement

The Environmental Statement (ES) documentation comprises:

- **Non-technical summary (NTS)** – which provides a summary in non-technical language of the Proposed Scheme, the likely significant environmental effects of the Proposed Scheme, both beneficial and adverse, and the means to avoid or reduce the adverse effects;
- **Volume 1: Introduction to the ES and the Proposed Scheme** – This describes High Speed Two (HS2), and the environmental impact assessment process, the approach to consultation and engagement, details of the permanent features and generic construction techniques as well as a summary of main strategic and route-wide alternatives and local alternatives (prior to 2012) considered;
- **Volume 2: Community forum area reports and map books** – 26 reports and associated map books providing an assessment of local environmental effects in each area;
- **Volume 3: Route-wide effects** – provides an assessment of the effects of the Proposed Scheme where it is not practicable to describe them within the CFA descriptions in Volume 2;
- **Volume 4: Off-route effects** – provides an assessment of the off-route effects of the Proposed Scheme;
- **Volume 5: Appendices and map books** – contains supporting environmental information and associated map books; and
- **Glossary of terms and list of abbreviations** – contains terms and abbreviations, including units of measurement, used throughout the ES documentation.

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, South Yorkshire and the East Midlands will be served by high speed trains running at speeds of up to 360kph (225mph).

1.1.2 HS2 is proposed to be built in two phases. Phase One, the subject of this ES, will involve the construction of a new railway line of approximately 230km (143 miles) between London and Birmingham. Construction will begin in 2017 and the line will become operational by 2026; with a connection to the West Coast Main Line (WCML) near Lichfield and to the existing HS1 railway line in London.

1.1.3 During Phase One, beyond the dedicated high speed track, these high speed trains will connect with and run on the existing WCML to serve passengers beyond the HS2 network to destinations in the north. A connection to HS1 will also allow some services to access that high speed line through east London and Kent and connect with mainland Europe via the Channel Tunnel.

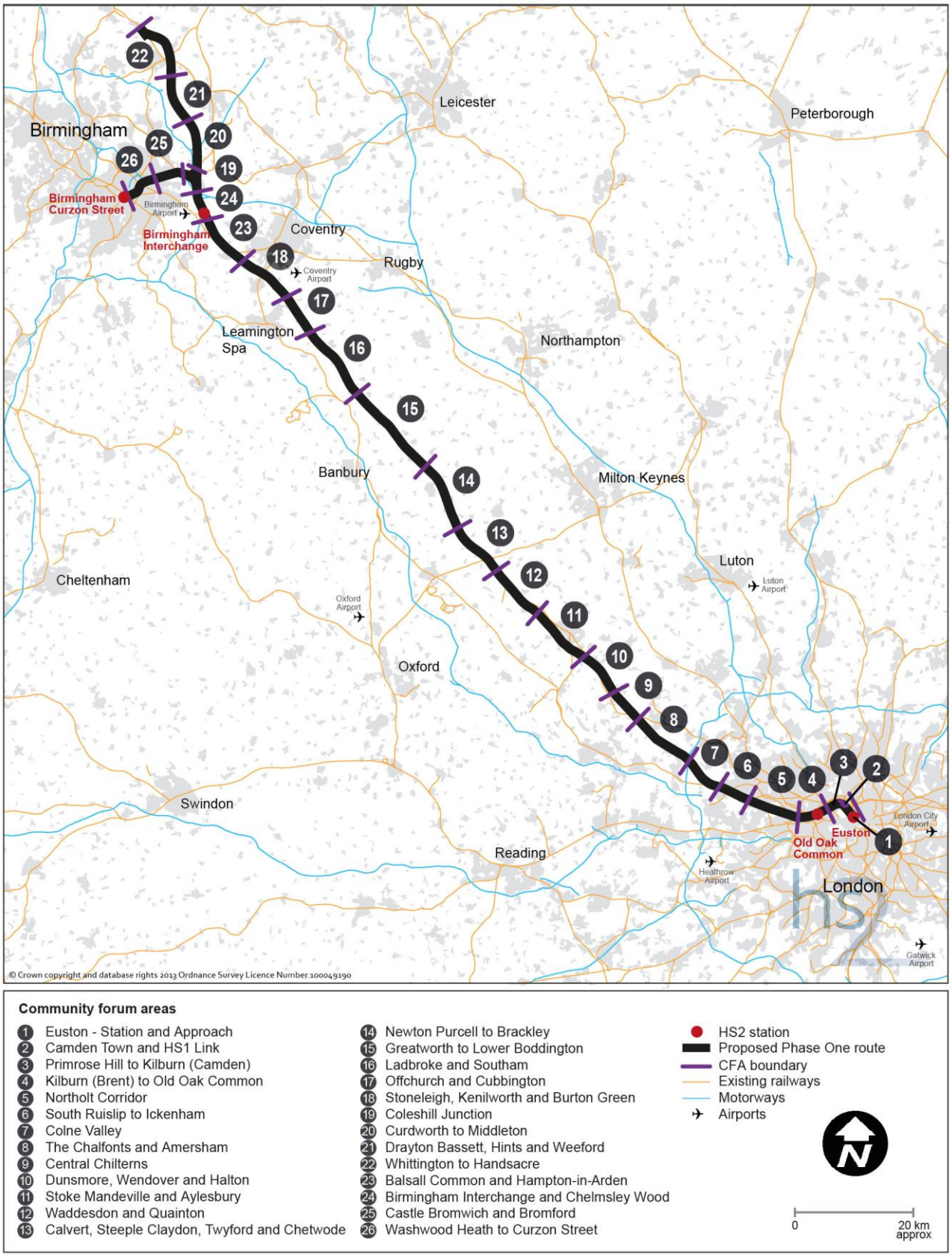
1.1.4 Phase Two will involve the construction of lines from Birmingham to Leeds and Manchester; with construction commencing approximately 2023, and planned to be operational by 2033.

1.1.5 Section 4 of Volume 1 describes the anticipated operational characteristics of HS2, including the anticipated frequency of train services. As Volume 1 shows, the frequency of trains is expected to increase over time and to increase further upon opening of Phase Two. In assessing the environmental effects of the Proposed Scheme the anticipated Phase 2 operational frequency has been used. For further details of the anticipated operation of the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area (CFA18), see Section 2.4.

1.1.6 The Government believes that the HS2 network should link to Heathrow and its preferred option is for this to be built as part of Phase Two. The Government has paused work on the Heathrow link until after 2015 when it expects the Airports Commission to publish its final report on recommended options for maintaining the country's status as an international aviation hub.

1.1.7 For consultation and environmental assessment purposes, the proposed Phase One route has been divided into 26 community forum areas (CFAs) as shown in Figure 1. This has enabled wider public engagement on the scheme design and on the likely adverse and beneficial effects.

Figure 1: HS2 Phase One route and community forum areas



1.2 Purpose of this report

1.2.1 This CFA report presents the likely significant effects of the construction and operation of the Proposed Scheme on the environment within the area of Stoneleigh, Kenilworth and Burton Green (CFA18). The report describes the mitigation measures that are proposed for the purpose of avoiding, reducing or managing the likely significant adverse effects of the Proposed Scheme on the environment within this area.

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 area, description of the Proposed Scheme within the area and its construction and operation, and a description of the main local alternatives;
- Sections 3-13 – an assessment for the following environmental topics:
  - agriculture, forestry and soils (Section 3);
  - air quality (Section 4);
  - community (Section 5);
  - cultural heritage (Section 6);
  - ecology (Section 7);
  - land quality (Section 8);
  - landscape and visual assessment (Section 9);
  - socio-economics (Section 10);
  - sound, noise and vibration (Section 11);
  - traffic and transport (Section 12); and
  - water resources and flood risk assessment (Section 13).

1.3.2 Each environmental topic section comprises: an introduction to the topic; a description of the environmental baseline within the area; the likely significant environmental effects arising during construction and operation of the Proposed Scheme; and any proposed mitigation measures for any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1, the Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2).

1.3.4 Where appropriate, potential climate change impacts and adaptation measures are discussed in the relevant environmental topic section. Volume 1 (Sections 7 and 9) and

the SMR Addendum in Volume 5 also include additional information about climate change adaptation and resilience.

1.3.5 The maps relevant to Stoneleigh, Kenilworth and Burton Green are provided in a separate corresponding document entitled Volume 2: CFA18 Map Book, which should be read in conjunction with this report.

1.3.6 The Proposed Scheme described in this report is that shown on the map series CT-05 (construction) (Volume 2, CFA18 Map Book) and CT-06 (operation) (Volume 2: CFA18 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament, and as set out within the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.4.

1.3.7 In addition to the environmental topics covered in Sections 3-13 of this report electromagnetic interference is addressed in Volume 1 and climate (greenhouse gas emissions and carbon) and waste and material resources are addressed in Volume 3. An assessment of potential environmental effects beyond the CFA has also been undertaken and this 'off-route' assessment is reported in Volume 4.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

2.1.1 The Stoneleigh, Kenilworth and Burton Green area (CFA18) covers approximately 11km of the Proposed Scheme, where it passes through the narrow gap of countryside between Kenilworth and Coventry. It extends from approximately 500m south-east of the A445 Leicester Lane to the B4101 Waste Lane at Beechwood in the north-west. The area includes land within the parishes of Stoneleigh, Kenilworth and Burton Green, Berkswell and Balsall. An overview of the area and key scheme features within it is provided in Figure 2.

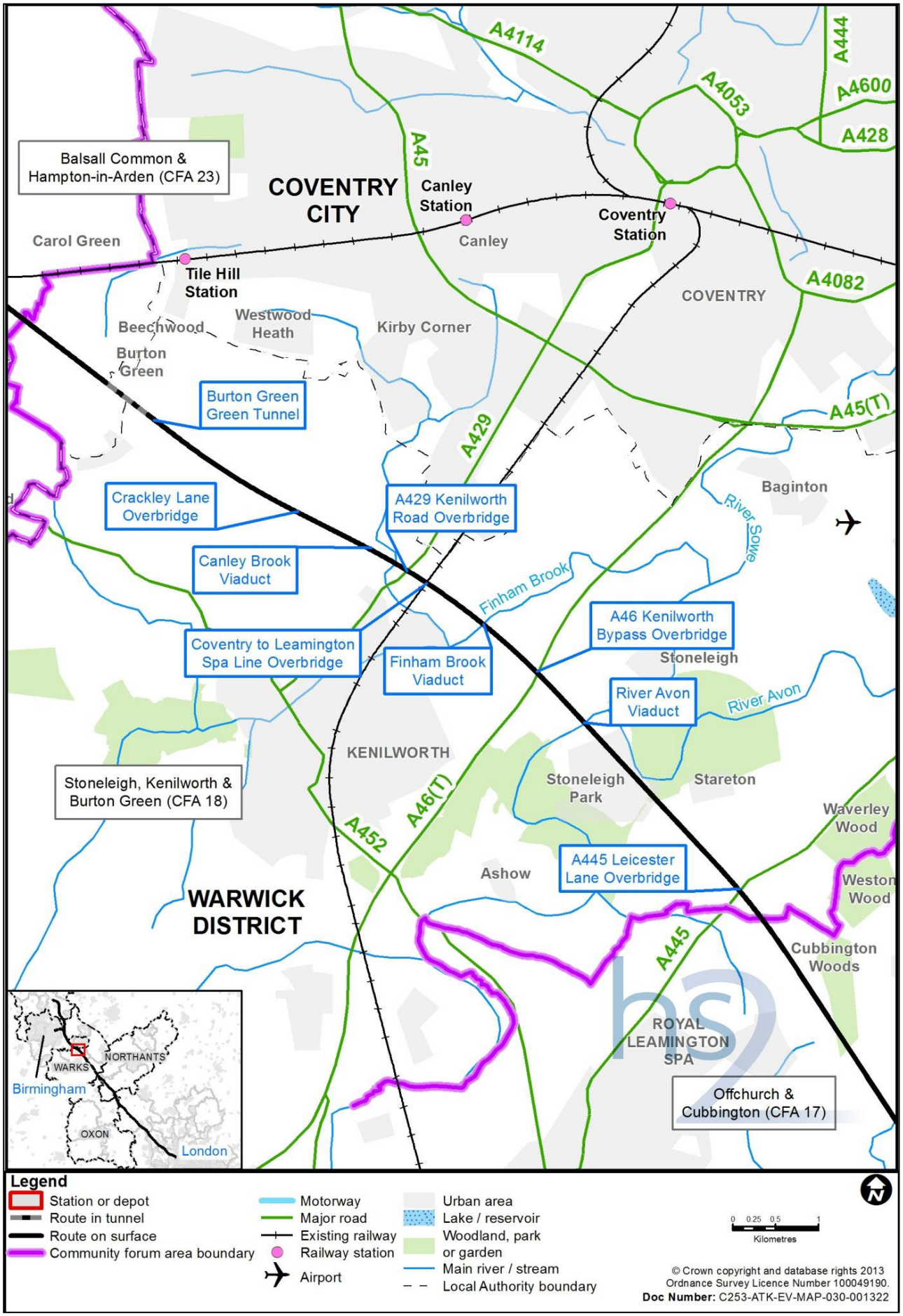
2.1.2 The Offchurch and Cubbington area (CFA17) lies to the south, and Balsall Common and Hampton-in-Arden area (CFA23) lies to the north-west. The city of Coventry lies to the north and the administrative boundary extends into the eastern side of the area around Gibbet Hill (Map CT-10-48, B2), the University of Warwick Campus, Westwood Heath and Tile Hill.

Settlement, land use and topography

2.1.3 Kenilworth is the main settlement in the centre of the area, whilst Coventry city centre lies about 6km to the north-east. The villages of Stoneleigh, Ashow and the small hamlet of Stareton are situated in the south-eastern part of the area. The village of Burton Green and the small hamlets of Beechwood and Catchems Corner are situated in the north-western part of the area.

2.1.4 Land uses within the area are varied. Agriculture is the main land use throughout the area for land outside the settlements, except for Stoneleigh Park in the south-east part of the area. This extensive registered historic parkland alongside the River Avon encompasses several elements. In the centre of the park on the site of the former National Agricultural Centre (Map CT-10-47, E2), is now a business centre which also hosts conferences and exhibitions. For the purposes of the assessment, this part of the Stoneleigh Park area s is referred to as Stoneleigh Business Park. To the south of this is Stoneleigh Abbey (Map CT-10-47, B9), an historic country house and visitor attraction with associated properties. Stoneleigh Park estate parkland around Stoneleigh is accessible to the public and is well used for informal recreation. Abbey Park (Map CT-10-47, E3), which is a modern business campus in a parkland setting, is located just to the east of Stareton and alongside the Stoneleigh Deer Park Golf Club (Map CT-10-47, C2), which occupies the eastern part of the park. North of the River Avon, the Kenilworth Golf Club (Map CT-10-48, F7) lies to the east of Kenilworth. There is a National Grid transformer compound just north of Burton Green. Warwick University campus lies on the south-west side of Coventry.

Figure 2: Area context map



2.1.5 Overall, the landform of the area is gently undulating and low lying. The rivers Avon and Sowe flow through the southern part of the area, with their confluence being about 500m south-west of the centre of Stoneleigh village. Finham Brook flows towards the Sowe through the area between Kenilworth and Stoneleigh, broadly following the line of Dalehouse Lane, just north of Kenilworth Golf Club (Map CT-10-48, E7). Canley Brook flows into Finham Brook, draining southwards from the University of Warwick campus area via Cryfield Grange (Map CT-10-49, H2 to J7).

2.1.6 There are pockets of woodland dispersed throughout the area, particularly between Kenilworth and Burton Green, with Crackley Wood (Map CT-10-49, G8, G9, H8 and H9), being the largest and adjacent to the recently planted Jubilee Wood.

Key transport infrastructure

2.1.7 The principal roads through the area are orientated in a south-west to north-east direction, reflecting the dominance of movement patterns between Kenilworth and Coventry. The A46 Kenilworth Bypass dual carriageway and the A429 Kenilworth Road are the main routes between Kenilworth and Coventry. The B4113 Stoneleigh Road and B4115 Ashow Road rural routes run parallel to and south of the A46 Kenilworth Bypass, connecting the villages of Ashow, Stareton and Stoneleigh.

2.1.8 The A452 Chester Road in the west of the study area is the main south-east to north-west route in the area, and connects Kenilworth to Leamington Spa in the south and Balsall Common in the north. A well used rural route on the east side of the area connects Stoneleigh with Burton Green, via Gibbet Hill and Westwood Heath. North of Kenilworth and in the gap of countryside separating the town from Coventry, there is a network of minor rural lanes, which provide connections to Burton Green and to Westwood Heath on the southern edge of Coventry.

2.1.9 The Coventry to Leamington Spa Line crosses through the area running south of and parallel to the A429 Kenilworth Road. Tile Hill in the north has a station on the Rugby to Birmingham Line, which passes to the north of the area.

2.1.10 There are relatively few PRoW in the southern part of the area, but a well-developed network in the northern part of the area. A former railway line between Kenilworth now forms the Kenilworth Greenway, which runs through Crackley Wood and Burton Green. The Coventry Way and Centenary Way long-distance routes wind their way through the area. The Coventry Way is a 64km circular route around the outskirts of the city, passing through Stareton, Stoneleigh and Kenilworth, and for part of its length following the Kenilworth Greenway north of Crackley. The Centenary is a 158km route that runs from Shipston-on-Stour in the south to Kingsbury in the north. It shares the same route as the Coventry Way through Stareton and Stoneleigh, but then diverges westwards towards Kenilworth.

Socio-economic profile

2.1.11 To provide a socio-economic context for the area, data is presented for the demographic character areas (DCA) of Stoneleigh, Kenilworth East, Warwick University and Tile Hill[1]. In total, the DCA population is 22,200 highlighting the low

[1] A DCA represents a community that, depending on the area, may consist of a local ward, neighbourhood or village(s).

population density and rural nature of the area. Unemployment ranges from 3.8% in the Kenilworth East DCA to 9.7% in the Warwick University DCA compared to the national level of 7.4%. The average economic activity rate in the four DCA is 58% which is lower than the national average of 69.9%[2].

Notable community facilities

2.1.12 In the south of the area, the villages of Ashow and Stoneleigh have a small number of community facilities. Stoneleigh has a church, village club, village hall and recreation ground, whilst Ashow has a church and village club. The hamlet of Stareton has no facilities. There is a day care nursery situated within the grounds of Stoneleigh Park (Map CT-10-47, B8).

2.1.13 Crackley is situated in the centre of the area on the northern edge of Kenilworth. It comprises a mixture of post-war housing, together with industrial estates at Princes Drive and Common Lane. Given the lack of facilities, Crackley residents are dependent upon Kenilworth for most of their day-to-day needs. There is an independent school, Crackley Hall School, located to the south of Crackley close to Kenilworth Common.

2.1.14 The University of Warwick is a major educational facility in the centre of the area. Cryfield Grange, just west of Gibbet Hill, is used as accommodation for visiting academics and researchers. There is a school for children with behavioural, social and emotional difficulties at Gibbet Hill.

2.1.15 Burton Green in the north of the area has a limited range of community facilities. Notable amongst these is a primary school on the south side of the village, two day care nurseries which are located on either side of the village, a community hall on the west side of the village and a public house to the north.

Recreation, leisure and open space

2.1.16 Kenilworth and Coventry provide the focus for recreational activities in the area. The Kenilworth Golf Club lies in the centre of the area along with the sports fields for the University of Warwick, which are situated on the southern edge of Coventry. Outside the main urban areas, there are several outdoor recreation facilities including the Stoneleigh Deer Park Golf Club (Map CT-10-47, C2), a fishing lake at Brook Farm which is about 2km to the east of Kenilworth and horse riding establishments to the north-west of Burton Green.

2.1.17 There are s number of open spaces that are publicly accessible within the area, notably the Stoneleigh Park Estate (Map CT-10-47) and Crackley Woods (Map CT-10-49, H9), which are located north of Kenilworth. A recreation ground at Stoneleigh and both Stoneleigh Meadows and Stoneleigh Orchard, which lie closer to the village itself, are publicly accessible.

2.1.18 Burton Green no longer has a recreation ground in use, but has a small play area to the south of the village at Red Lane. The Kenilworth Greenway, which runs along the route of the dismantled Kenilworth to Balsall line, is the main focus of outdoor recreation in the area. The route serves as a permissive bridleway and is managed by WCC as a linear country park. A new pedestrian and cycleway link from the University

[2] All data comes from the 2011 Population Census.

of Warwick to connect with the Kenilworth Greenway at Crackley, known as the 'Connect2Kenilworth' project was completed during 2012 and a greenway bridge over the A429 Kenilworth Road has also been built recently.

Policy and planning context

Planning framework

2.1.19 Given that HS2 is being developed on a national basis, to meet a national need it is not included or referred to in many local plans. Nevertheless, in seeking to consider the Proposed Scheme in the local context, relevant local plan documents and policies have been considered in relation to environmental topics.

2.1.20 Warwick District Council (WDC) is the local planning authority for the majority of the area with responsibility passing to Solihull Metropolitan Borough Council (SMBC) at the borough boundary, just north of Burton Green and broadly following the north and west side of Cromwell Lane and Hob Lane. The south-western fringes of Coventry, encompassing Gibbet Hill, Westwood Heath and Tile Hill are within Coventry City Council's (CCC) administrative area.

2.1.21 The following local policies have been considered and referred to where appropriate to the assessment. Where a policy document is not referred to within a particular technical section, it is due to the absence of policies of relevance to that topic:

- the saved policies of the Warwickshire Structure Plan[3];
- the saved policies of the Warwick District Local Plan (WDLP) 2007[4];
- the saved policies of the Solihull Unitary Development Plan (SUDP) 2006[5]; and
- the saved policies of the City of Coventry UDP 2001[6].

2.1.22 Key planning designations within the area (shown on the maps in Volume 2, CFA18 Map Book, Maps CT-10) include:

- several parcels of designated ancient woodland within the area, some of which are also designated as local nature reserves (LNRs). Several other open spaces within the urban areas, notably Kenilworth Common at Crackley, together with both Tocil Wood (Map CT-10-49, H1) and Park Wood (at Westwood Heath) in Coventry, are also designated as LNRs;
- Stoneleigh Abbey grounds and Stoneleigh Abbey Deer Park which are listed as Grade II in the English Heritage Register of Historic Parks and Gardens. There are also several hundred other listed buildings within the area and numerous scheduled monuments; and
- the settlements of Stoneleigh (Map CT-10-47, A2) and Ashow, as well as the historic core of Kenilworth and Gibbet Hill on the outskirts of Coventry, which are designated as conservation areas.

[3] Warwickshire County Council (2001), *Warwickshire Structure Plan 1996-2011.*
[4] Warwick District Council (2007), *Warwick District Local Plan 2007.*
[5] Solihull Metropolitan Borough Council (2006), *Solihull Unitary Development Plan 2006.*
[6] Coventry City Council (2001), *Coventry Unitary Development Plan 2001.*

Committed development

2.1.23 Developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme, are shown on Appendix 5: Map Series CT-13 and listed in Volume 5: Appendix CT-004-000. Except where noted otherwise in Appendix CT-004-000, it has been assumed that these developments will have been completed by 2017. These are termed 'committed developments' and are treated as potential receptors from the Proposed Scheme. Where developments have a particular relevance to an assessment topic, this is noted in the future baseline section for that topic. The following committed developments are relevant to several topic assessments in this area:

- ref: W/12/0766 – Redevelopment of Stoneleigh Business Park into a science, business innovation and technology park; and
- ref. W/13/0018 – Kingswood Farm, Dalehouse Lane, Kenilworth; change of use of land from agriculture to an extension to Kenilworth Golf Club.

2.1.24 In addition, the assessment has considered a minor development immediately adjacent to the Proposed Scheme, which involves the conversion of a redundant cart store at Little Beanit Farm, Waste Lane to two holiday let units (ref 2012/1400).

2.1.25 Where such development lies wholly or partly within the land required for the Proposed Scheme it is assumed that it will not be commenced or completed in its proposed form. In this area, the development at Stoneleigh Business Park (ref: W/12/0766) is subject to negotiations with HS2 Ltd to allow the development to proceed in an amended form.

2.1.26 No developments have been identified which are likely to have cumulative effects, when considered together with the Proposed Scheme.

2.1.27 Planning applications yet to be determined and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These are listed in Volume 5: Appendix CT-004-000. They are not included in the assessment. The progress of these proposals is being monitored by Hs2 Ltd and appropriate action will be taken if they are approved.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area, including the main environmental mitigation measures. 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 The Proposed Scheme will require some land on a permanent basis, key features of which are illustrated on maps series CT-06 (Volume 2, CFA18 Map Book). Land that will also be required, but only on a temporary basis for construction, is set out in Section 2.3.

2.2.3 In general, features are described from south to north along the route and east to west for features that cross HS2.

2.2.4 Since the draft ES was published the following changes have been introduced to permanent features of the Proposed Scheme:

- revisions to several road crossings (the B4113 Stoneleigh Road, the B4115 Ashow Road, Dalehouse Lane and the B4101 Waste Lane) and the Kenilworth Greenway diversion;
- the layout and form of the Burton Green feeder station;
- incorporation of the Stoneleigh Business Park access works;
- incorporation of replacement floodplain storage areas; and
- development of mitigation earthworks.

Overview

2.2.5 The Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area will be approximately 11km in length, extending from south-east of Stoneleigh Business Park to north-west of Burton Green.

2.2.6 Initially in cutting, the Proposed Scheme will pass underneath the A445 Leicester Lane before entering a partially retained cutting under the realigned B4113 Stoneleigh Road and continuing through the eastern part of Stoneleigh Business Park.

2.2.7 The route will exit the north-western boundary of Stoneleigh Business Park, crossing the River Avon on a viaduct before passing beneath the B4115 Ashow Road and the A46 Kenilworth Bypass and then into cutting past Kenilworth Golf Club.

2.2.8 After leaving the cutting the route will pass under the raised Dalehouse Lane, cross over Finham Brook on viaduct and then into cutting past Millburn Grange Farm and under the Coventry to Leamington Spa Line and the A429 Kenilworth Road, to the north-east of Kenilworth. Canley Brook will be realigned to the north-west to allow the route to pass over it on a viaduct as it rises into higher ground.

2.2.9 Running through undulating topography to Burton Green, the route will alternate between cutting and embankment and will pass under Crackley Lane. Approaching Burton Green the route will enter a green tunnel, following the footprint of the dismantled Kenilworth to Balsall line (Kenilworth Greenway), before entering a retained cutting to the south-west of the proposed Burton Green auto-transformer feeder stations. Climbing away from the cutting, the route will pass under the B4101 Waste Lane before leaving the Stoneleigh, Kenilworth and Burton Green area.

Start of the Stoneleigh, Kenilworth and Burton Green CFA to Stoneleigh Business Park

2.2.10 On leaving the Offchurch and Cubbington area (CFA17), the route will enter the Stoneleigh, Kenilworth and Burton Green area in the south-east (Map CT-06-093b) in cutting. It will continue mainly in either cutting or partially retained cutting for approximately 2.9km, passing under the A445 Leicester Lane (Map CT-06-093b, F5) to the east of Stonehouse Farm (Map CT-06-093, C7), under the B4113 Stoneleigh Road (Map CT-06-094, G6) and through Stoneleigh Business Park. Key features of this section of the route are shown on Maps CT-06-93b to CT-06-094 and will include:

- Cubbington cutting: a 400m-long shallow cutting, with raised earthworks on both sides to provide visual screening;
- the A445 Leicester Lane will be realigned approximately 80m south-east of its current location to pass over the route on a raised alignment approximately 9m above existing ground level;
- Cubbington embankment: a 150m-long embankment with a height of approximately 2m at its highest point, with raised earthworks on both sides to provide visual screening;
- an auto-transformer station on the north-east side of the route adjacent to the A445 Leicester Lane as shown on Map CT-06-093b, E4 and E5 (Furzen Hill auto-transformer station);
- Stonehouse cutting: a 570m-long cutting increasing in depth northwards to approximately 10m at its deepest point, with raised earthworks on both sides of the south-eastern part to provide visual screening;
- Stoneleigh Park retaining wall: a 1.8km-long retaining wall running along both sides of the route within a cutting south-east of and through most of Stoneleigh Business Park to reduce the amount of land required, provide noise screening, and prevent groundwater flooding;
- two railway drainage balancing ponds will be provided; one on the north-east side of the route, adjacent to the A445 Leicester Lane; the second will be located to the north-east of the route together with a pumping station approximately 400m south of the centre of Stareton[7];
- three highway drainage balancing ponds will be provided; two adjacent to the realigned A445 Leicester Lane and one to the south-west of the route, north of the realigned B4113 Stoneleigh Road;
- the B4113 Stoneleigh Road will be realigned approximately 40m south-east of its current location on a slightly raised alignment with associated diversions to minor roads and tracks to retain access to Stoneleigh Business Park and properties; the realigned road will include a new roundabout to replace that identified in the current proposals for the redevelopment of Stoneleigh Business Park (see Section 2.1);

[7] Railway drainage will generally be gravity driven, but where track levels require it, pumping stations will be utilised.

- a new overbridge will be constructed to carry the B4113 Stoneleigh Road. This will be a green bridge providing connectivity for wildlife across the Proposed Scheme;
- a permanent 490m diversion of Footpath W171 to connect with the realigned B4113 Stoneleigh Road (Map CT-06-094, F5 and F6);
- Stareton Road will be diverted to the north as it approaches its junction with the realigned B4113 Stoneleigh Road;
- a new section of road and new overbridge will be provided across the route to allow access within Stoneleigh Business Park as necessary; and
- planting will be undertaken on both sides of the route and the realigned roads to provide a combination of visual screening, landscape integration and habitat connectivity.

Stoneleigh Business Park to River Avon viaduct

2.2.11 The route will then come out of cutting for about 350m to cross the River Avon immediately to the north-west of Stoneleigh Business Park. Key features of this section of the route (from Map CT-06-094 to CT-06-095) will include:

- a 122m-long embankment increasing in height to the north;
- a 75m-long viaduct over the River Avon;
- a railway drainage pond on the south-west side of the route immediately north-west of the River Avon;
- planting on both sides of the route north-east and south-west of the River Avon to provide a combination of visual screening, landscape integration and habitat connectivity;
- an ecological mitigation area to include provision of a replacement bat roost and an otter holt within Stoneleigh Park, adjacent to the River Avon (Map CT-06-094, B3 and B4); and
- a replacement floodplain storage area adjacent to the ecological mitigation area, to provide potential additional flood storage to offset any impacts from the Proposed Scheme.

River Avon Viaduct to Finham Brook viaduct

2.2.12 The route will continue into cutting for approximately 1.3km, passing beneath the B4115 Ashow Road, the A46 Kenilworth Bypass and Dalehouse Lane to the east of Kenilworth Golf Club. Key features of this section of the route (from Maps CT-06-095 to CT-06-096) will include:

- Glasshouse Wood embankment: a 133m-long embankment decreasing in height to the north-west;
- Glasshouse Wood cutting: a 1.3km-long cutting, increasing in depth to approximately 14m towards the north-western end, at which point the width of the cutting will be approximately 100m. Localised mitigation earthworks

will be provided adjacent to Dalehouse Lane to provide screening to properties and the golf course;

- realignment of the B4115 Ashow Road to pass over the route on a bridge approximately 50m north-west of its current location. The road will be on a raised alignment approximately 7m above existing ground level (Map CT-06-095, H6);
- the A46 Kenilworth Bypass crossing the route on its existing alignment on a new bridge (Map CT-06-095, E6);
- realignment of Footpath K29 (Coventry Way/Centenary Way) by approximately 570m to pass over the route on a new footbridge at the approximate location of New Kingswood Farm, which will be demolished (Map CT-06-095, C5 and C6);
- realignment of Dalehouse Lane approximately 20m to the north-west; the route will have a raised alignment and bridge approximately 10m above existing ground level (Map CT-06-096, I6 and I7);
- use of strengthened earthworks and retaining walls along Dalehouse Lane to minimise the footprint of the embankments where reasonably practicable within the floodplain and avoid removal of mature woodland screening alongside the golf course;
- provision of replacement access off Dalehouse Lane for Dalehouse Farm; and
- planting along the new road embankments and along both sides of the cuttings to provide a combination of landscape integration, visual screening, and habitat connectivity.

Finham Brook viaduct to Canley Brook viaduct

2.2.13 The route will continue in a north-westerly direction, over the Finham Brook on viaduct before entering cutting, passing to the east of Kenilworth, under the existing Coventry to Leamington Spa Line and the A429 Kenilworth Road, and over the realigned Canley Brook. Key features of this next section of the route (from Map CT-06-095 to CT-06-097) will include:

- Finham Brook embankment: a 49m-long approach embankment to the south-east of Finham Brook, approximately 5m high;
- a 50m-long viaduct over the Finham Brook (Map CT-06-096, I6);
- Dalehouse embankment: an 81m-long approach embankment on the north-west side of Finham Brook, approximately 6m high;
- Kenilworth cutting: a 430m-long cutting varying in depth up to approximately 10m and up to a width of 80m (Map CT-06-096, E6); raised earthworks on both sides will provide visual and noise screening;
- Canley Brook retaining wall: a 950m long retaining wall within the above cutting to prevent groundwater flooding within the cutting;

- an auto-transformer station on the north-east side of the route to the north-west of the A429 Kenilworth Road as shown on Map CT-06-096, C6 (Crackley auto-transformer station);
- diversion of the Canley Brook to create approximately 1km of new meandering channel which will cross beneath the railway about 600m north-west of its current location (Map CT-06-097, H6);
- approximately 200m of the existing Canley Brook channel will be regraded and used as an outflow channel from the balancing pond; the existing flow direction will be reversed. At Birches Wood Farm (Volume 5: Map WR-01-031, SWC-CFA18-004), the channel will be regraded and realigned to enable it to pass beneath the route in a new culvert;
- a 61m-long viaduct over the diverted Canley Brook;
- construction of a new farm accommodation bridge for Millburn Grange Farm, located immediately to the south-east of the Coventry to Leamington Spa Line (Map CT-06-096, E6);
- construction of a new Coventry to Leamington Spa Line overbridge on the existing route of the railway (Map CT-06-096, E6);
- realignment of the A429 Kenilworth Road over a new bridge about 50m south-east of its current location, with new access provided to a pumping station and Crackley auto-transformer station on the north-east side of the Proposed Scheme;
- construction of a new bridge to carry Bridleway W164 (the 'Connect2Kenilworth' Cycleway), which will be diverted around the Canley Brook diversion to cross the railway on a new overbridge approximately 250m north-west of its current location (Map CT-06-097, G6);
- provision of two new railway drainage ponds to the north-east of the Proposed Scheme, one adjacent to the pumping station, and one just north-east of the realigned Canley Brook;
- planting along the new road embankments, the new river valley slopes, the outer slopes of the raised earthworks and along both sides of the cuttings to provide a combination of landscape integration, visual screening, and habitat connectivity;
- an ecological mitigation area to include replacement habitat for reptiles and amphibians located immediately north-east of the Finham Brook viaduct, on the east side of the Proposed Scheme (Map CT-06-096, I5 and I6); and
- a replacement floodplain storage area to the south-west side of the Proposed Scheme, near Dalehouse Lane, to provide potential additional flood storage to offset any impacts from the Proposed Scheme (Map CT-06-096, H8 and H9).

Canley Brook viaduct to Burton Green green tunnel (south portal)

- This 2.9km section of route will continue in a south-east to north-west direction, alternating between embankment and cutting as it passes between Crackley Wood (Map CT-06-97, E8, E9, F7, F8, F9 and G7) to the south-west and Roughknowles Wood (Map CT-06-097, C4, C5, D4 and D5) to the north-east. It will then pass to the south-west of South Hurst Farm and gradually converge with the alignment of the Kenilworth Greenway, where it will enter into tunnel just to the south-east of Burton Green. Key features of this section of the route (from Map CT-06-097 to CT-06-098) will include:
- North Crackley cutting: a 249m-long cutting decreasing in depth from approximately 6m to ground level;
- Crackley Wood embankment: a 130m-long embankment approximately 2.5m high at its highest point, with a culvert provided to carry an existing watercourse under the new embankment in Crackley Wood (Map CT-06-97, E8, E9, F7, F8, F9 and G7);
- Roughknowles Wood cutting: an 830m-long cutting with a depth of approximately 12m at its deepest point and a width of approximately 90m at its widest point;
- Broadwells Wood embankment: a 1.1km-long embankment, varying in height up to approximately 8m, with raised earthworks on both sides where the route is not in existing woodland to provide visual and noise screening;
- Bockenden cutting: a 440m-long cutting approximately 3m deep at its deepest point with raised earthworks on both sides to provide visual screening;
- Black Waste Wood embankment: a 47m-long embankment approximately 2m high with raised earthworks on the both sides to provide visual and noise screening;
- a tunnel services area including a building and emergency assembly area at the southern entrance to the tunnel (Map CT-06-099, H6), with access from Red Lane;
- diversion of Bridleway W165X (Map CT-06-097, F6) approximately 350m south-east of its current location which, combined with the diverted Bridleway W164, will cross over the cutting on the new overbridge described in the previous section (Map CT-06-097, G6);
- realignment of Crackley Lane over a new bridge approximately 75m west of its current location Map CT-06-097, D6, with associated realignment of Cryfield Grange Road;
- a new culvert to carry an unnamed stream below the route in Black Waste Wood (Map CT-06-099, H6);
- realignment of Footpath W168 (Map CT-06-098, F6) by approximately 510m to a new underpass (CT-06-098, G6 and G7);

- realignment of Footpath W167 (Map CT-06-098, G8, H7, H8 and I7) by approximately 1,230m to join Footpath W168 and the new underpass (Map CT-05-98,G6 and G7);
- provision of a railway drainage pond to the east of the Proposed Scheme, north of the Footpath W168 underpass (CT-06-98, F6);
- realignment of the Kenilworth Greenway and Footpath W169 to pass to the south-west of the tunnel portal, over the green tunnel and then climb up to Cromwell Lane at Burton Green (Map CT-06-099, H6, H7, G6 and G7);
- planting on both sides of the route to provide a combination of landscape integration, visual screening, and habitat connectivity, including replacement for the areas of ancient woodland loss and creation of a new landform and landscape area between Red Lane and the route; and
- an ecological mitigation area to the west of the Proposed Scheme, between the route and the Kenilworth Greenway (Map CT-06-098, G8, H8 and I8). This could be used for woodland creation, ancient woodland soil translocation, creation of water bodies and hedgerow improvements.

Burton Green green tunnel (south portal) to B4101 Waste Lane and end of Stoneleigh, Kenilworth and Burton Green CFA

2.2.14 On entering the proposed green tunnel south portal, the route will continue in a north-westerly direction, passing through Burton Green green tunnel before exiting north-west of the village into retained cutting. It will then pass under the B4101 Waste Lane. Key features of this section of the route (from Map CT-06-099, H6; to CT-06-100a, E6) will include:

- Burton Green green tunnel: a 621m-long green tunnel, incorporating a 100m long porous portal at each end (Maps CT-06-099, E6, F6, G6 and H6);
- Burton Green retaining structure: a 1.13km-long retained cutting on the west side, and a combination of retained cutting and natural cutting plus noise barrier fence on the east side, approximately 12m deep;
- Waste Lane embankment: a 120m length of low embankment (approximately 2m high);
- replacement of Cromwell Lane on its current alignment over the green tunnel (Map CT-06-099, G6);
- reinstatement of Footpath W182 to pass over the green tunnel (Map CT-06-099, F6);
- realignment of Footpath M186 approximately 200m north-west of its current location to cross a new farm accommodation bridge over the retained cutting (Map CT-06-100a, H6);
- diversion of the south-western section of Footpath M187 (Map CT-06-099, D7) to connect to the realigned Kenilworth Greenway and cross over the green tunnel and rejoin Hodgett's Lane on the north-eastern side of the route;

- realignment of the B4101 Waste Lane approximately 20m north-west of its current location and to cross the route on a new bridge with a slightly raised alignment (Map CT-06-100a, F6 and F7);
- diversion of Footpath M198 Millennium Way (CT-06-100, E6 and F6), approximately 200m south-east of its current location to connect with the realigned B4101 Waste Lane;
- realignment of approximately 700m of the Kenilworth Greenway within Burton Green to pass along the top of the green tunnel and then along the south-west side of the Proposed Scheme, before returning to its existing alignment just south-east of Little Beanit Farm; new planting will be provided alongside the realigned length to recreate the Greenway character. At Cromwell Lane, a new signal controlled crossing will be provided for users of the Greenway to cross the road at-grade, rather than beneath the road as is presently the case;
- construction of an auto-transformer feeder station and a new National Grid substation on the north-east side of the Proposed Scheme adjacent to the tunnel portal, as shown on Map CT-06-099,C5, C6, D5, D6 and E6;
- demolition of the existing Burton Green village hall and provision of a replacement village hall on the area of land adjacent to Burton Green Church of England Primary School, off Hob Lane (Map CT-06-099, H10), if this is the preferred option of the village hall trustees; and
- planting on both sides of the route to provide visual screening of the auto-transformer feeder station, realigned roads and route, as well as integrating the Proposed Scheme into the landscape.

2.2.15 The route will then continue north-westwards on low embankment, leaving the Stoneleigh, Kenilworth and Burton Green area and passing into the Balsall Common and Hampton-in-Arden area (CFA23).

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the strategy for construction of the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area, including:

- overview of the construction process;
- description of the advance works;
- description of the engineering works to build the railway;
- construction waste and material resources;
- commissioning the railway; and
- indicative construction programme.

2.3.2 The assessment presented in this ES is based on the construction arrangements as described in this section.

2.3.3 In addition to the land that will be required permanently by the Proposed Scheme (see Section 2.2), land will be required on a temporary basis for construction. Key temporary construction features are illustrated on the construction maps series CT-05 (Volume 2: CFA18 Map Book).

2.3.4 Following construction works, land required temporarily will be prepared for its eventual end use, which will include being returned to its pre-construction use wherever appropriate.

2.3.5 A guide to standard construction techniques is provided in Volume 1, Section 6. In instances for which more than one possible construction technique might be possible, this section specifies which technique has been assumed for the purposes of the assessment.

2.3.6 In addition, non-standard construction techniques are to be adopted for some scheme elements including the Stoneleigh retaining wall, Canley Brook diversion, retaining wall and viaduct, the Coventry to Leamington Spa Line overbridge and Burton Green green tunnel. These are detailed further below.

Stoneleigh retaining walls, Stoneleigh Road and Park overbridges

2.3.7 The Stoneleigh retaining walls, Stoneleigh Road overbridge and Stoneleigh Park overbridge are adjacent features that will be interlinked for construction. The Stoneleigh Park retaining wall will be a U shaped trough located within a cutting; the height of the wall will vary along its length. It is envisaged that the construction of the retained cutting will commence from the north-west and south-east ends of the structure simultaneously with construction progressing from both ends towards the B4113 Stoneleigh Road. The lower wall sections will be excavated and cast in-situ on top of a concrete base slab, with deeper sections constructed as diaphragm walls which will be temporarily propped to allow placing of the base slab.

2.3.8 The new Stoneleigh Road overbridge and road realignment will be constructed off-line. It is expected that the Stoneleigh Park overbridge will be placed as a pre-cast unit after completion of the retaining walls. On completion of the new road overbridge and realignment of the B4113, road traffic will be diverted onto the new route to release the old road area for completion of the retained cutting.

Coventry-Leamington Spa rail overbridge

2.3.9 To construct the new Coventry to Leamington Spa line overbridge the existing line is likely to be subject to two temporary closures known as rail possessions.

2.3.10 The first is anticipated to be a one-weekend 52-hour rail possession to install the bridge abutment piles and precast bearing shelf. Work will entail temporarily removing the rail tracks at the abutments to allow the bored piles to be installed. Track will be reinstated at the end of the possession. Installation of the wing wall bored piles and capping beams will be carried out with the railway open.

2.3.11 A second one-weekend 52-hour rail possession will be required to install the precast abutment walls and the bridge deck. Tracks will be temporarily removed over the full length of new bridge deck and excavation undertaken to provide sufficient work space to install the precast bridge abutments walls and bearing plinths. The new bridge deck will then be installed. The rail tracks will be reinstated at the end of the possession.

Canley Brook retaining wall, viaduct and river diversion

2.3.12 The Canley Brook retaining wall will be constructed using in-situ reinforced concrete and other conventional construction techniques. The earthworks cutting will be first excavated to the top of the retaining wall structure and then cut in stable terraces down to the formation level of the base slab. The slab and walls will be cast and the walls then backfilled to the required profile. Water seepage into the excavation prior to completion of the structure will be treated to remove silt and then pumped to a licensed discharge point.

2.3.13 Canley Brook viaduct, Coventry-Leamington Spa rail overbridge and A429 Kenilworth Road overbridge all interface with the construction of Canley Brook Retaining Wall. The permanent diversion of the Canley Brook will also be coordinated with these works.

2.3.14 The viaduct and bridge structures will be constructed first in order to simplify access during their construction. The retaining wall will cut across the existing route of the Canley Brook requiring the permanent watercourse diversion to be completed prior to construction of the northern section of retaining wall. The length of the retaining wall allows construction of the southern section of the retaining wall without impeding the construction of the crossing structures to the north.

2.3.15 Work to excavate beneath the rail bridge deck and construct the Canley Brook Retaining Wall will be undertaken while trains are running but with a monitoring regime in place.

Burton Green green tunnel and Cromwell Lane realignment

2.3.16 The southern portal of the green tunnel will be constructed in-situ, where an excavation to the formation level of the tunnel base slab is practical. The majority of the green tunnel will be constructed top-down, which requires diaphragm walling to be installed to allow the construct the tunnel walls from the tunnel roof level. The tunnel is then excavated internally and the base slab cast in-situ. Cromwell Lane will be locally diverted allowing the southern section of the tunnel to be excavated in-situ. The road will then be re-aligned to its original location, on top of the tunnel, to allow the northern section of the green tunnel to be constructed.

2.3.17 It is envisaged that as a minimum, one-way running with traffic light control will be provided for Cromwell Lane for the majority of the construction period, although there may be a need for occasional overnight or weekend closures.

Overview of the construction process

2.3.18 Building and preparing the railway for operation will comprise the following general stages:

- advance works, including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works, including: establishment of construction compounds; site preparation and enabling works; main earthworks and structure works and site restoration;

- railway installation works, including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and
- rail system testing and commissioning.

2.3.19 General provisions relating to the construction process are set out in more detail in Volume 1, Section 6 of the draft Code of Construction Practice (CoCP) (see Volume 5: Appendix CT-003-000/1) including:

- the approach to environmental management during construction and the role of the Code of Construction Practice;
- working hours;
- the management of construction traffic (draft CoCP, Section 14); and
- the handling of construction materials.

Advance works

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

- further detailed site investigations and surveys;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, and further built heritage survey and investigation;
- land possession;
- site establishment with temporary fence construction; and
- utility diversions.

Engineering works

2.3.21 Construction of the railway will require engineering works along the entire length of the route, and within land adjacent to the route. This will comprise two broad types of engineering work:

- civil engineering works such as drainage, earthworks and erection of bridges and viaducts; and
- railway installation works such as laying ballast or slabs and tracks and installing power supply and communications features.

2.3.22 The construction of the Proposed Scheme will be subdivided into sections, each of which will be managed from compounds. The compounds will act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds will either be main compounds or satellite compounds. Some compounds will be used for civil

engineering works and others for railway installation works, and in some cases for both.

2.3.23 In the Stoneleigh, Kenilworth and Burton Green area there will be one main construction compound, 13 civil engineering satellite compounds, and six rail services and installation works satellite compounds (one of which will share the same location as a civil engineering compound).

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

General overview of construction compounds

2.3.25 Main compounds will be used for core project management staff (i.e. engineering, planning and construction delivery), and commercial and administrative staff. These management teams will directly manage some works and/or coordinate satellite compounds, which will manage other works. In general, main compounds will contain:

- office space for management staff, limited car parking for staff and site operatives, and welfare facilities;
- space for the storage of bulk materials (aggregates, structural steel and steel reinforcement);
- space for the receipt, storage and loading/unloading of excavated material either onto or off the site;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage; and
- necessary operational parking.

2.3.26 Satellite compounds, as shown in Figure 3 will be used as the base to manage specific works along a section of the route. They will usually provide office accommodation for limited numbers of staff, local storage for plant and materials, limited car parking for staff and site operatives, and welfare facilities.

2.3.27 Some compounds will also accommodate additional functions as listed below. Where this is the case they will be included in the description of the compound:

- roadheads will require an area of land for the storage and loading and unloading of bulk earthworks materials which are moved to and from the site on public highways; and
- living accommodation for the construction workforce.

2.3.28 In addition, areas adjacent to some compounds will be used for the storage of topsoil stripped as part of the works prior to it being used when the land is reinstated to its former use.

2.3.29 Further information on the function of compounds, including general provisions for their operation, including; security fencing, lighting, utilities supply, site drainage and codes of worker behaviour are set out in Volume 1, Section 6, and the draft CoCP, Section 5.

Construction traffic routes

2.3.30 The movement of construction vehicles carrying materials, plant, other equipment and workforce (or moving empty) will take place both within the construction sites, on public roads and via the rail network. The construction compounds will provide the interface between the construction works and the public highway or rail network, and the likely road routes to access compounds are described in subsequent sections below.

2.3.31 Movements between the construction compounds and the work sites will be on designated haul roads within the site, often along the line of the Proposed Scheme or running parallel to it.

Figure 3: Schematic of construction compounds for civil engineering works

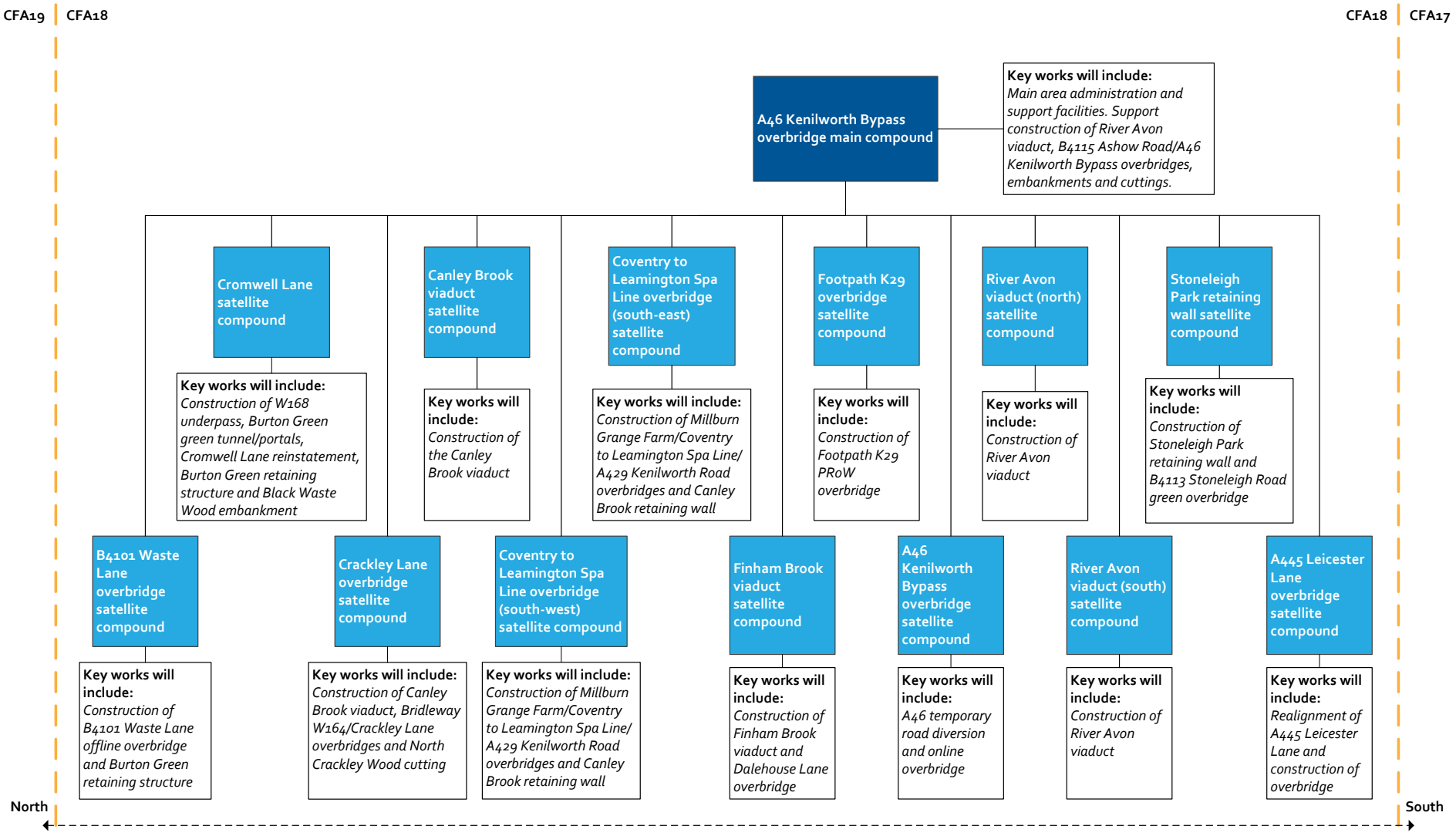
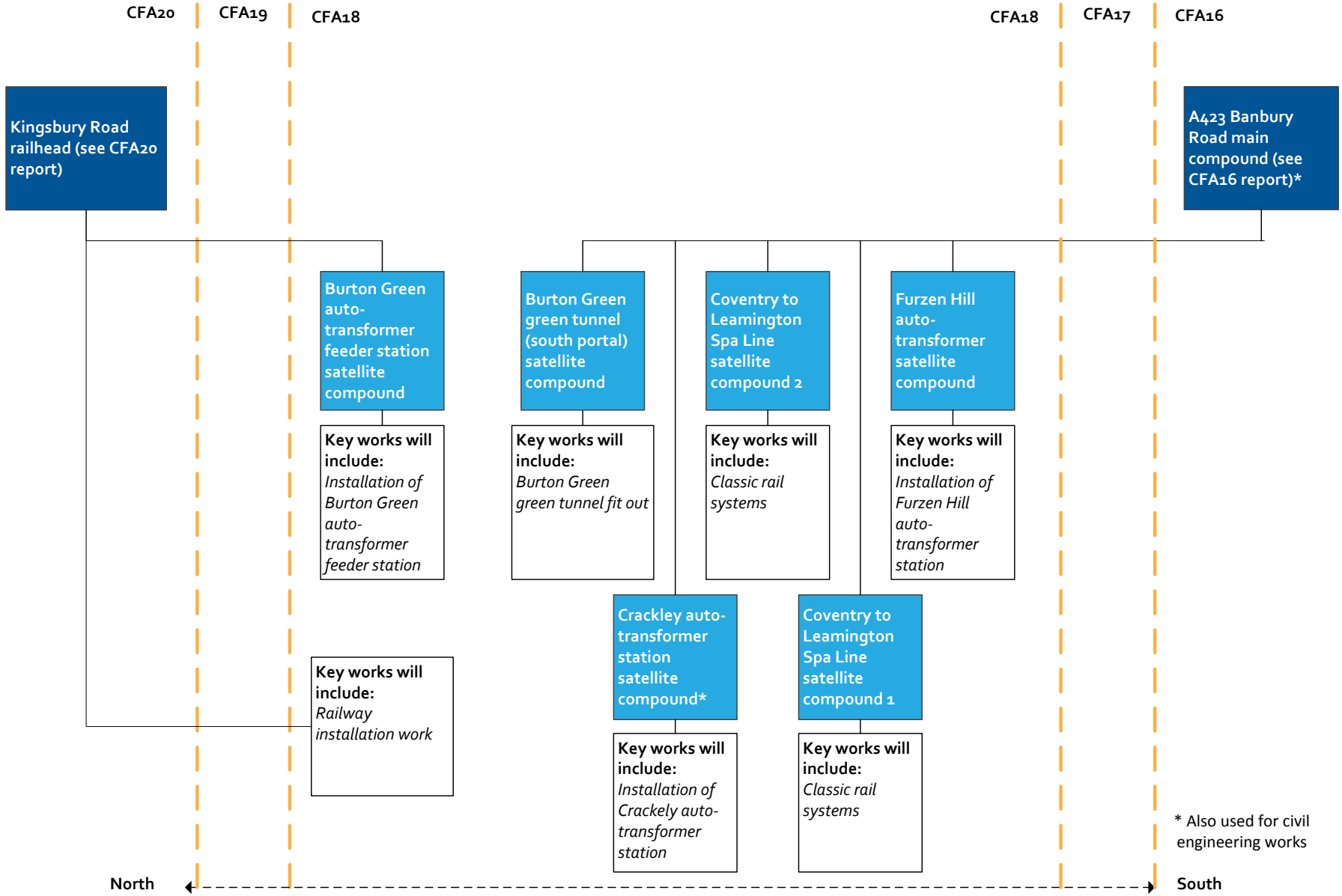


Figure 4: Schematic of construction compounds for railway installation works



A46 Kenilworth Bypass overbridge main compound (Map CT-05-95, F3)

2.3.32 The A46 Kenilworth Bypass overbridge main compound will comprise the main area administration and support facilities. It will also support construction of the B4115 Ashow Road, theA46 Kenilworth Bypass and all cuttings and embankments.

2.3.33 Works in this section of the Proposed Scheme will be carried out in the following broad phases:

- site clearance and enabling works;
- building demolition;
- viaduct and bridge construction;
- retaining wall construction;
- construction of the green tunnel;
- cutting, and landscaping earthworks;
- drainage and culverts;
- backfill over the green tunnel;
- highway and footpath reinstatement;
- topsoiling and landscape planting; and
- railway systems installations.

2.3.34 The A46 Kenilworth Bypass overbridge main compound will be operational for approximately five years, three months and will be subject to the contractor's standard working hours. The compound will be accessed directly off the B4115 Ashow Road. From here construction traffic will travel north to the B4115 Ashow Road/B4113 Stoneleigh Road junction, and then west to the B4113 Stoneleigh Road/A46 interchange, before travelling southbound on the A46 to join the M40. Alternatively construction traffic will travel northbound on the A46 to join the A45 northbound. The compound will support an average of approximately 70 workers each day throughout the civil engineering works period, rising to approximately 130 during periods of peak activity.

Demolition works

2.3.35 The buildings that will need to be demolished are listed in Table 1.

Table 1: Demolition works

Description of structure	Map reference
Stoneleigh Business Park southern area, includes East Gate and Stare Lodge, 100m north of Stoneleigh Road (total buildings – five, five dwellings).	Map CT-05-094, F6
Stoneleigh Business Park southern area, commercial buildings (total buildings – three).	Map CT-05-094, F6 and G6
Stoneleigh Business Park northern area, commercial buildings (total buildings – 13)	Map CT-05-094,B6, C6 and D6

Description of structure	Map reference
New Kingswood Farm agricultural commercial buildings, 50m south of Footpath K29 (total buildings – two).	Map CT-05-095,D6
New Kingswood Farm, Dalehouse Lane immediately south of K29 Footpath bridge (total buildings – two, one dwelling).	Map CT-05-095 C5 andC6
Burton Green, to the east of Cromwell Lane. Three residential properties and associated outbuildings plus another outbuilding associated with a fourth property (total buildings – six, three dwellings).	Map CT-05-099,G6
Burton Green village hall (total buildings – one)	Map CT-05-099, F6
Stable buildings between Hodgett's Lane and Proposed Scheme (total buildings – two)	Map CT-05-099, E6
Odnaull End Farm, Waste Lane (total buildings – six, one dwelling)	Map CT-05-100a, F6

Highway and road diversions and realignments

2.3.36 Proposed highway and road realignments are shown on CT-05-093b to CT-05-100a and shown in Table 2. The temporary closure of routes will be kept to as short a duration as reasonably practicable. Table 2 and CT-05 maps show indicative alternative routes; these may be subject to change as part of the development of the design. Permanent and temporary realignments are shown in Table 2.

Table 2: Highway and road diversions/realignments

Name	Location	Diversion/realignment route	Approximate length of diversion/realignment	Approximate duration
A445 Leicester Lane	Map CT-05-093b, F5	New overbridge. Permanent realignment.	1,220m	Permanent
Stareton Road	Map CT-05-094, G5 and G6	Permanent realignment to connect with realigned B4113 Stoneleigh Road.	280m	Permanent
B4113 Stoneleigh Road	Map CT-05-094, G6, G7, G8	New green overbridge. Permanent realignment.	750m	Permanent
B4115 Ashow Road	Map CT-05-095, G7, G8, G9, H3, H4, H4, H6 and H7	New overbridge. Permanent realignment.	970m	Permanent
A46 Kenilworth Bypass	Map CT-05-095, E5 and E6	Temporary realignment and traffic management to avoid closure. New online overbridge.	680m	1 year, 5 months
Dalehouse Lane	Map CT-05-096, I6	New overbridge. Permanent realignment.	5,000m	Permanent
Millburn Grange Farm access	Map CT-05-096, E6	New overbridge. Permanent realignment.	390m	Permanent
A429 Kenilworth Road	Map CT-05-096, C6	New overbridge. Permanent realignment.	540m	Permanent
Crackley Lane	Map CT-05-097, D6	New overbridge. Permanent realignment.	460m	Permanent

Name	Location	Diversion/realignment route	Approximate length of diversion/realignment	Approximate duration
Cromwell Lane	Map CT-05-099, G6	Slight temporary realignment and on-line reinstatement on green tunnel.	70m	2 years
B4101 Waste Lane	Map CT-05-100, F6	New overbridge. Permanent realignment.	430m	Permanent

Footpath, cycleway and bridleway diversions and realignments

2.3.37 Proposed footpath, cycleway and bridleway realignments are detailed on Map CT-05-093b to CT-05-100a and shown in Table 3. The closure of routes will be kept to as short a duration as reasonably practicable.

Table 3: Footpath, cycleway and bridleway diversions/realignments

Name	Location	Proposed route	Approximate length of diversion/realignment	Approximate duration
Footpath W171	Map CT-05-094, F5, F6 and G5	Diverted to B4113 Stoneleigh Road green overbridge.	490m	Permanent
Footpath K29	Map CT-05-095, C5 and C6	Temporary realignment via Dalehouse Lane. The footpath will be permanently reinstated across the new Footpath K29 overbridge.	570m	1 year, 4 months
Bridleway W164	Map CT-05-097, G6	Permanent realignment to new Bridleway W164 overbridge.	800m	Permanent
Bridleway W165x	Map CT-05-097, G6	Diverted to new Bridleway W164 overbridge.	1,190m	Permanent
Footpath W167	Map CT-05-098, G7	Divert to new Footpath W168 underpass. Temporary minor reroute at ground level while underpass is constructed.	1,230m	Permanent
Footpath W168	Map CT-05-098, G7	Realigned to new Footpath W168 underpass.	510m	Permanent
Kenilworth Greenway (cycle path)	Map CT-05-099, G6, G7, H6 and H7	The Greenway will be temporarily realigned to the south-west and reinstated over the green tunnel once works are complete.	Alongside	5 years, 2 months
Footpath W169	Map CT-05-099, G6	Diverted over the green tunnel.	515m	Permanent
Footpath M182	Map CT-05-099, G6	Temporary realignment to run alongside the route and cross over on Cromwell Lane. Reinstated over the green tunnel.	1,060m	1 year, 6 months
Footpath M187	Map CT-05-099, E6	Temporary closure for the duration of work. On completion permanently realigned over the green tunnel north portal and along Kenilworth Greenway.	460m	2 years Permanent

Name	Location	Proposed route	Approximate length of diversion/realignment	Approximate duration
Footpath M186	Map CT-05-100a, H6	New overbridge. Temporary scaffold bridge across retained cut for nine months.	200m	Permanent
Footpath M184	Map CT-05-100a, H6	Diverted along the Kenilworth Greenway to Footpath M186 overbridge.	840m	Permanent
Footpath M198	Map CT-05-100a, F6	Diverted to Waste Lane overbridge.	815m	Permanent

Utility diversions

2.3.38 Utilities affected by the Proposed Scheme will need to be diverted, the principal diversions being:

- medium and high-pressure gas mains including:
  - a 600mm high-pressure main near the A445 Leicester Lane; and
  - 300mm high-pressure gas main beneath the A46 Kenilworth Bypass, south of Kingswood Farmhouse;
- large-diameter water mains including:
  - diversion of 500mm Severn Trent water main adjacent to the A46 Kenilworth Bypass; and
  - 675mm Severn Trent water main crossing the route to the north east of Red Lane;
- high voltage electricity plant including:
  - diversion of overhead Western Power Distribution electricity lines, in the vicinity of Burton Green; and
- other services:
  - fuel pipeline running adjacent to the works, and along the Kenilworth Greenway.

2.3.39 Overhead line works will require access to modify pylons remote from the diversion. A corridor of land beneath the power lines will be required for these works as indicated on Volume 2: CFA18 Map Book, Map series CT-05.

Drainage and culverts

2.3.40 It is anticipated that drainage ponds will be required for both railway track and highway drainage. Indicative locations are shown on Maps CT-06-093b to CT-06-100a. Culverts will be required in several places to channel unnamed watercourses beneath the route; these include a tributary of the Canley Brook at Crackley Wood, another at Broadwells Wood and an unnamed watercourse at Black Waste Wood.

Watercourse diversions

2.3.41 The route of the Proposed Scheme and associated highway works require diversions of the following watercourses:

- diversion and regrading of approximately 1,200m of the Canley Brook (see Maps CT-06-096 and 097); in addition, approximately 200m of the existing Canley Brook channel will be regraded and used as an outflow channel from the balancing pond; the existing flow direction will be reversed;
- diversion and regrading of two tributaries of the Canley Brook, one at Crackley Wood and at Black Waste Wood to enable them to pass beneath the route in culvert; and
- minor diversion (approximately 100m) of a tributary of the Canley Brook at Broadwells Wood (see Map CT-06-98-G7) to enable it to pass beneath the route in culvert.

Finalisation works

2.3.42 Finalisation works will include landscaping and planting.

Satellite compounds

2.3.43 A total of 13 satellite compounds will be required to construct the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area. Table 4 details the principal construction activity, start date and approximate duration, number of workers, and highway access route for each satellite compound.

Table 4: Satellite construction compounds within the Stoneleigh, Kenilworth and Burton Green area

Compound name	Principal construction activity	Start date	Estimated duration of use	Number of workers (ave/peak)	Highways access route
Start of Stoneleigh, Kenilworth and Burton Green CFA to Stoneleigh Business Park					
A445 Leicester Lane overbridge Map CT-05-093b, F4	Offline road realignment and construction of road overbridge	2018	10 months	19/20	A445 Leicester Lane, Westhill Road, Bericote Road, A452 Leamington Road, and then onto the A46 and M40
Stoneleigh Park retaining wall Map CT-05-094, G7 and H7	Stoneleigh Park Retaining Walls, B4113 Stoneleigh Road green overbridge and Stonehouse cutting	2019	2 years, 2 months	126/147	B4113 Stoneleigh Road, Bericote Road, A452 Leamington Road and then onto the A46 and M40
Stoneleigh Business Park to River Avon viaduct					
River Avon viaduct (south) Map CT-05-094, A5 and A6	River Avon viaduct	2018	9 months	20/30	B4113 Stoneleigh Road, Bericote Road, A452 Leamington Road and then onto the A46 and south to the M40.

Compound name	Principal construction activity	Start date	Estimated duration of use	Number of workers (ave/peak)	Highways access route
River Avon viaduct (north) Map CT-05-095, H5 and I5	River Avon viaduct	2018	9 months	20/30	B4115 Ashow Road, west to the B4113 Stoneleigh Road/A46 interchange, then south on the A46 to join the M40
River Avon viaduct to Finham Brook viaduct					
A46 Kenilworth Bypass overbridge Map CT-05-095, E5	Online road overbridge	2018	1 year, 3 months	20/30	Dalehouse Lane, Stoneleigh Road then south on the A46 to join the M40
Footpath K29 overbridge Map CT-05-095, D6	K29 overbridge	2018	1year, 4 months	20/30	Dalehouse Lane, Stoneleigh Road then south on the A46 to join the M40
Finham Brook viaduct to Canley Brook viaduct					
Finham Brook viaduct Map CT-05-096, H6 and I6	Finham Brook (river) viaduct, Dalehouse Lane overbridge and associated retaining walls	2018	12 months	34/35	Dalehouse Lane, Stoneleigh Road then south on the A46 to join the M40
Coventry to Leamington Spa Line overbridge (south-east) Map CT-05-096,E7	Millburn Grange Farm accommodation/Coventry to Leamington Spa Line/A429 Kenilworth Road overbridges and Canley Brook retaining wall	2018	3 years, 10 months	20/30	A429 Kenilworth Road, south west on Stoneleigh Road then south on the A46 to join the M40
Coventry to Leamington Spa Line overbridge (south-west) Map CT-05-096,D7 and E7	Millburn Grange Farm Accommodation/Coventry to Leamington Spa Line/A429 Kenilworth Road overbridges and Canley Brook retaining wall	2018	3 years, 10 months	53/120	A429 Kenilworth Road, south west on Stoneleigh Road then south on the A46 to join the M40
Canley Brook Viaduct to Burton Green Tunnel					
Canley Brook viaduct Map CT-05-097, H7	Canley Brook viaduct	2019	10 months	20/30	Haul road onto A429 Kenilworth Road, south west on Stoneleigh Road then south on the A46 to join the M40
Crackley Lane overbridge Map CT-05-097, C5	Canley Brook viaduct, Bridleway W164/Crackley Lane overbridges and North Crackley/Roughknowles Wood cuttings	2018	2 years, 6 months	30/55	Haul road onto A429 Kenilworth Road, south west on Stoneleigh Road then south on the A46 to join the M40

Compound name	Principal construction activity	Start date	Estimated duration of use	Number of workers (ave/peak)	Highways access route
Burton Green Tunnel to Waste Lane					
Cromwell Lane Map CT-05-099, E8 and F8	Footpath W168 underpass, Burton Green tunnel/south and north portals, Cromwell Lane reinstatement, Burton Green retaining structure and Black Waste Wood embankment	2018	3 years, 9 months	94/115	Cromwell Lane, Hob Lane, Windmill Lane, Kelsey Lane onto the A452, before travelling north-eastwards to join the A45 and then west to the M42
B4101 Waste Lane overbridge Map CT-05-100a, F7 and F8	B4101 Waste Lane offline road overbridge and Burton Green retaining structure	2019	3 years, 9 months	19/20	B4101 (Waste Lane), Kelsey Lane and onto the A452 before travelling north-eastwards to join the A45 and then west to the M42

Roadhead sites

2.3.44 There are three roadhead sites within the Stoneleigh, Kenilworth and Burton Green area:

- Kenilworth Bypass southbound roadhead – located to the north-east of the route, south of A46 Kenilworth Bypass overbridge compound, in operation from 2019 for approximately three years (see Map CT-05-095, F4, F5, G4 and G5);
- Kenilworth Road northbound roadhead – located to the north-east of the route and south-west of the A429 Kenilworth, in operation from 2020 for approximately three years (see Map CT-05-096, B5, B6, C5 and C6 and Map CT-05-097, H5, H6, I5 and I6); and
- Waste Lane east and westbound roadhead – running parallel to the route, either side of the B4101 Waste Lane, in operation from 2021 for approximately one year (see Maps CT-05-100a, G6, G7, H6 and H7).

2.3.45 These sites will be used for the storage and loading and unloading of bulk earthworks material which is moved to and from the site on public highways. Roadheads will be operational for the duration of the civil engineering works.

Material transfer stockpiles

2.3.46 There are four temporary material stockpile areas within the Stoneleigh, Kenilworth and Burton Green area:

- north-east of the route and south of the A445 Leicester Lane (see Map CT-05-093b, F3, F4, G3, G4 and G5);
- within the Kenilworth Bypass southbound roadhead, north-east of the route and south of the A46 Kenilworth Bypass (see Map CT-05-095, E4, F4, G3 and G4);

- within the Kenilworth Road northbound roadhead – located to the north-east of the route and south-west of the A429 Kenilworth (see Map CT-05-096, B5, B6, C5 and C6 and Map CT-05-097, H5, H6, I5 and I6); and
- within the Waste Lane east and westbound roadhead – running parallel to the route, either side of the B4101 Waste Lane (see Maps CT-05-100a, G6, G7, H6 and H7).

2.3.47 These areas are designated for the temporary stockpiling and/or treatment of excavated materials. These areas will also receive bulk materials (e.g. aggregates, drainage equipment) for dispersal throughout the construction area.

Worker accommodation sites

2.3.48 One worker accommodation site will be located within the Stoneleigh, Kenilworth and Burton Green area of the Proposed Scheme. It will be located immediately to the east of the A46 Kenilworth Bypass overbridge main compound (Map CT-05-095, E3, E4, F3, F4 and G3). It will provide living accommodation, welfare facilities and car parking for approximately 30 workers for an estimated period of 63 months. Worker accommodation will occupy the northern part of the compound and will adhere to the draft CoCP.

Kingsbury Road railhead (see Curdworth to Middleton area (CFA20) for more information)

2.3.49 The Kingsbury Road railhead is not located within the Stoneleigh, Kenilworth and Burton Green area but is the main compound providing support for all rail systems installation from the southern portal of Long Itchington Wood Tunnel to Handsacre junction, and to Birmingham Curzon Street. It will also provide support to one of the six rail systems satellite compounds within this area, as illustrated in Figure 4.

2.3.50 The railway systems installation works will include track, overhead line equipment, communications equipment and traction power supply. The installation of track in open areas will be of standard ballast or slab track configuration.

2.3.51 The railhead compound will facilitate the following activities:

- ballast and/or slab track installation;
- Overhead Line Electrification (OLE) installation;
- train control;
- signalling;
- telecommunication fit out;
- Low voltage line side power fit out; and
- installation of the Burton Green auto-transformer feeder station.

A423 Banbury Road main compound (see Ladbroke and Southam area (CFA16) for more information)

2.3.52 The A423 Banbury Road main compound is not located within the Stoneleigh, Kenilworth and Burton Green area, but will provide management support to all rail

installation works and five of the six rail system satellite compounds within this area (refer to Figure 4).

Rail systems satellite compounds

2.3.53 Table 5 details the principal activity, start date and approximate duration, number of workers, and highway access route for each of the associated railhead satellite compounds within the area.

Table 5: Satellite rail systems compounds within the Stoneleigh, Kenilworth and Burton Green area

Compound name	Principal Construction Activity	Start Date	Estimated Duration of Use	Number of Workers (ave/peak)	Highways Access Route
Start of the Stoneleigh, Kenilworth and Burton Green CFA to Stoneleigh Business Park					
Furzen Hill auto-transformer satellite compound	Installation of Furzen Hill auto-transformer station	2022	1 year, 3 months	27/38	Furzen Hill auto-transformer station access road, A445 Leicester Lane, Westhill Road, Bericote Road, A452 Chester Road, and then onto the A46 and M40.
Finham Brook viaduct to Canley Brook viaduct					
Coventry to Leamington Spa Line satellite compound 1	Facilitate the Coventry to Leamington Spa Line classic railway installation works	2018	8 months	35/48	Realigned private access road to A429 Kenilworth Road, south west on Stoneleigh Road and then southbound on the A46 to join the M40.
Coventry to Leamington Spa Line satellite compound 2	Facilitate the Coventry to Leamington Spa Line classic railway installation works	2018	8 months	35/48	Realigned private access road to A429 Kenilworth Road, south west on Stoneleigh Road and then southbound on the A46 to join the M40.
Crackley auto-transformer satellite compound	Installation of Crackley auto-transformer station	2022	1 year, 3 months	27/38	Crackley ATS access road to A429 Kenilworth Road south west on Stoneleigh Road and then southbound on the A46 to join the M40.
Burton Green green tunnel to Waste Lane					
Burton Green green tunnel south portal satellite compound	Tunnel fit out	2023	11 months	9/12	Red Lane via the Burton Green Tunnel South Portal access road, north-west to join Hob Lane and then along Windmill Lane, Kelsey Lane onto the A452, before travelling north-eastwards to join the A45. Then west to the M42.
Burton Green auto-transformer feeder station satellite compound	Installation of Burton Green auto-transformer feeder station	2022	1 year, 6 months	33/58	Hodgett's Lane via the B4101 (Waste Lane) to, Kelsey Lane and onto the A452 before travelling north-eastwards to join the A45 and then west to the M42.

2.3.54 Further details on features and construction details for the Proposed Scheme can be found in Volume 1, including:

- descriptions of typical cuttings and embankments, and viaducts, Volume 1, Section 5.2 and 5.9 respectively);
- a general description of a green tunnel (Volume 1, Section 5.5);

- a description of typical tunnel portals (Volume 1, Section 5.6);
- descriptions of typical railway systems (Volume 1, Section 5.15-5.17); and
- typical construction techniques for the above and other scheme features (Volume 1, Section 6).

Construction waste and material resources

2.3.55 Forecasts of the amount of construction, demolition and excavation waste (CDEW) and waste from worker accommodation produced during the construction of the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area have been prepared and are presented in Volume 5: Appendix WM-001-000.

2.3.56 The majority of excavated materials that will be generated across the Proposed Scheme will be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, either with or without treatment.

2.3.57 Based on the mitigation earthworks design approach adopted for the Proposed Scheme, local excess or shortfall of excavated material within the Stoneleigh, Kenilworth and Burton Green area will be managed with the aim of contributing to the overall balance of excavated material on a route-wide basis. The overall balance of excavated material is presented in Volume 3, Section 14.

2.3.58 The quantity of surplus excavated material originating from the Stoneleigh, Kenilworth and Burton Green area that will require off-site disposal to landfill as excavation waste is shown in Table 6. This is the forecast quantity of contaminated excavated material that is chemically unsuitable for reuse within the Proposed Scheme.

2.3.59 The quantities of demolition, construction and worker accommodation site waste that will be reused, recycled and recovered (i.e. diverted from landfill) have been based on the landfill diversion performance of similar projects as follows:

- demolition waste: 90%;
- construction waste: 90%; and
- worker accommodation site waste: 50%.

2.3.60 The quantities of demolition, construction and worker accommodation site waste that will require off-site disposal to landfill are shown in Table 6.

Table 6: Estimated construction, demolition and excavation waste to landfill

Waste type	Estimated material quantities that will be generated (tonnes)	Estimated quantity of waste for off-disposal to landfill (tonnes)
Excavation	7,187,325	0
Demolition	19,859	1,986
Construction	44,843	4,484
Worker accommodation site	51	26
TOTAL	**7,252,078**	**6,496**

2.3.61 The assessment of the likely significant environmental effects associated with the disposal of CDEW and worker accommodation site waste has been undertaken for the Proposed Scheme as a whole (see Volume 3, Section 14).

Commissioning of the railway

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

Construction programme

2.3.63 A construction programme that illustrates indicative periods for the construction activities within Stoneleigh, Kenilworth and Burton Green, as described above is provided in Figure 5.

Figure 5: Indicative construction programme

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 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	1	2	3	4
Advance works																																				
Civil engineering works																																				
A46 Kenilworth Bypass Main Compound																																				
Cubbington cutting																																				
Cubbington embankment																																				
Stonehouse Cutting																																				
Agriculture Centre embankment																																				
Glasshouse Wood cutting																																				
Glasshouse Wood embankment																																				
B4115 Ashow Road																																				
Kenilworth cutting																																				
Dalehouse Lane embankment																																				
Crackley Road cutting																																				
Crackley Wood embankment																																				
Roughknowles Wood cutting																																				
Satellite Compounds																																				
A445 Leicester Lane overbridge satellite compound																																				
A445 Leicester Lane overbridge																																				
Stoneleigh Park retaining wall satellite compound																																				
Stoneleigh Park retaining wall																																				
B4113 Stoneleigh Road green overbridge																																				
River Avon viaduct (south and north) satellite compounds																																				
River Avon viaduct																																				
A46 Kenilworth Bypass overbridge satellite compound																																				
A46 Kenilworth Bypass overbridge																																				
Footpath K29 overbridge satellite compound																																				
Footpath K29 overbridge																																				
Finham Brook viaduct satellite compound																																				
Finham Brook viaduct																																				

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 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	1	2	3	4
Dalehouse Lane overbridge																																				
Coventry to Leamington Spa Line overbridge satellite compounds																																				
Millburn Grange Farm accommodation overbridge																																				
Coventry to Leamington Spa Line overbridge																																				
A429 Kenilworth Road overbridge																																				
Canley Brook retaining wall																																				
Canley Brook viaduct satellite compound																																				
Canley Brook viaduct																																				
Crackley Lane overbridge satellite compound																																				
Canley Brook viaduct																																				
Bridleway W164 overbridge																																				
Crackley Lane overbridge																																				
North Crackley Wood cutting																																				
Cromwell Lane satellite compound																																				
Footpath W168 overbridge																																				
Burton Green green tunnel (including portals)																																				
Burton Green retaining structure																																				
Black Waste Wood embankment																																				
B4101 Waste Lane overbridge satellite compound																																				
B4101 Waste Lane overbridge																																				
Burton Green retaining structure																																				
Rail infrastructure and systems works																																				
Kingsbury Road railhead (see CFA20)																																				
Track laying																																				
Burton Green auto-transformer feeder station satellite compound																																				
A423 Banbury Road Main Compound (see CFA16)																																				
Satellite Compounds																																				
Furzen Hill auto-transformer station satellite compound																																				
Coventry to Leamington Spa Line satellite compounds 1 and 2																																				
Crackley auto-transformer station satellite compound																																				

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 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	1	2	3	4
Burton Green green tunnel (south portal) satellite compound																																				
Commissioning																																				
Commissioning																																				

Key: Construction works Compound duration

2.4 Operation of the Proposed Scheme

Operational specification

2.4.1 Volume 1, Section 4.4 describes the envisaged operational characteristics of Phase One of HS2 as a whole and how they may change when Phase Two is also operational.

HS2 services

2.4.2 It is anticipated that initially there will be 11 trains per hour each way passing through the Stoneleigh, Kenilworth and Burton Green area in the morning and evening peak hours, and fewer during other times. The first trains of the day will leave the terminus stations no earlier than 05:00 Monday to Saturday (and 08:00 on Sundays) and the last will arrive no later than midnight.

2.4.3 It is anticipated that with Phase One in place the frequency of services could rise to 14 trains per hour each way during peak hours, and that with Phase Two in place the frequency could rise to 18 trains per hour each way during peak hours. The assessment of sound, noise and vibration has taken into account the frequency during Phase Two.

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

Maintenance

2.4.5 Volume 1, Section 4.4 describes the maintenance regime for HS2.

2.4.6 The intention is that inspections of the route will take place on a regular basis, at night when the railway is not operating. There will be routine preventative maintenance, including grinding and milling of the rails to keep them in good condition, and more periodic heavy maintenance as necessary.

Operational waste and material resources

2.4.7 Forecasts for the amount of operational waste produced annually during operation of the Proposed Scheme have been prepared and are presented in Volume 5, Appendix WM-001-000.

2.4.8 Railway station and train waste refers to waste that will arise at each station. It will include waste from station operations and passenger waste removed from trains at terminating stations. This has only been reported for areas along the route in which these stations will be located.

2.4.9 Rolling stock maintenance waste is that which will be generated by the relevant train operating company at rolling stock maintenance facilities. This has only been reported for the areas along the route in which these facilities will be located.

2.4.10 Track maintenance waste and ancillary infrastructure waste (for example waste from depots, signalling locations, operations and maintenance sites) has been estimated using an average waste generation rate per kilometre length of total track. For this reason, both track maintenance waste and ancillary infrastructure waste have been reported for each area along the route.

2.4.11 The quantity of operational waste that will be reused, recycled and recovered (i.e. diverted from landfill) has been based on landfill diversion performance data from Network Rail and other sources as follows:

- railway station and trains: 60%;
- rolling stock maintenance: 80%;
- track maintenance: 85%; and
- ancillary infrastructure: 60%.

2.4.12 On this basis, approximately 165 tonnes of operational waste will be reused, recycled and recovered during each year of operation of the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area. Approximately 33 tonnes will require disposal to landfill (see Table 7).

Table 7: Operational waste forecast for the Proposed Scheme

Waste source	Estimated quantity of waste generated per annum (tonnes)	Estimated quantity of waste for disposal to landfill per annum (tonnes)
Railway station and trains	0	0
Rolling stock maintenance	0	0
Track maintenance	183	27
Ancillary infrastructure	15	6
TOTAL	**198**	**33**

2.4.13 The assessment of the likely significant environmental effects associated with the disposal of operational waste has been undertaken for the Proposed Scheme as a whole (see Volume 3, Section 14).

2.5 Community forum engagement

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

2.5.2 The engagement undertaken within this CFA is summarised below. A series of community forum meetings and discussions with individual landowners, organisations and action groups were undertaken. Community forum meetings were held on:

- 2 April 2012 at Burton Green village hall;
- 26 June 2012 at St. Francis parish centre;
- 5 September 2012 at Burton Green village hall;
- 21 November 2012 at Burton Green village hall;
- 12 February 2013 at the Kenilworth centre; and
- 18 September 2013 at Burton Green village hall.

2.5.3 In addition to HS2 Ltd representatives, attendees at these community forum meetings typically included local residents (and residents groups), public

representatives, representatives of local authorities and parish and district councils, action groups, affected landowners and other interested stakeholders.

2.5.4 The main themes to emerge from these meetings were:

- effects on green belt designation;
- impacts of river and railway crossing at Crackley Gap;
- impacts on ancient woodlands, Stoneleigh Park, Little Poors Wood, Ancient Monuments and wildlife sites;
- impacts on the River Avon, Finham Brook, and Canley Brook;
- possibility of a tunnel at Burton Green, Stoneleigh and Kenilworth Golf Club;
- permanent and temporary land take needs including impacts on agricultural land and land uses;
- maintaining access to Dalehouse Lane;
- visual, noise and vibration effects;
- impacts on Kenilworth Golf Club;
- impacts of the feeder station in Burton Green and auto-transformer stations;
- impacts on the school and village in Burton Green;
- the amount and disposal of excavated materials;
- impacts on A46 Kenilworth Bypass and other highways during construction;
- construction: timeframe, construction compounds, road diversions, short and long-term impacts due to road adjustments; and
- security of HS2 during operation.

2.5.5 In addition to the engagement through the Community Forums, the draft ES and associated consultation were launched on 16 May 2013 for a period of 8 weeks and closed on the 11 July 2013. As part of these consultations, members of local communities and other interested parties were notified, provided with information and invited to engage on issues pertinent to the draft ES and the development of the scheme. Details of the local consultation events were provided on HS2 Ltd website, social media, posters at local venues, national and regional advertising and to properties within 1km of the Proposed Scheme. In the Stoneleigh, Kenilworth and Burton Green area consultations on the draft ES was held on the 10 June 2013 at Castle Farm Recreation Centre. HS2 Ltd staff attended the events, including engineers and environmental specialists, for members of the public to speak to.

2.5.6 Responses from the draft ES consultation have been analysed and an overview of those received and how the ES has taken account of responses is contained in the draft Consultation Summary Report (Volume 5: Appendix CT-001-000/3).

2.6 Route section main alternatives

2.6.1 The main strategic alternatives to the Proposed Scheme are presented in Volume 1, Section 10 and in Appendix: CT-002-000. The main local alternatives considered for the Proposed Scheme within the local area are set out within this section.

2.6.2 Since April 2012, as part of the design development process, a series of local alternatives have been reviewed within workshops attended by engineering, planning and environmental specialists. During these workshops, the likely significant environmental effects of each design option have been reviewed. The purpose of these reviews has been to ensure that the Proposed Scheme draws the right balance between engineering requirements, cost and potential environmental impacts.

Canley Brook crossing

2.6.3 Option B which involves the diversion of the Canley Brook is the preferred option which has been taken forward as part of the Proposed Scheme.

2.6.4 The January 2012 announced route included a crossing of Canley Brook, located just north of Kenilworth Road, which on further evaluation did not meet the flood risk requirements at this location. The January 2012 announced route is Option A and is the baseline against which the other options have been assessed. The following further three options were considered for Canley Brook crossing:

- Option B: divert the course of Canley Brook and its floodplain to cross the route some 600m north-west of its current location where the alignment would be 4m above the floodplain level;
- Option C: raise the route by 6m at Canley Brook to provide adequate clearance for a viaduct across the existing floodplain. This would also require a raising of the alignment for the A429 and the Coventry to Leamington Spa Line; and
- Option D: maintain the route as the January 2012 announced route, with a large inverted siphon beneath the Proposed Scheme that would accommodate Canley Brook flood condition flows.

2.6.5 Option C, which lifts the route by 6m was rejected on environmental grounds based on the resultant increased sound and visual intrusion for nearby housing.

2.6.6 Option D, which adopts an inverted siphon was rejected as being an excessively long-term maintenance liability.

2.6.7 Therefore, Option B, which relocates both Canley Brook and the proposed viaduct was selected as the preferred option and was taken forward within the Proposed Scheme for the Canley Brook crossing.

Finham Brook crossing

2.6.8 Option B provides an engineering solution that does not increase flood risk in the vicinity of the Finham Brook and is therefore the preferred option and has been taken forward as part of the Proposed Scheme.

2.6.9 The January 2012 announced route (Option A) included a crossing of Finham Brook which on further evaluation did not meet the flood risk requirements at this location.

This option is the baseline against which other options have been assessed. A further option (Option B) was also considered for the Finham Brook section of the route.

2.6.10 Option B will raise the route at Finham Brook 2m above the Proposed Scheme, raise the route at the A46 crossing by 3m and raise the Dalehouse Lane diversion by approximately 2m. It will not require any changes to the Coventry to Leamington Spa Line. Option B achieves an engineering solution for the provision of a viaduct across the Finham Brook floodplain without significant net increase in visual and noise intrusion and provides no increase in the current flood risk at this location. It was therefore taken forward within the Proposed Scheme.

Burton Green tunnel

2.6.11 Option B, a raise of the route with a cut and cover tunnel, is the preferred option being taken forward at Burton Green as part of the Proposed Scheme.

2.6.12 The January 2012 announced route through Burton Green (Option A) follows an existing disused railway cutting and is proposed within a 520m-long green tunnel. The vertical profile of the route is such that this will require significant excavation below the base of the existing cutting with a significant cover to the roof of the cut and cover tunnel. Seven options were considered for the Burton Green to Kenilworth section of the route, including three cut and cover tunnel options:

- Option B: raise the route by approximately 5m and reposition the cut and cover tunnel by extending it 50m to the south and reducing it by 50m to the north of the January 2012 announced route;
- Option C: raise the route to the north by approximately 5m but maintain the level of the January 2012 announced route to the southern end of the tunnel and reposition the 520m-long cut and cover tunnel by extending it by 50m to the south and reducing it by 50m to the north of the January 2012 announced route; and
- Option H: raise the route by approximately 5m and extend the cut and cover tunnel 50m to the south.

2.6.13 A further four bored tunnel options were considered:

- Option D: a short bored tunnel, from Broadwells Wood to Beanit Spinney incorporating cut and cover approaches at both the southern and northern extents with an approximate total length of 2.5km;
- Option E: a bored tunnel, from Broadwells Wood to Marlowes incorporating cut and cover approaches at both the southern and northern extents with an approximate total length of 6km;
- Option F: a bored tunnel from just north of Crackley Wood to Marlowes incorporating cut and cover approaches at both the southern and northern extents with an approximate total length of 7.4km; and
- Option G: a bored tunnel from close to the A46 to Marlowes incorporating cut and cover approaches at both the southern and northern extents with an approximate total length of 10.7km.

2.6.14 Option C was discounted as it provided fewer construction environmental benefits than Option B, which raises the line at both ends.

2.6.15 Option H would have greater construction impacts and costs due to the longer tunnel than Option B.

2.6.16 The most cost effective bored tunnel proposal considered was Option D. This bored tunnel mitigates much of the construction disturbance and community severance immediately within the village of Burton Green. It would also decrease the visual and noise impacts during operation.

2.6.17 Whilst the bored tunnel options would provide an overall reduction in environmental impacts during construction, they would provide only limited environmental improvement over the Proposed Scheme, in the long term, and would result in a significant increase in construction costs.

2.6.18 Therefore Option B, which would reduce the construction impact, facilitate landscape integration and save cost, whilst maintaining a broadly similar impact during operation as the January 2012 announced route was taken forward within the Proposed Scheme for the Burton Green green tunnel.

Line raise through South Cubbington Wood

2.6.19 A change has been adopted into the Proposed Scheme that has resulted in a raise in route in this the southern part of this area as far as Stoneleigh Road. Details relating to this change can be found within Section 2.6 of the Offchurch and Cubbington area (CFA17) Report.

Proposals from community forums

2.6.20 Seven proposals resulting from stakeholder engagement have been considered within the Stoneleigh, Kenilworth and Burton Green section of the route. Due consideration of the costs, and environmental impacts was given by the project to each of the proposals, which were:

- a 2.1km-long green tunnel from near Stonehouse Farm to the River Avon, assessed as significantly more complex to construct and would increase the construction cost and duration, would have higher whole-life (operational) costs, though with lower landscape impacts during operation;
- an extended 2.1km retained cutting from near Stonehouse Farm to the River Avon crossing, assessed as significantly more complex to construct and would increase the construction cost and duration;
- a 900m-long green tunnel from just south of the A46 Kenilworth Bypass to Dalehouse Lane, assessed as significantly more complex to construct and would increase the construction cost and duration, would have higher whole-life (operational) costs, though with lower landscape impacts during operation;
- a 2.5km-long green tunnel extending from just south of the A46 Kenilworth Bypass to the north of the A429 Kenilworth Road, assessed as significantly more complex to construct and would increase the construction cost and duration, would have higher whole-life (operational) costs, though would have

major reductions in landscape impacts during construction due to the removal of the Canley Brook diversion, also with lower landscape impacts during operation;

- a 3.2km-long bored tunnel incorporating cut and cover tunnel approaches from just south of the A46 Kenilworth Bypass to South Hurst Farm, assessed as significantly more complex to construct and would increase the construction cost and duration, would have higher whole-life (operational) costs, though would cause less disruption to existing infrastructure during construction, would have major reductions in landscape impacts during construction due to the removal of the Canley Brook diversion, also with lower landscape impacts during operation;
- a 200m-long green tunnel adjacent to Millburn Grange Farm, assessed as significantly more complex to construct and would increase the construction cost and duration, though with lower landscape impacts during operation; and
- a 250m-long green tunnel adjacent to Birches Wood Farm, assessed as significantly more complex to construct and would increase the construction cost and duration, though with lower landscape impacts during operation.

2.6.21 In summary, the proposed alternative options came out of the environmental appraisal generally with fewer significant operational environmental impacts than the proposed scheme, but in most cases with increased construction environmental impacts. In combination with the increased construction complexity and construction costs associated with the proposed alternative options, none of the alternative options have been incorporated into the Proposed Scheme.

3 Agriculture, forestry and soils

3.1 Introduction

3.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and an assessment of the likely impacts and significant effects as a result of the construction and operation of the Proposed Scheme. 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.

3.1.2 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC) 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.

3.1.3 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 the ecology and landscape and visual assessments (see Sections 7 and 9).

3.1.4 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 cultural heritage, ecology and landscape and visual assessment (see Sections 6, 7 and 9).

3.1.5 The main issue for farm holdings is the disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both its construction and operational phases. Key engagement has been undertaken with farmers and landowners affected by the Proposed Scheme to obtain factual information on the scale and nature of the farm and forestry operations and related farm-based uses.

3.1.6 Details of published and publicly available information used in the assessment, and the results of surveys undertaken within the Stoneleigh, Kenilworth and Burton Green area, are contained in Volume 5: Appendix AG-001-018.

3.2 Scope, assumptions and limitations

3.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

3.2.2 The study area for the agriculture, forestry and soils assessment covers all of the land that will 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 in the general locality, taken as 2km either side of the centre line of the Proposed Scheme.

3.2.3 Common assumptions that have been applied to the Proposed Scheme, such as the restoration of agricultural land to pre-existing quality, the handing back of land used temporarily to the original landowner and the non-replacement of capital items demolished, are set out in Volume 1. There are no assumptions or limitations that are specific to the assessment in this CFA.

3.3 Environmental baseline

Existing baseline

3.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Stoneleigh, Kenilworth and Burton Green 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.

Soils and land resources

Topography and drainage

3.3.2 The main topographical features within the study area are described in detail in the landscape and visual assessment (Section 9). The route of the Proposed Scheme passes into the south-east of the study area across the A445 Leicester Lane, Cubbington Heath at 70m to 80m above Ordnance Datum (AOD) and descends to the River Avon at 55m to 60m AOD. Towards the north-west the gently rolling country rises to a narrow plateau at Burton Green, at 130m AOD, forming a watershed between the Severn and Trent drainage systems. The softer rocks have been eroded and resistant bands of sandstone and conglomerate form prominent south-facing scarps.

3.3.3 The main drainage is by way of the River Avon, a tributary of the Severn, which meanders south-westwards, and by the River Sowe which flows southwards to join the Avon north-west of Stoneleigh Business Park. The River Avon and River Sowe have cut deep, wide, gently sloping valleys which are flanked by a series of flat river terraces. Their main tributary, the Finham Brook, flows north-eastwards into the River Sowe and has also cut deeply into the landscape.

Geology and soil parent materials

3.3.4 The main geological features are described in detail in Land quality (Section 8) and summarised in Volume 5: Appendix AG-001-018.

3.3.5 Superficial deposits, predominantly fluvial in origin, are present sporadically along the Proposed Scheme associated with surface watercourses. River terrace deposits (sand and gravel) and alluvium (silt and clay) are present associated with major surface watercourses to the north-west of Stoneleigh Business Park and to the north-west of Dalehouse Lane respectively. Alluvium is also present, associated with Canley Brook and one of its tributaries to the north-west of the A429 Kenilworth Road, and to the

east of Birches Wood Farm. A cover of the Oadby Till, a varied glacial deposit, extends from Burton Green to Little Beanit Farm in the north of the study area.

3.3.6 Sandstone of the Bromsgrove Sandstone Formation underlies the majority of the Proposed Scheme. Sandstones and occasional mudstones of the Kenilworth Sandstone Formation underlie the route from the south of the study area to Gooseberry Hall, Kenilworth. Northwards from Gooseberry Hall, the Proposed Scheme will be underlain by bedrock of the Tile Hill Mudstone Formation (mudstones with subordinate sandstones and rare lenses of conglomerate).

Description and distribution of soil types

3.3.7 The characteristics of the soils are described by the Soil Survey of England and Wales[8] and shown on the National Soil Map[9]. More detailed published information is also available for part of the study area[10]. The soils are grouped into associations of a range of soil types. They are described in more detail in Volume 5: Appendix AG-001-18 and their distribution is shown in Volume 5: Map Book – Agriculture, Map AG-02-018. The soils throughout this area are variable according to the topography and geology.

3.3.8 The Bromsgrove association is mapped on reddish Carboniferous sandstones to the south and west of Stoneleigh, along the Finham Brook and on rising ground north west of the A429 Kenilworth Road; it contains well drained reddish sandy loam soils over soft and hard sandstone, with deeper soils in places that are in Wetness Classes (WC)[11]; there are also some clay loam soils with slowly permeable subsoils in mudstone that experience slight seasonal waterlogging (WC II). In alluvium of the Finham Brook and its tributaries there is the clay loam textured Trent series (WC III).

3.3.9 From Furze Hill across the A445 Leicester Lane towards Stoneleigh Business Park on the Bromsgrove Sandstone Formation occur sandy loam soils over sandstone in the Rivington 1 association; the soils are well drained (WC I) but locally, similar soils over interbedded sandstone and mudstone are affected by groundwater (WC II).

3.3.10 Soils of the Wick 1 association are of limited occurrence on terraces of the River Avon north-west of Stoneleigh Business Park; they consist of deep sandy loams, mostly well drained (WC I) but with slight seasonal waterlogging where affected by groundwater (WC II). The association includes narrow strips of the clayey Fladbury series (WC IV) in alluvial valley bottoms bordering the River Avon.

3.3.11 Carboniferous reddish mudstones and interbedded sandstones form the subsoils along several sections of the proposed route north-westwards from the A46 Kenilworth Bypass; the soils of the Whimple 2 association consist of reddish clay loam over clay with slowly permeable subsoils and slight seasonal waterlogging (WC II), becoming wetter on higher ground in the west (WC III); locally, reddish sandy loam soils over sand or soft sandstone are well drained (WC I).

[8] 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.
[9] Cranfield University (2001), *The National Soil Map of England and Wales* 1:250,000 scale, National Soil Resources Institute, Cranfield University, UK.
[10] Beard, G.R. (1984), *Soils in Warwickshire V – Sheet SP27/37 (Coventry South)*. Soil Survey Record No. 81, Haprenden.
[11] The Wetness Class (WC) of a soil is classified in Appendix II of Hodgson, J.M. (1977), *The Soil Survey Field Handbook*. Soil Survey and Land Research Centre, Technical Monograph No.5, according to the depth and duration of waterlogging in the soil profile and has six bands ranging from Wetness Class I (well drained) to Wetness Class VI (permanently waterlogged).

3.3.12 Over the half kilometre at the north-western end of the CFA at Burton Green, are slowly permeable and seasonally waterlogged clay loam soils of the Salop (WC III to IV) and sandy clay loam to clay loam Beccles 3 associations (WC III) developed in Oadby Till.

Soil and land use interactions

Agricultural land quality

3.3.13 The principal soil/land use interaction in the study area is the quality of the agricultural land resource. The Agricultural Land Classification (ALC)[12] is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate and the site.

3.3.14 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. The two distinct soil characteristics within the area are the slowly permeable and seasonally waterlogged soils (Salop and Beccles 3 associations and the Fladbury series associations), and the well drained, light to medium loams of the Bromsgrove, Rivington 1, Wick 1 and Whimple 2 associations.

3.3.15 Climate in this part of England does not, in itself, place any limitation upon land quality, but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the land. The influence of climate on soil wetness is assessed by reference to median field capacity days (FCD) when the soil moisture deficit is zero, the soil WC and topsoil texture. Droughtiness is determined by comparing the available water capacity of the soil, adjusted for the crop, with the moisture deficit for the locality for two crops, winter wheat and potatoes.

3.3.16 The local climatic factors have been interpolated from the Meteorological Office's standard 5km grid point dataset at two points within the Stoneleigh, Kenilworth and Burton Green area, set out in Volume 5: Appendix AG-001-018. Climate varies across the local area with altitude, between the lower ground at 60m to 80m AOD to the south-east of Finham Brook, and higher ground at 80 to 130m AOD between Finham Brook and Burton Green. Field capacity days (FCD) are from 141 days to 160 days, with the longer periods above 150 days being on the higher ground. This is around the average for lowland England (150 days), which is considered to be quite favourable for providing opportunities for agricultural cultivations and soil handling.

3.3.17 The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and erosion. Each soil can be allocated a (WC) based on soil structure, evidence of waterlogging and the number of days the soils are at field capacity; the topsoil texture then determines its ALC Grade. Light loamy soils over sandstone of the Bromsgrove and Rivington 1 associations and deep light loamy and sandy soils of the Wick 1 association are permeable and largely well drained (WC I) or have slight seasonal waterlogging (WC II) where affected by fluctuating groundwater, and in all cases are without a wetness limitation. Land with soils typical of the

[12] 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*.

Whimple 2 association with a medium clay loam topsoil will be limited to Grade 2 if in WC II, or to Subgrade 3a if in WC III. Seasonally waterlogged soils (WC III) of the Salop and Beccles 3 associations will be limited to Subgrade 3a where the topsoil is medium clay loam, but Subgrade 3b where heavy clay loam; in wetter situations (WC IV) both medium and heavy clay loam topsoil textures will limit the land to Subgrade 3b.

3.3.18 Soil texture and structure determine the available water capacity of the soil profile. The ability of the soil profile to hold sufficient water for optimum crop growth of wheat and potatoes can be calculated and the degree of droughtiness, i.e. shortfall of water, can be derived. The medium loam over clay soils of the Whimple 2, Salop and Beccles 3 associations have sufficient moisture reserves in an average year to have no droughtiness limitation, or only a slight one that limits the land to Grade 2; light textured soils of the Bromsgrove, Rivington 1 and Wick 1 associations, however, tend to have a smaller available water capacity. Dominantly light loamy soils limit the land to Grade 2 or Subgrade 3a depending on the stone content and depth over sandstone or gravels; sandy soils are Subgrade 3a or 3b, again depending on the stone content. Where irrigation facilities are available, and irrigation is a current or recent practice, this is taken into account and may raise the grade as the potential range and yield of crops (particularly horticultural and root crops) are increased.

3.3.19 Gradient and micro-relief are not limiting to agriculture in this area. Flooding is restricted to the floodplains of the Avon, Sowe, Finham Brook and their tributaries. The duration, frequency and timing of flood events are not considered limiting to agricultural land quality in this area.

3.3.20 Overall, the assessment of agricultural land quality required permanently in the study area indicates that it is almost entirely (98%) BMV land in Grade 2 (59%) and Subgrade 3a (39%), with a small proportion of non-BMV land in Subgrade 3b (2%).

3.3.21 Grade 2 land occurs on the sandy loam soils of Wick 1 association and some of the better drained soils of the Whimple 2 association with slowly permeable subsoils, and the deeper soils of the Bromsgrove and Rivington 1 associations; the main limitation is droughtiness due to a moderately small available water capacity.

3.3.22 On shallower soils over sandstone in the Bromsgrove and Rivington 1 associations and stony soils of the Wick 1 association, small to moderately small available water capacities increase the droughtiness limitation to Subgrade 3a. Where soil wetness is accompanied by heavier topsoil textures, these features become the main limitation restricting the range of crops. Within the Whimple 2 association, the limitation for the dominant soil is only moderate in an area with FCD values of over 150 days and the land is allocated to Subgrade 3a. The alluvial Trent series (within the Bromsgrove association), with medium clay loam textures, is also in Subgrade 3a.

3.3.23 Within the seasonally waterlogged soils of the Salop and Beccles 3 associations, where the wetness/texture limitation is more restrictive and the safe working period shorter, the land is classed as Subgrade 3a with 3b where topsoil textures are heavy clay loam. Alluvial soils occupying the narrow floodplains of tributaries of the Avon, and a tributary of the Finham Brook are assessed as Subgrade 3b due to wetness.

Department for Environment, Food and Rural Affairs (Defra) mapping[13] shows that there is generally a high likelihood of encountering BMV land in the locality, which makes such land a resource of low sensitivity in this study area.

Other soil interactions

3.3.24 Soil fulfils a number of functions and services for society in addition to those of food and biomass production which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[14] and The Natural Choice: securing the value of nature[15], 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.

3.3.25 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. The value and sensitivity of the resources are assessed in Section 7, Ecology.

3.3.26 Flooding is limited to the floodplains of the rivers Avon, Sowe, Finham Brook and their tributaries, as set out in Section 13, Water resources and flood risk assessment. Flood Zone mapping shows there to be a significant risk of flooding in this area, with the soils functioning as water stores for flood attenuation, as well providing a habitat for ecology.

3.3.27 The presence of soil-borne cultural assets is detailed in Section 6, Cultural heritage. There are few known archaeological sites from the prehistoric periods but there are a small number of Roman sites, notably a Romano-British settlement. Most recorded soil-borne archaeology is located at Stoneleigh Abbey and its associated granges, and takes the form of late medieval remains of deserted settlements and field systems.

Land use

Land use description

3.3.28 Agricultural land use in the study area is dominated by arable crops based on wheat, barley and oil seed rape in rotation. This dominant land use is broken by grassland for stock rearing (cattle and sheep) as well as occasional woodlands (some substantial) and parkland.

3.3.29 A number of environmental designations potentially influence land use within the study area. The whole area is a nitrate vulnerable zone (NVZ), which is an area in

[13] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land.*
[14] Defra (2009), *Soil Strategy for England.*
[15] Defra (2011), *The Natural Choice: securing the value of nature.*

which nitrate pollution is a potential problem. Statutory land management measures apply which seek to reduce nitrogen losses from agricultural sources to water. Some agricultural land is also subject to management prescriptions associated with the Environmental Stewardship Scheme which seeks either generally (the Entry Level Scheme) or specifically (the Higher Level Scheme) to retain and enhance the landscape and biodiversity qualities and features of farm land. Holdings which have land entered into an agri-environment scheme are identified in Table 8.

3.3.30 The main parcels of woodland occur at Stoneleigh Park (CFA18/3), Crackley Wood (CFA18/13), and Broadwells Wood and Black Waste Wood (CFA18/15), as shown on Map AG-01-047 to 050 in Volume 5: Appendix AG-001-018. Woodland covers 13% of land in the study area, which is above the national average of 10%. Therefore, woodland in this area is a resource of low sensitivity.

Number, type and size of holdings

3.3.31 There are 22 holdings in the study area, as set out in Table 8. Six are mainly arable enterprises, with some grass for livestock and occasional small pockets of woodland. Two are given over to general cropping with both vegetables and salad crops included in arable rotations. Three support mainly livestock (predominantly sheep and cattle). Three are traditional mixed farms, one is given over to grassland and two are small areas of woodland. There are also five equestrian enterprises. The size of holdings varies quite considerably, with the largest being around 1,093ha and the smallest less than 1ha. The boundaries of the holdings are shown on Map AG-01-047 to 050 in Volume 5, along with the location of the main farm buildings.

3.3.32 Field drainage is very common throughout the study area and four holdings (CFA18/1, Furzen Hill Farm; CFA18/2, Park Farm; CFA18/3 Stoneleigh Park and CFA18/12, Cryfield Grange) can be irrigated. Many of the larger farm businesses support diversified activities including equestrian services and a range of lets (holiday, residential and commercial). Stoneleigh Park is a particularly diversified enterprise and offers field space and car parking for shows as well as demonstration plots for specialist agricultural events; a livestock market and livestock shows are also run at the central venue.

3.3.33 Table 8 sets out the sensitivity of individual holdings to change, which 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) and irrigation systems 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. The holding/reference name provides a unique identifier and relates to Map AG-01-047 to Map AG-01-050, given in Volume 5: Appendix AG-001-018.

Table 8: Summary of characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA18/1 Furzen Hill Farm	General cropping (cereals and vegetables)	404.7	Equestrian (commercial); holiday let; office facilities	ELS	High Irrigated
CFA18/2 Park Farm	General cropping (cereals and vegetables)	182.1	None	None	High Irrigated
CFA18/3 Stoneleigh Park	Mixed arable and livestock and woodland	223.4	Agricultural demonstration; livestock market; livestock and equestrian shows	No formal schemes	High Irrigated
CFA18/6* Stoneleigh Abbey	Woodland	3.0	None	None	Medium
CFA18/8 Kingswood Farm House	Equestrian (non-commercial)	6.5	None	None	Low
CFA18/9 New Kingswood Farm	Mainly arable and some livestock	36.5	Storage	ELS	Medium
CFA18/10 Dalehouse Farm	Equestrian (commercial)	12.5	None	None	High Equestrian
CFA18/11 Millburn Grange	Mixed arable and livestock	89.0	None	ELS	Medium
CFA18/12 Cryfield Grange	Mainly arable and some woodland	105.2	None	Woodland Grant Scheme	High Irrigated
CFA18/13 Crackley Farm	Mainly livestock (pedigree beef cattle)	40.5	None	None	Medium
CFA18/14* Birches Wood	Mixed arable and livestock (sheep and cattle)	5.1	Commercial unit	None	Low
CFA18/15 South Hurst and Bockendon Grange Farms	Mainly arable	1092.7	Residential let	ELS	Medium
CFA18/16* Burton Green Farm	Mainly arable	23.7	None	ELS	Medium
CFA18/17* Moat House Farm	Mainly arable	18.8	Equestrian (non-commercial)	ELS	Medium
CFA18/18 Little Beanit Farm	Mainly livestock (pedigree beef cattle)	59.0	Equestrian (commercial); holiday let; commercial unit	ELS	Medium
CFA18/19 Odnaull Farm	Equestrian (non-commercial)	2.4	None	None	Low
CFA18/20 Crabmill Farm	Mainly livestock (cattle and sheep)	3.1	None	None	Medium

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA18/21* Land adjacent to Waste Lane	Equestrian (non-commercial)	1.4	None	None	Low
CFA18/22 Land north-west of Waste Lane	Grassland	2.5	None	None	Medium
CFA18/23* Land to north of Red Lane	Mainly arable	2.5	None	None	Medium
CFA18/25 Little Poors Woods	Woodland	1.6	None	None	Low
CFA18/26 Land to south of Hodgett's Lane	Equestrian (non-commercial)	0.8	None	None	Low

* No farm impact assessment interview conducted; data estimated.

Future baseline

Construction (2017)

3.3.34 No committed developments have been identified in this area that will materially alter the baseline conditions in 2017 for agriculture, forestry and soils.

3.3.35 The future of agri-environment schemes is uncertain at present due to on-going reform of the Common Agricultural Policy. The majority of schemes seem likely to cease over the next two to three years and replacements are uncertain. Whilst this will remove a level of support from the agricultural industry that has been used to offset some of the costs incurred in managing land in an environmentally responsible manner, it is unlikely to materially alter the way agricultural land is managed in the future. Whilst some field margins may be cropped closer to hedgerows and stocking rates may increase in some locations, the stocking and cropping baseline set out in the previous section is unlikely to change significantly.

Operation (2026)

3.3.36 No committed developments have been identified in the Stoneleigh, Kenilworth and Burton Green area that will materially alter the baseline conditions in 2026 for agriculture, forestry and soils.

3.4 Effects arising during construction

Avoidance and mitigation measures

3.4.1 During the development of the design, the following measures have been incorporated to avoid or mitigate severance impacts on agriculture during construction. Access across the Proposed Scheme for agricultural vehicles will be provided by:

- overbridges at A445 Leicester Lane, B4113 Stoneleigh Road, B4115 Ashow Road, A46 Kenilworth Bypass, Dalehouse Lane, A429 Kenilworth Road, Crackley Lane and B4101 Waste Lane;

- an agricultural bridge at Millburn Grange (CFA18/11);
- a footpath underpass at South Hurst Farm (CFA18/15) widened to accommodate agricultural vehicles (Ref W168); and
- a footpath overbridge at Little Beanit Farm (CFA18/18) widened to accommodate agricultural vehicles.

3.4.2 In addition, there is a need to avoid or reduce environmental impacts to soils during construction. It is an essential element of the construction process that the soil resources from the areas required temporarily and permanently are stripped and stored so that land required temporarily for construction purposes which is currently in agricultural use can be returned to that use, where agreed, and to its pre-existing agricultural condition.

3.4.3 Subject to the adoption of good practice techniques in handling, storing and reinstating soils on land where agricultural or forestry uses are to be resumed, there will be no reduction in the long term capability which would downgrade the quality of disturbed land. Some land with heavier textured soils may require careful management during the aftercare period to ensure this outcome.

3.4.4 Compliance with the draft CoCP will avoid or reduce environmental impacts during construction. Of particular relevance to agriculture, forestry and soils are the following measures (see Volume 5: Appendix CT-003-000/1):

- the reinstatement of agricultural land which is used temporarily during construction to agriculture, where this is the agreed end use (draft CoCP, Section 6);
- the provision of a method statement for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This will include any remediation measures necessary following the completion of works (draft CoCP, Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events which may affect agriculture, forestry and soil resources during construction (draft CoCP, Section 16);
- arrangements for the maintenance of farm and field accesses affected by construction (draft CoCP, Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where practicable (draft CoCP, Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (draft CoCP, Sections 6 and 9);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (draft CoCP, Section 7);

- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (draft CoCP, Section 9);
- the adoption of measures to prevent, as far as reasonably practicable, the spread of soil-borne, crop and animal diseases from the construction area (draft CoCP, Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (draft CoCP, Sections 5 and 6).

Assessment of impacts and effects

3.4.5 The cessation of existing land uses will be required not only on the land on which permanent works will be sited, but also on that required temporarily to facilitate the delivery of those permanent works.

3.4.6 The land required for the Proposed Scheme and for its construction will, in places, sever and fragment individual fields and operational units of agricultural and forestry land. This will 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 structural disruption, and to incorporate inaccessible severed land as part of environmental mitigation works.

3.4.7 The timing and duration of various construction elements are set out in Section 2.3. Where land is restored to agricultural use, it will be subject to a further period of five years of managed aftercare to ensure stabilisation of the soil structure, where appropriate.

Temporary effects during construction

Impacts on agricultural land

3.4.8 During the construction phase, the total area of agricultural land used will be 248.5ha as shown in Table 9. Of this total, 76.6ha will be restored and available for agricultural use following construction.

Table 9: Agricultural land required the construction of the Proposed Scheme

Agricultural land quality	Area required (ha)	Percentage of agricultural land	Area to be restored (ha)
Grade 1	0.0	0%	0.0
Grade 2	147.1	59%	40.5
Subgrade 3a	97.5	39%	35.1
BMV SUBTOTAL	244.6	98%	75.6
Subgrade 3b	3.9	2%	1.0
Grade 4	0.0	0%	0.0
Grade 5	0.0	0%	0.0
TOTAL AGRICULTURAL LAND	248.5	100%	76.6

3.4.9 The disturbance during construction to 244.6ha of land of BMV quality is assessed as an impact of high magnitude, comprising more than 60% of the overall agricultural land requirement. Considering BMV land in this local area is a receptor of low sensitivity, the effect on BMV land is assessed as a moderate adverse effect of the Proposed Scheme, which is significant.

3.4.10 Following completion of the construction project, all temporary facilities will be removed and the topsoil and subsoil will be reinstated in accordance with the agreed end use for the land. Overall, it is estimated that there will not be any significant surplus of topsoil or subsoil material arising from the Proposed Scheme in the area, but if surplus soils are generated they will be used locally where land is to be restored to agriculture with slightly thicker topsoil and subsoil layers.

Nature of the soil to be disturbed

3.4.11 The sensitivity of the soils is greatest in relation to those which will be disturbed by construction activity and returned to an agricultural or other rural land-based use upon completion of the Proposed Scheme. The quantum of each disturbed soil type is less important than the sensitivity of particular soils to the effects of handling during construction and reinstatement of land.

3.4.12 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[16]. These principles will be followed throughout the construction period. The heavier (clayey and clay loam) and seasonally waterlogged Salop, Beccles 3 and Fladbury 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 impede successful reinstatement.

Impacts on holdings

3.4.13 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 will occur simultaneously at the start of the construction period and it is the combined effect of both that will have the most impact on the holding. In due course some agricultural land will be restored and the impact on individual holdings will reduce, but the following assessment focuses on the combined effect during the construction phase. The residual permanent effects are described at the end of this section.

3.4.14 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period are summarised in Table 10. This table shows the total area of land required on a particular holding in absolute terms and as a percentage of the total area farmed. It also shows the area of land that will be returned to the holding following the construction period. The scale of effect is based on the proportion of the holding required rather than the absolute area of land. The holding/reference name provides a unique identifier and relates to Volume 5: Map

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

Book – Agriculture, forestry and soils, Maps AG-01-047 to Map AG-01-50 and Volume 5: Appendix AG-001-018.

3.4.15 The effects of temporary severance during construction are judged on the ease and availability of access to severed land. For the most part these will be the same during and post construction but occasionally they will differ between the two phases. The disruptive effects, principally of construction noise and dust, are assessed according to their effects on land uses and enterprises. Full details of the nature and significance of effects are set out in Volume 5: Appendix AG-001-018. Where the total sum of the land required by ALC grade (as shown in Table 9) differs from the total sum of the land required by holding (as shown in Table 10), the difference is because some holdings are affected in more than one CFA and some holdings include non-agricultural land. The combined impact on holdings is reported once in the CFA report where the main holding is located.

Table 10: Summary of temporary effects on holdings during construction

Holding reference/name	Total area required	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA18/1 Furzen Hill Farm	25.1ha – 6% Low	Medium	Medium	Major/Moderate adverse	11.3ha
CFA18/2 Park Farm	19.4ha – 11% Medium	Medium	Medium	Major/Moderate adverse	6.9ha
CFA18/3 Stoneleigh Park	54.2ha – 24% High	Medium	Medium	Major adverse	18.6ha
CFA18/6* Stoneleigh Abbey	0.2ha – 8% Low	Negligible	Low	Minor adverse	0.0ha
CFA18/8 Kingswood Farm House	2.6ha – 40% High	Negligible	Medium	Moderate adverse	0.9ha
CFA18/9 New Kingswood Farm	11.2ha – 31% High	Medium	Medium	Major/Moderate adverse	1.7ha
CFA18/10 Dalehouse Farm	7.6ha – 61% High	Negligible	Medium	Major adverse	0.3ha
CFA18/11 Millburn Grange	17.5ha – 20% Medium	Low	Medium	Moderate adverse	2.6ha
CFA18/12 Cryfield Grange	33.4ha – 32% High	Negligible	Low	Major adverse	4.3ha
CFA18/13 Crackley Farm	8.7ha – 21% High	Negligible	Low	Major/Moderate adverse	0.0ha
CFA18/14* Birches Wood	1.7ha – 33% High	Negligible	Low	Moderate adverse	0.4ha
CFA18/15 South Hurst and Bockendon Grange Farms	47.2ha – 4% Negligible	Low	Medium	Moderate adverse	4.8ha

Holding reference/name	Total area required	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA18/16* Burton Green Farm	8.3ha – 35% High	Negligible	Negligible	Major/Moderate adverse	6.0ha
CFA18/17* Moat House Farm	3.0ha – 16% Medium	Negligible	Negligible	Moderate adverse	0.0ha
CFA18/18 Little Beanit Farm	17.4ha – 30% High	Low	Medium	Major/Moderate adverse	8.5ha
CFA18/19 Odnaull Farm	2.1ha – 88% High	Negligible	Negligible	Moderate adverse	0.0ha
CFA18/20 Crabmill Farm	0.4ha – 12% Medium	Negligible	Low	Moderate adverse	0.1ha
CFA18/21* Land adjacent to B4101 Waste Lane	1.4ha – 97% High	Negligible	Low	Moderate adverse	0.9ha
CFA18/22 Land north-west of B4101 Waste Lane	0.4ha – 17% Medium	Negligible	Low	Moderate adverse	0.3ha
CFA18/23* Land to north of Red Lane	1.6ha – 65% High	Low	Negligible	Major/Moderate adverse	0.0ha
CFA18/25 Little Poors Woods	0.2ha – 15% Medium	Negligible	Negligible	Minor adverse	0.0ha
CFA18/26 Land to south of Hodgett's Lane	0.6ha – 75% High	Negligible	Medium	Moderate adverse	0.4ha

* No farm impact assessment interview conducted; data estimated.

3.4.16 Overall, it is considered that 20 holdings will experience moderate or major temporary effects during construction.

3.4.17 Two farms (CFA18/1, Furzenhill Farm and CFA18/2 Park Farm) have salad crops and vegetables in their rotations. These could be contaminated by dust generated during construction; however, the emission of dust during the construction phase will be controlled by implementing best practice set out in the draft CoCP, Section 7.

3.4.18 Two non-commercial equestrian interests (CFA18/21, Land adjacent to Waste Lane and CFA18/26, Land to south of Hodgett's Lane) will cease to operate as a result of the high proportion of land required during the construction phase.

Cumulative effects

3.4.19 No significant cumulative effects on agriculture, forestry and soils have been identified for the construction of the Proposed Scheme.

Permanent effects from construction

Impacts on agricultural and forestry land

3.4.20 Land used for the construction of the Proposed Scheme will fall into a number of categories when work is complete, as follows:

- part of the operational railway and kept under the control of the operator;
- returned to agricultural use (with restoration management);

- used for drainage or flood compensation which may also retain some agricultural use; or
- used for ecological and landscape mitigation.

3.4.21 Following construction and restoration, the area of agricultural land that will remain permanently required will be 171.8ha, as shown in Table 11.

Table 11: Agricultural and forestry land required permanently

Agricultural land quality	Permanent works	
	Area (ha)	% agricultural land
Grade 1	0.0	0%
Grade 2	106.6	62%
Subgrade 3a	62.4	36%
BMV SUBTOTAL	169.0	98%
Subgrade 3b	2.8	2%
Grade 4	0.0	0%
Grade 5	0.0	0%
TOTAL AGRICULTURAL LAND	171.8	100%
Forestry land	21.4	n/a

3.4.22 The permanent loss of 169.0ha of land of BMV quality is assessed as an impact of high magnitude, comprising more than 60% of the overall agricultural land requirement. As stated previously, BMV land in this area is a receptor of low sensitivity so that the permanent effect on BMV land is assessed as a moderate adverse effect of the Proposed Scheme, which is significant.

3.4.23 Areas proposed for ecological and landscape mitigation will be removed from mainstream agricultural production. These include an area of planting to connect existing woods to the south-east of Stoneleigh Park, an area of planting to the north of the River Avon viaduct (both affecting CFA18/3), mitigation areas and an area of woodland planting around the Finham Brook viaduct (affecting both CFA18/9, New Kingswood Farm and CFA18/10, Dalehouse Farm), an area of planting to connect Crackley with Roughknowles Wood (CFA18/12, Cryfield Grange) and a combination of an ecological mitigation area and an area of planting between the Proposed Scheme and the Kenilworth Greenway to the north of Broadwells Wood (CFA18/15, South Hurst and Bockendon Grange Farms).

3.4.24 Areas engineered to provide replacement floodplain storage will be subject to marginal downgrading in land quality and include agricultural land adjacent to the River Avon (CFA18/3) and Finham Brook (CFA18/11).

3.4.25 Areas of woodland that will be permanently affected include Broadwells, Crackley and Black Waste Woods, as well as woodland cover to the south-east of Stoneleigh Park. Overall, the total amount of forestry land required to implement the Proposed Scheme will be 21.4ha, out of the total permanent land area required for the operation of the Proposed Scheme of 231.1ha (9%), which is a medium impact.

The extent of the forest cover in the study area is more than the average national woodland cover (i.e. low resource sensitivity) and so, quantitatively, the loss of this woodland is considered as minor adverse effect of the Proposed Scheme, which is not significant. The qualitative assessment of loss is addressed in other relevant sections.

Impacts on holdings

3.4.26 The permanent effects of the Proposed Scheme on individual agricultural and related interests is summarised in Table 12. The land required column refers to the area of land permanently required to operate the Proposed Scheme (in absolute terms and as a percentage of the overall area farmed). The degree of impact is based on the proportion of land required. The effects of severance are judged on the ease and availability of access to severed land once construction is completed and the impact on farm infrastructure refers mainly to the loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises. Full details of the nature and scale of effects are set out in Volume 5: Appendix AG-001-018.

Table 12: Summary of permanent effects on holdings from construction

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA18/1 Furzen Hill Farm	13.7ha – 3% Negligible	Medium	Negligible	Major/Moderate adverse
CFA18/2 Park Farm	12.5ha – 7% Low	Medium	Negligible	Major/Moderate adverse
CFA18/3 Stoneleigh Park	35.6ha – 16% Medium	Medium	High	Major adverse
CFA18/6* Stoneleigh Abbey	0.2ha – 8% Low	Negligible	Negligible	Minor adverse
CFA18/8 Kingswood Farm House	1.7ha – 27% High	Negligible	Negligible	Moderate adverse
CFA18/9 New Kingswood Farm	9.5ha – 26% High	Medium	High	Major/Moderate adverse
CFA18/10 Dalehouse Farm	7.3ha – 58% High	High	Negligible	Major adverse
CFA18/11 Millburn Grange	14.9ha – 17% Medium	Low	High	Major/Moderate adverse
CFA18/12 Cryfield Grange	29.1ha – 28% High	Negligible	Negligible	Major adverse
CFA18/13 Crackley Farm	8.6ha – 21% High	Negligible	Negligible	Major/Moderate adverse
CFA18/14* Birches Wood	1.3ha – 26% High	Negligible	Negligible	Moderate adverse
CFA18/15 South Hurst and Bockendon Grange Farms	42.4ha – 4% Negligible	Low	Negligible	Minor adverse
CFA18/16* Burton Green Farm	2.3ha – 10% Low	Negligible	Negligible	Minor adverse

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA18/17* Moat House Farm	3.0ha – 16% Medium	Negligible	Negligible	Moderate adverse
CFA18/18 Little Beanit Farm	8.9ha – 15% Medium	Low	High	Major/Moderate adverse
CFA18/19 Odnaull Farm	2.1ha – 86% High	Negligible	High	Moderate adverse
CFA18/20 Crabmill Farm	0.3ha – 8% Low	Negligible	Negligible	Minor adverse
CFA18/21* Land adjacent to B4101 Waste Lane	0.4ha – 30% High	Negligible	Medium	Moderate adverse
CFA18/22 Land north-west ofB4101 Waste Lane	0.1ha – 4% Negligible	Negligible	Negligible	Negligible
CFA18/23* Land to north of Red Lane	1.6ha – 64% High	Low	Negligible	Major/Moderate adverse
CFA18/25 Little Poors Woods	0.2ha – 15% Medium	Negligible	Negligible	Minor adverse
CFA18/26 Land to south of Hodgett's Lane	0.2ha – 22% High	Negligible	Negligible	Moderate adverse

* No farm impact assessment interview conducted; data estimated.

3.4.27 Overall, it is likely that 16 holdings will experience major or moderate permanent adverse effects from the construction of the Proposed Scheme, which are significant. Particularly on smaller holdings, these effects often result from a high proportion of the farm being required by the Proposed Scheme. It is considered that two agricultural enterprises will be rendered commercially unviable in their current form (CFA18/10, Dalehouse Farm and CFA18/13, Crackley Farm). Also a currently non-commercial equestrian holding (CFA18/19, Odnaull Farm) will cease to operate.

3.4.28 Non-residential agricultural buildings/structures that will become redundant as a result of constructing the Proposed Scheme occur at New Kingswood, Dalehouse and Odnaull Farms (CFA18/9, CFA18/10 and CFA18/19), as well as on land to the south of Hodgett's Lane (CFA18/26). Residential demolitions also occur at New Kingswood and Odnaull Farms. The effects of constructing the Proposed Scheme, particularly severance, is likely to have long-term implications for the diversified activities at Stoneleigh Park (CFA18/3), particularly the public demonstrations of new agricultural equipment in the field, possibly causing them to be relocated elsewhere.

3.4.29 Although financial compensation will 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.

Cumulative effects

3.4.30 No significant cumulative effects on agriculture, forestry and soils have been identified for the construction of the Proposed Scheme.

Other mitigation measures

3.4.31 Other mitigation measures include replanting areas of Jubilee Wood (adjacent to Crackley Wood) required by the Proposed Scheme at Cryfield Grange (CFA18/12); access provisions for holdings including Furzen Hill and New Kingswood Farms (CFA18/1 and CFA18/9) and replacement of farm infrastructure such as silage clamps at Stoneleigh Park, Millburn Grange and Little Beanit Farm (CFA18/3, CFA18/11 and CFA18/18).

3.4.32 Mitigation, including access provision for very large agricultural machinery may also be required to manage severance of public agricultural demonstration venues on farmland associated with Stoneleigh Park (CFA18/3). Financial compensation could also address this issue, although there can be no certainty that this would be used.

Summary of likely residual significant effects

3.4.33 Once the construction process is complete and land required temporarily has been restored as appropriate, the residual permanent loss of agricultural land will be 171.9ha, of which 169.1ha is BMV. This is assessed as a moderate adverse residual effect which is significant.

3.4.34 A total of 16 holdings has been identified that will experience major or moderate permanent adverse effects, which are significant. Of these, 14 are likely to remain as agricultural or rural businesses and the use of compensation payments to purchase replacement land or farm buildings could reduce the effects to not significant, if chosen. Two holdings are likely to be rendered commercially unviable by the Proposed Scheme (CFA18/10, Dalehouse Farm and CFA18/13, Crackley Farm). Demolitions including residential properties at two holdings (CFA18/9, New Kingswood Farm and CFA18/19 Odnaull Farm).

3.5 Effects arising from operation

Avoidance and mitigation measures

3.5.1 No measures are required to mitigate operational effects of the Proposed Scheme on agriculture, forestry and soils.

3.5.2 It is assumed that operational noise is not significant and/or will be attenuated where public agricultural demonstrations on farmland at Stoneleigh Park (CFA18/3) continue at the present locations.

Assessment of impacts and effects

3.5.3 Potential impacts arising from the operation of the Proposed Scheme will include:

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

3.5.4 The potential for significant effects on sensitive livestock receptors from noise has been assessed. No likely significant effects have been identified. The propensity of

linear transport infrastructure to harbour and spread noxious weeds is not only a consequence of the management of the highway and railway land, but also of the readiness of weed spread onto such land from adjoining land, which could be exacerbated with the effects of climate change. The presence of noxious weeds, ragwort in particular, will be controlled through the adoption of an appropriate management regime which identifies and remedies areas of weed growth which might threaten adjoining agricultural interests.

Summary of likely residual significant effects

3.5.5 No residual significant effects on agriculture, forestry and soils have been identified for the operation of the Proposed Scheme.

4 Air quality

4.1 Introduction

4.1.1 This section of the document provides as assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme, covering nitrogen dioxide (NO_2), fine particulate matter (PM_{10} and $PM_{2.5}$)[17] and dust.

4.1.2 With regard to air quality the main issues are anticipated to result from emissions of dust from the demolition of buildings, the construction of new structures and earthworks and possible transfer of dust and mud on to public highways from vehicles travelling to and from construction areas. In addition, there may be changes in concentrations of NO_2 and particulate matter due to changes in road traffic during the construction and operation of the Proposed Scheme.

4.1.3 Detailed reports on the air quality data and assessments for the Stoneleigh, Kenilworth and Burton Green area, as well as relevant maps are contained within Volume 5. These include:

- Volume 5: Appendix AQ-001-018;
- Volume 5: Map Book – Air quality, Map AQ-01-018; and
- Volume 5: Map Book – Air quality, Map AQ-02-018.

4.1.4 Maps showing the location of the key environmental features can be found in the Volume 2, CFA18 Map Book, Map series CT-10.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the air quality assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1), the SMR Addendum (Volume 5: Appendix CT-001-000/2) and appendices presented in Volume 5: Appendix AQ-001-018.

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

4.2.3 The assessment of impacts arising from construction dust emissions has been undertaken using the methodology based on that produced by the Institute of Air Quality Management (IAQM)[18]. It is important to note that this methodology provides a means of assessing the scale and significance of effects that is partly dependent on the approximate number of receptors within close proximity to the dust-generating activities. In doing so, it assigns a lower scale of effect to cases where the number of

[17] $PM_{2.5}$ and PM_{10} 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 micrometres in diameter.
[18] Institute of Air Quality Management, (2011), *Guidance on the assessment of the impacts of construction on air quality and the determination of their significance*.

properties is small, e.g. fewer than 10 properties. Thus, a single property cannot experience a 'significant effect' as defined by this methodology.

4.2.4 The assessment presented here reaches a conclusion that incorporates this concept of significance being proportional to the number of people affected. However, in cases where less than 10 properties are close to the construction activity, it will still be the case that mitigation in accordance with the draft CoCP will be applied. The assessment of construction traffic impacts has used traffic data that is based on the highest predicted monthly flows throughout the construction period (2017-2026). However, the assessment assumes 2017 vehicle emission rates and 2017 background pollutant concentrations. The reason for this is because both pollutant emissions from exhausts and background pollutant concentrations are expected to reduce year by year as a result of vehicle emission controls, and so the year 2017 represents the worst case for the assessment. Furthermore, it has been assumed that the changes in construction traffic would occur for the whole year. In many cases, this represents a pessimistic assumption as the duration of the proposed construction works may be much shorter.

4.3 Environmental baseline

Existing baseline

4.3.1 The environmental baseline reported in this section represents the existing air quality conditions identified within the study area. The main source of existing air pollution within the Stoneleigh, Kenilworth and Burton Green area is emissions from road traffic. The principal roads in the Stoneleigh, Kenilworth and Burton Green area are the A445 Leicester Lane, A46 Kenilworth Bypass, the A429 Kenilworth Road and the A429 Coventry Road. The Stoneleigh, Kenilworth and Burton Green area is predominantly rural.

4.3.2 Estimates for NO2, PM10 and PM2.5 concentrations have been obtained from UK-wide modelled pollution maps for 2012, published by the Department for Environment, Feed and Rural Affairs (Defra) in 2010[19]. These data provide estimates of background concentrations of NO2, PM10 and PM2.5 for 1km grid squares across the UK.

4.3.3 The Stoneleigh, Kenilworth and Burton Green area lies within the West Midlands region, in the administrative area of Warwickshire County Council (WCC) and the local authority areas of Warwick District Council (WDC), Coventry City Council (CCC) and Solihull Metropolitan Borough Council (SMBC).There is one continuous air quality monitoring site within the Stoneleigh, Kenilworth and Burton Green area. This site is an urban background site in Coventry Memorial Park, approximately 4.4km north-east of the centre line of the Proposed Scheme. NO2, PM10 and PM2.5 are measured at this site. Concentrations were below the relevant air quality standards for the 2008-2012 period.

4.3.4 Annual mean NO2 concentrations are also measured within the Stoneleigh, Kenilworth and Burton Green area, using diffusion tubes. Four diffusion tubes

[19] Defra (2010), Based Background Maps for NOx, NO2, PM10 and PM2.5; http://laqm.defra.gov.uk/maps/maps2010.html; Accessed 11 November 2013.

operated by WDC are in Kenilworth, approximately 2km south-west of the centre line of the Proposed Scheme. These are roadside sites, adjacent to roads in Kenilworth town centre. There were exceedences of the annual mean air quality standard at a number of the sites in 2009, 2011 and 2012. The concentrations in the mostly rural area surrounding the Proposed Scheme will be lower than at these sites as sources of emissions are more distant. Further details of these monitoring sites and the five-year trends in concentrations are available in Volume 5: Appendix AQ-001-018.

4.3.5 While the continuous monitoring and diffusion tube sites can be used to indicate trends in concentrations they are not considered to be representative of the predominantly rural area through which the Proposed Scheme will pass within the Stoneleigh, Kenilworth and Burton Green area. On this basis the Defra background concentrations maps have been used to characterise the baseline air quality for the study area. These maps indicate that the average background pollutant concentrations across the Stoneleigh, Kenilworth and Burton Green area are below the relevant air quality standards.

4.3.6 There are three air quality management areas (AQMA) within the Stoneleigh, Kenilworth and Burton Green area (see Volume 5: Map AQ-01-018), all of which have been declared due to exceedences of the annual average air quality standard for NO2 (40µg/m^3). Two of these AQMA are in Kenilworth, approximately 1.8km and 2.6km south-west of the centre line of the Proposed Scheme. The third AQMA is the city-wide AQMA declared by CCC. The south-west boundary of the city-wide AQMA is approximately 400m north-east of the centre line of the Proposed Scheme.

4.3.7 Human receptors that could potentially be affected by changes in air quality as a result of the Proposed Scheme have been identified. Air quality at these receptors could potentially be affected, due to their proximity to construction activities, to roads with vehicle flows that may change, or to roads that will be subject to realignment during the construction or operational phases of the Proposed Scheme. These locations are residential properties: along the A445 Leicester Lane, north-east of the Proposed Scheme; along the A445 Leicester Lane, south-west of the Proposed Scheme; along the B4113 Stoneleigh Road, Stoneleigh Park; adjacent to the A46 Kenilworth Bypass, Kenilworth; around Dalehouse Lane, Kenilworth; at Dalehouse Farm, Dalehouse Lane, Kenilworth; at Millburn Grange, off the A429 Kenilworth Road, Crackley; along the A429 Kenilworth Road, Crackley; along the A429 Coventry Road; at Birches Wood Farm, Crackley Lane; in Burton Green along Red Lane, Cromwell Lane and Hodgett's Lane; at Burton Green Primary School and along the B4101 Waste Lane, Balsall Common.

4.3.8 There are six ecological receptors with statutory or non-statutory designation, within the Stoneleigh, Kenilworth and Burton Green area, that could potentially be affected by construction dust or road traffic emissions due to the Proposed Scheme. These sites are the River Avon Local Wildlife Site (LWS); Kenilworth Road Spinney Local Nature Reserve (LNR) and LWS; Broadwells Wood LWS; Black Waste Wood LWS; Big Poors and Little Poors Wood LWS and Beanit Farm Hedge LWS. Further details of these sites are provided in Section 7, Ecology.

Future baseline

4.3.9 Section 2.1, Overview of the area and description of the Proposed Scheme; Volume 5: Appendix CT-004-000; and Volume 5: Map Book – Cross Topic Maps, Maps CT-13-047, CT-13-048, CT-13-049 and CT-13-050a identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the future baseline for the assessment of effects from the construction and operation of the Proposed Scheme. In this area, there are no 'committed developments' that are considered to introduce new receptors requiring air quality assessment.

4.3.10 The data used for the air quality assessment take account of predicted changes in traffic, which are derived from a combination of national traffic growth factors and consideration of major locally consented schemes, as described in Section 12.3, Traffic and transport.

Construction (2017)

4.3.11 Future background pollutant concentrations have been sourced from Defra background maps for 2017, which predict NO2 and PM10 levels in 2017 to be lower than in the 2012 baseline.

Operation (2026)

4.3.12 Future background pollutant concentrations have been sourced from Defra background maps for 2026, which predict NO2 and PM10 levels in 2026 to be lower than in the 2012 baseline.

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the CoCP, where appropriate. The draft CoCP (Volume 5: Appendix CT-003-000) includes a range of mitigation measures that are accepted by the IAQM as being suitable to reduce impacts to as low a level as reasonably practicable. It also makes provision for the preparation of Local Environmental Management Plans (LEMP) which will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

4.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP (Volume 5: Appendix CT-003-000) will 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;

- 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

4.4.3 Impacts from the 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 human receptors sensitive to dust and exposure to NO_2 and PM_{10}, as well as ecological receptors sensitive to dust.

4.4.4 An assessment of construction traffic emissions has been undertaken for two scenarios in the construction period: a Without the Proposed Scheme scenario and a With the Proposed Scheme scenario.

4.4.5 In the Stoneleigh, Kenilworth and Burton Green area, dust-generating activities will comprise demolition and the construction of new structures and earthworks, including the movement of materials along haul roads along the line of the Proposed Scheme, as well as potential dust and mud deposited on to public highways from vehicles travelling to and from construction areas.

4.4.6 A construction dust assessment was undertaken for the 12 locations where residential properties are located, at Burton Green Primary School on Hobs Road and at the location of the six ecological receptors, due to their close proximity to the dust generating activities identified. The locations with residential properties were: along the A445 Leicester Lane, north-east of the Proposed Scheme; along the A445 Leicester Lane, south-west of the Proposed Scheme; along the B4113 Stoneleigh Road, Stoneleigh Park; adjacent to the A46 Kenilworth Bypass, Kenilworth; around Dalehouse Lane, Kenilworth; at Dalehouse Farm, Dalehouse Lane, Kenilworth; at Millburn Grange, off the A429 Kenilworth Road, Crackley; along the A429 Kenilworth Road, Crackley; along the A429 Coventry Road; at Birches Wood Farm, Crackley Lane; in Burton Green along Red Lane, Cromwell Lane and Hodgett's Lane; and along the B4101 Waste Lane, Balsall Common.

4.4.7 The ecological receptors were: River Avon LWS; Kenilworth Road Spinney LNR) and LWS; Broadwells Wood LWS; Black Waste Wood LWS; Big Poors and Little Poors Wood LWS and Beanit Farm Hedge LWS.

4.4.8 Given the application of the mitigation measures set out within the draft CoCP, the construction dust assessment determined that of the locations where residential properties are present the magnitude of impact at properties along the A445 Leicester Lane, south-west of the Proposed Scheme; at Millburn Grange, off the A429 Kenilworth Road; properties in Burton Green along Red Lane, Cromwell Lane and Hodgett's Lane and along the B4101 Waste Lane will be slight adverse (which is not a significant effect), due to the presence of residential properties within 20m of the dust generating construction activities. The magnitude of impact will be negligible at the

other residential locations assessed. At Burton Green Primary School, Hobs Lane the magnitude of impact will be negligible. The magnitude of effect will be negligible at all of the ecological receptors.

4.4.9 Overall, the construction dust assessment determined that the air quality effects will not be significant. The basis for this conclusion is presented in full in Volume 5: Appendix AQ-001-018.

4.4.10 Construction activity could also affect local air quality through the emissions associated with additional traffic generated on roads as a result of construction traffic routes, temporary road realignments and changes to traffic patterns arising from temporary road diversions. Screening was undertaken to identify locations requiring assessment.

4.4.11 Six locations within the Stoneleigh, Kenilworth and Burton Green area met the criteria for more detailed assessment of change in traffic emissions during the construction phase. This assessment found that the predicted increase in construction traffic on the A46 Kenilworth Bypass, A429 Kenilworth Road, A429 Coventry Road and B4101 Waste Lane was sufficient to require assessment of changes in air quality at receptors around these roads. In addition, the proposed temporary road realignment on Cromwell Lane gave rise to the requirement for assessment at receptors around this road. These assessments found that the magnitude of impact will be negligible at all receptors assessed for NO2 and PM10.

4.4.12 Therefore, the effect on air quality due to construction traffic will not be significant. The basis for this conclusion is presented in full in Volume 5: Appendix AQ-001-018.

Permanent effects

4.4.13 There are no permanent effects anticipated to arise during construction of the Proposed Scheme.

Cumulative effects

4.4.14 There are no cumulative effects anticipated to arise during construction of the Proposed Scheme.

Other mitigation measures

4.4.15 No other mitigation measures during construction are proposed in relation to air quality in this area.

Summary of likely residual significant effects

4.4.16 The methods outlined within the draft CoCP to control and manage potential air quality effects are considered effective in this location and no residual significant effects are considered likely.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No mitigation measures are proposed during operation in relation to air quality in this area.

Assessment of impacts and effects

4.5.2 There are no direct atmospheric emissions from the operation of trains that will cause an impact on air quality. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

4.5.3 The assessment of operational traffic emissions has been undertaken for two scenarios in the operation year 2026: a without the Proposed Scheme scenario and a with the Proposed Scheme scenario.

4.5.4 Traffic data for the Stoneleigh, Kenilworth and Burton Green area were screened to identify roads that required an assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in 2026.

4.5.5 Six locations within the Stoneleigh, Kenilworth and Burton Green area met the criteria for an assessment of emissions from traffic during the operational stage, following completion of the Proposed Scheme. These locations were the A445 Leicester Lane; the B4113 Stoneleigh Road, Stoneleigh Park; Dalehouse Lane, Kenilworth; the A429 Kenilworth Road, Crackley; Crackley Lane, Kenilworth; and B4101 Waste Lane, Balsall Common. There will be permanent road realignments at all these locations, which required assessment of changes in concentrations at receptors around these roads. The assessment at receptors around these roads found that the magnitude of impact will be negligible at all receptors assessed for NO_2 and PM10.

4.5.6 The effect on air quality following completion of the Proposed Scheme will not be significant. The basis for this conclusion is presented in full in Volume 5: Appendix AQ-001-018.

Cumulative effects

4.5.7 There are no cumulative effects anticipated to arise during operation of the Proposed Scheme.

Other mitigation measures

4.5.8 No other mitigation measures are proposed in relation to air quality in this area during operation.

Summary of likely residual significant effects

4.5.9 No residual significant effects are anticipated for receptors as a consequence of changes to air quality in this area during operation of the Proposed Scheme.

5 Community

5.1 Introduction

5.1.1 This section reports the impacts and likely significant effects on local communities resulting from the construction and operation of the Proposed Scheme.

5.1.2 Key issues concerning the community for this study area comprise:

- the demolition of residential properties at Stoneleigh and Burton Green;
- the demolition of Burton Green village hall;
- the loss of land from some private residential properties along the line of the route of the Proposed Scheme;
- changes in amenity for residents living close to the Proposed Scheme, and associated construction works or construction traffic routes;
- impacts on users of key recreational routes in the area which are crossed by the Proposed Scheme, including the Coventry Way, the Centenary Way, the 'Connect2Kenilworth' Sustrans national cycle route No. 52, the Kenilworth Greenway and the Millennium Way;
- impacts on recreational and open space facilities due to the loss of land including public open space at Stoneleigh, the showground at Stoneleigh Park, and Kenilworth Golf Club; and
- disruption to local journeys and day to day access to facilities in the area, due to construction works, particularly at Burton Green.

5.1.3 Further details of the community assessments and write-ups of open space surveys and recreational public right of way (PRoW) surveys undertaken within the CFA are contained in Volume 5: Appendix CM-001-018.

5.1.4 Community assessment maps are provided in Volume 5: Maps CM-01-108 to CM-01-111.

5.1.5 The assessment draws upon information gathered from a combination of desk top studies and site surveys and through engagement with local organisations, including Warwickshire County Council, parish councils, Stoneleigh Park and the charitable trust responsible for the management of the Burton Green village hall.

5.2 Scope, assumptions and limitations

5.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

5.2.2 Construction worker accommodation will be located at the A46 Kenilworth Bypass overbridge main compound which will be sited on land between the B4115 Ashow Road and the A46 Kenilworth Bypass near Stoneleigh. Construction worker impacts on community resources are considered at a route-wide level in Appendix

CM-002-000. The assessment takes into account the number of workers, the type and location of accommodation, working hours, facilities provided on construction compounds and experience from other large projects (such as HS1) and the measures contained in the Draft CoCP. On this basis it is concluded that there will be no significant effects associated with construction worker accommodation.

5.3 Environmental baseline

Existing baseline

5.3.1 Baseline data on community resources was collected up to 1km from the centre line of the Proposed Scheme and, additionally, up to 250m from the boundary of land required for construction.

5.3.2 The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme, together with a wider corridor within which receptors or resources could be affected by a combination of residual significant effects, such as noise, vibration, construction dust, poor air quality and visual intrusion. In addition, the study area has regard to the proposed routeing of construction traffic and takes account of catchment areas for community facilities which could be affected where crossed by the Proposed Scheme. Overall the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme.

5.3.3 The study area includes the main settlements of Stoneleigh in the south-east and Burton Green in the north-west. The outer edges of Kenilworth and Coventry, in the centre of the study area, extend up to the boundary of land required for the Proposed Scheme at Crackley and at Gibbet Hill. The outer edge of Balsall Common, in the vicinity of Catchems Corner is within the very northern part of the study area, this area is referred to as the Beechwood area within this section of the report.

Stoneleigh

5.3.4 Stoneleigh is the main settlement in the south-eastern part of the study area; it has a small range of facilities, including a village hall, recreation ground, sports pavilion, church and a social club. Stoneleigh has no shop, school or General Practitioner (GP) surgery. The centre of the village is about 1km north-east of the route of the Proposed Scheme and is beyond the corridor within which receptors are likely to be affected by amenity effects or land take required for the construction and operation of the Proposed Scheme. The village falls within the catchment area for primary and secondary schools at Kenilworth and for GP surgeries at both Coventry and Kenilworth. The small residential hamlet of Stareton lies about 1.5km south-east of Stoneleigh village and within 400m of the route of the Proposed Scheme as it approaches Stoneleigh Park from the south-east. The hamlet has no facilities and falls within the catchment for schools and other facilities at Kenilworth. Stoneleigh Park, formerly known as the National Agricultural Centre, is situated about 1km south-west of Stoneleigh Village and is partly within the area of land required for the Proposed Scheme. The Stoneleigh Park showground site is used typically for over 100 conferences, events, shows and exhibitions each year. Effects of the Proposed Scheme upon businesses at Stoneleigh Park are assessed within Section 10 – Socio economics. The Wren Day Nursery is situated within the grounds of Stoneleigh Park,

beyond the area required for the Proposed Scheme. A number of residential properties are located close to the East Gate entrance to Stoneleigh Park; some of these are within or adjoining the area of land required for the Proposed Scheme.

5.3.5 Land to the south of the B4113 Stoneleigh Road opposite the East Gate entrance to Stoneleigh Park is also used to provide additional car parking for events at Stoneleigh Park. This land is also used as the venue for the Kenilworth Show, which is a major agricultural show held annually, attracting about 8,000-10,000 each year.

5.3.6 There are numerous open spaces and recreational facilities in the Stoneleigh area. Much of the estate parkland, which wraps around the eastern edge of Stoneleigh Park, is accessible to the public. It comprises a mix of natural and semi-natural green spaces, crossed by a number of public footpaths and other established walking routes, including the Centenary Way and Coventry Way. The parkland extends to both sides of the B4113 Stoneleigh Road and a small part of the open space lies within the area of land required for the Proposed Scheme.

5.3.7 A number of rural properties along the A445 Leicester Lane in the vicinity of Furzen Hill Farm and Stone House Farm to the north of Cubbington are also included within this part of the study area.

Edge of Kenilworth

5.3.8 Some of the residential properties on the edge of Kenilworth lie within or close to the land required for the construction and operation of the Proposed Scheme, and have therefore been included within the study area for this topic assessment.

5.3.9 The centre of Kenilworth is about 1.7km away at its closest point and is beyond the study area for this assessment. There are numerous public open spaces in the countryside on the edge of the town. The Kenilworth Golf Club is immediately to the west of the route and falls partly within the land required for the construction of the Proposed Scheme. The shared route of the Coventry Way and Centenary Way (Footpath K29) long distance path passes through the Golf Club and will be crossed by the Proposed Scheme. The Centenary Way is a 158km route that runs from Shipston-on-Stour in the south to Kingsbury in the north passing through Stoneleigh and Kenilworth, whilst the Coventry Way is a 64km circular route around the outskirts of Coventry, passing through Stoneleigh, Kenilworth and Burton Green. Crackley Wood is designated as a Local Nature Reserve and provides trails or walks that are accessible to the public. It lies just beyond the study area for the assessment.

5.3.10 The Kenilworth Greenway, which runs along the route of the dismantled Kenilworth to Balsall line, is a well-used and valued recreational route connecting Kenilworth with Burton Green and onwards to Balsall Common. The route, which is managed by WCC as a country park, is a permissive bridleway and serves as a public footpath, cycleway and horse-riding route. The Greenway is also used as part of the route for the Coventry Way, between Crackley and Beechwood in the north, as well as forming part of the Sustrans National Cycle Route No. 523. In 2012, a new footpath and cycleway was opened near Crackley, providing a convenient link between the Greenway and the edge of Coventry in the vicinity of the University of Warwick. This link (PRoW W164), which is known as the 'Connect2Kenilworth project' now forms part of the Sustrans

National Cycle Route No. 52. It will be crossed by the Proposed Scheme at a point midway between the Kenilworth Greenway and Cryfield Grange Road to the north.

5.3.11 Also at Crackley, there is a dedicated cycle lane that runs along the verge of the A429 Coventry/Kenilworth Road. The A429 is identified by WDC as a showcase route for multi-modal travel and the cycle lane is promoted by Sustrans as the Coventry-Crackley Path, albeit not part of the Sustrans National Cycle Network. The A429 and the cycle path along its verge are crossed by the Proposed Scheme to the north-east of Crackley Crescent.

Edge of Coventry

5.3.12 The administrative boundary of CCC extends almost to the outer limit of the area of land required for construction of the Proposed Scheme at Gibbet Hill. This area comprises a mix of residential properties set in spacious landscaped grounds. These properties lie outside of the area of land required for the Proposed Scheme.

5.3.13 The University of Warwick is a major land use to the north-west of Gibbet Hill. Whilst the Campus site lies beyond the area of land required for the Proposed Scheme or the study area for amenity effects, a significant proportion of the University's students travel in from Kenilworth and Leamington Spa. Some of these travel routes will be crossed by the Proposed Scheme.

5.3.14 Community facilities, residential properties and open spaces on the southern edge of Coventry at Westwood Heath are just over 1km from the Proposed Scheme and are beyond the study area for the assessment. It is recognised that some residents in this area send their children to the nurseries and/or primary school at Burton Green and this has been taken into account in the isolation assessments of those facilities.

Burton Green

5.3.15 The route of the Proposed Scheme passes through the centre of Burton Green. A number of residential properties, the village hall and the Kenilworth Greenway are within or adjoining the area of land required for the construction and operation of the Proposed Scheme. Burton Green has a limited range of community facilities, notably a primary school on the south side of the village; two day care nurseries, one on either side of the village; a village hall on the west side of the village, together with a pub to the north. The village has no shop, church or GP surgery and no public open space, with the exception of a small children's play area, off Red Lane and the Kenilworth Greenway which passes through the centre of the village. The village falls within the catchment for the secondary school at Kenilworth, although children are also eligible for places at Balsall Common to the north-west. The nearest GP surgeries are at Balsall Common and at Tile Hill on the south-west edge of Coventry.

5.3.16 The Burton Green Church of England Primary School is situated south-west of the route for the Proposed Scheme. The school has capacity for about 105 pupils and approximately 36% of pupils attend from the village itself with the others travelling from further afield including from Tile Hill and Westwood Heath on the southern edge of Coventry and to a lesser extent from Kenilworth.

5.3.17 The Burton Green village hall lies alongside the route of the Proposed Scheme and within the boundary of land required for its construction and operation. The hall is a

well used and valued facility. The boundary of the land required for the construction and operation of the Proposed Scheme runs adjacent to the Two Oaks Day Nursery, which is situated at Red Lane on the south side of the village. This nursery opens daily (Mondays to Fridays) and accommodates about 26 children, drawn from a catchment covering the entire village of Burton Green, as well as from Kenilworth, Balsall Common and the edge of Coventry. The Two Oaks Nursery is set in about 2ha of grounds which are used as an outdoor educational resource. The Hedgerow Nursery at Cromwell Lane and the Peeping Tom public house are to the north of the route of the Proposed Scheme. The catchment for the nursery includes the entire village as well as Kenilworth, Tile Hill, Coventry and Balsall Common. The Kenilworth Greenway passes through the centre of the village and there is a pedestrian access point to the Kenilworth Greenway from the east side of Cromwell Lane. Approximately 2km of the Greenway in this area lies within the boundary of land required for the construction and operation of the Proposed Scheme.

Beechwood

5.3.18 The residential hamlet of Beechwood lies about 1km to the north of Burton Green. The Proposed Scheme crosses the B4101 Waste Lane between Catchems Corner in the south-west and the main are of Beechwood to the north-east. A number of residential properties lie within or close to the boundary of land required for the Proposed Scheme. The hamlet lacks any day-to-day community facilities and residents travel to Berkswell or Balsall Common for schooling and the nearest GP surgery.

5.3.19 The Millennium Way long distance route passes through the Beechwood area and is crossed by the Proposed Scheme to the north of the B4101 Waste Lane. This Footpath (PRoW M198) forms part of a 160km long distance trail that runs through Kenilworth and Leamington Spa, crossing the Kenilworth Greenway and joining with a section of the Coventry Way, heading north through the gap of countryside between Balsall Common and Coventry.

5.3.20 Nailcote Hall Hotel, Golf and Country Club lies to the north-east of the village and includes a health club and golf course which has public membership.

Future baseline

Construction (2017)

5.3.21 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017. Within this study area, outline planning permission (Planning Ref: W/12/0766) has been granted for the redevelopment of part of the Stoneleigh Park site, which will include provision for a new visitor centre, café, office buildings and a national equine centre. The illustrative master plan for the site indicates that some of these facilities could be sited within the area of land required for the construction and operation of the Proposed Scheme.

5.3.22 At the Kenilworth Golf Club, permission has been granted for an extension to the golf course (Planning Ref: W/13/0018) in the vicinity of New Kingswood Farm. The site lies partly within the area of land required for the Proposed Scheme.

Operation (2026)

5.3.23 The review of future baseline conditions has not identified any additional committed developments, within the study area, which will be completed by the opening year of operation.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 The following measures have been incorporated into the Proposed Scheme's design as part of the design development process to avoid or reduce the environmental effects during construction:

- making slight adjustments to the route of the Proposed Scheme through Burton Green to avoid the need for the demolition of residential properties to the north of the route;
- reprofiling earthworks to reduce the amount of land required for the construction of the Proposed Scheme, including from residential properties and along the boundary of the Kenilworth Golf Club at Dalehouse Lane;
- amending the design for the realignment of Dalehouse Lane, at Kenilworth and the B4101 Waste Lane at Beechwood to reduce the need for disruptive road closures;
- making provision for both temporary and permanent diversion routes for recreational PRoW routes to maintain continuity of use wherever practicable, including for the Kenilworth Greenway;
- providing landscaping alongside the Greenway to help recreate the Greenway character;
- redesigning the highway layout in the vicinity of Stoneleigh Park, to take account of future access requirements for the site and incorporating a retained cutting to reduce the amount of land that will be lost to the Proposed Scheme;
- incorporating measures to enable one running lane of traffic to be maintained at Cromwell Lane during the construction period and to reduce the likelihood of lengthy road closures;
- routing of construction traffic away from the centre of communities wherever practicable, including Stoneleigh village, Burton Green and unsuitable rural lanes on the edge of Kenilworth, including Crackley Lane; and
- providing solid temporary hoarding to reduce noise impacts at various locations including Stoneleigh Park, Dalehouse Lane, Kenilworth Greenway and B4101 Waste Lane.

5.4.2 The draft CoCP includes a range of provisions that will help mitigate community effects associated with construction within this area, including the following (see Volume 5: Appendix CT-003-000):

- appointment of community relations personnel (draft CoCP, Section 5);

- community helpline to handle enquires from the public (draft CoCP, Section 5);
- sensitive layout of construction sites to reduce nuisance (draft CoCP, Section 5);
- where reasonably practicable, maintenance of PRoW for pedestrians, cyclists and equestrians around the perimeter of construction sites and across entry and exit points (draft CoCP, Section 5);
- monitoring and management of flood risk and other extreme weather events which may affect community resources during construction (draft CoCP, Sections 5 and 16);
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (draft CoCP, Sections 7 and 13); and
- where reasonably practicable, the avoidance of large goods vehicles operating adjacent to schools during drop off and pick up periods) (draft CoCP, Section 14).

Assessment of impacts and effects

Stoneleigh

Temporary effects

Residential properties

5.4.3 Two residential properties in the Stoneleigh area will be affected temporarily by loss of land required during construction. Given the small number of properties affected, the slight temporary loss of land is not significant at a community level. The affected properties are: Stone House Farm, Leicester Lane, Cubbington and 1 Stareton Road, Kenilworth.

Community infrastructure

5.4.4 Construction of the Proposed Scheme will require the loss of land from the eastern edge of Stoneleigh Park (showground site). During the works, it is possible that about one third of the site may be affected by construction activities, including the need for utility diversions across the site. The area of land required temporarily will include the equine arena, which plays a key role in a variety of events held at Stoneleigh Park including the Trailblazers Championships, International Sheep Dog Trials and the All Breeds Britain Calf Show. The site also provides a campsite which, although is largely used during events, is available to the public at other times. Other events hosted at Stoneleigh Park include the Coventry and Warwickshire Race for Life and The Ram Run, cross country challenge, both of which, the Proposed Scheme crosses and will be unable to function in their current routes; taking a worse case approach to the assessment, the temporary loss of use will limit the scope of some of these events to take place at Stoneleigh Park during construction, possibly for a period of up to 3 years.

5.4.5 The current extant planning permission at Stoneleigh Park proposes to develop the site as a rural innovation science park, but it will continue to host the show ground

events with continued strong links to agricultural and equine events and re-provide the campsite. Therefore loss of land from the showground site is assessed as giving rise to a major adverse effect upon the current use and proposed consented uses on the value of the site as a recreational resource, which is significant.

Permanent effects

Residential properties

5.4.6 The construction of the Proposed Scheme will require the demolition of five residential properties at the East Gate entrance to Stoneleigh Park. Given the number of properties affected, the loss of these properties is assessed as a moderate adverse effect and is therefore significant.

Community infrastructure

5.4.7 At Stoneleigh Park, the Proposed Scheme will require the permanent loss of land from the eastern side of the showground, amounting to approximately 15% of the overall site area. The land affected includes the areas with planning permission for a new visitor centre, a new National equine centre and areas proposed for new offices and retailing. The permanent loss of land from the showground site is assessed as giving rise to a moderate adverse effect on people who visit the site for recreational purposes, which is significant for both current and consented uses.

5.4.8 Land to the south of the B4113 Stoneleigh Road, opposite the East Gate entrance to Stoneleigh Park also falls within the boundary of land required for the construction and operation of the Proposed Scheme. This land has been used once per year for the last three years as a venue for the Kenilworth Show, a large agricultural show, which attracts up to 10,000 visitors annually. The land is also used on an occasional basis to provide car parking for some of the events at Stoneleigh Park. The permanent loss of land from this area to the Proposed Scheme will effectively preclude the continued use of this site for the Kenilworth show and will substantially reduce the area available for overflow car parking. However, it is likely that an alternative suitable venue could be found on adjacent land in the same landholding. The permanent loss of land and displacement of the Kenilworth Show venue is therefore assessed as giving rise to a minor adverse effect which is not significant.

Open space

5.4.9 The Proposed Scheme will result in the permanent loss of about 1.9ha of public open space managed as part of the Stoneleigh Park Estate to the south of the B4113 Stoneleigh Road. This land is required for the re-alignment of the junction of the B4113 Stoneleigh Road and Stareton Road and for earthworks associated with the railway construction. Whilst the area affected represents only a small proportion of the total open space area on the estate (less than 10%), this particular section is well used by walkers. It includes a pathway connecting the open space back to the Stoneleigh Road and appears to be used as part of an informal circular walk around the estate via the historic Stare Bridge area to the north. The permanent loss of land is assessed as giving rise to a moderate adverse effect on recreational users of this land which is significant.

Kenilworth

Temporary effects

Residential properties

5.4.10 Two dwellings at Dalehouse Lane, Brookview and Wayside, will be affected by the inclusion of their access road within the area of land required temporarily during construction. As access will be maintained throughout the works, the impact on the occupiers of these two properties is assessed as not significant at a community level.

Recreational PRoW

5.4.11 The Proposed Scheme also crosses the route of the recently completed 'Connect2 Kenilworth' recreational PRoW and cycleway (W164/Sustrans NCR No. 52) to the north of Crackley. During the construction period, part of this route will be closed as it will not be feasible to maintain its alignment given the extensive nature of earthworks required around the Canley Brook. Walkers and cyclists using this route will have to re-route further along the Kenilworth Greenway, connecting with the diverted Bridleway W165 and the proposed new bridleway overbridge near Crackley Wood. This will add significantly to the length of this section of the route throughout the 15 month construction period. This alternative is unlikely to offer a comparable quality of surface for cyclists. Gates at the connection between the Greenway and Bridleway W165 will also be less convenient for cyclists. As a well used and valued recreational route, the temporary loss of this recently purpose built cycle and pedestrian route and the need for users to incur a detour along a section of Bridleway W165 will functionally impair this resource. As the route is effectively partially closed and unusable for its intended purpose, the impacts of temporary construction works is assessed as giving rise to a moderate adverse effect on pedestrians and cyclists, which is significant.

Permanent effects

Residential properties

5.4.12 The Proposed Scheme will require the demolition of one residential property in the Kenilworth area at New Kingswood Farm, which is not considered to be significant at a community level.

5.4.13 In addition, a number of residential properties in the Kenilworth area fall partly within the boundary of land required permanently for the construction and operation of the Proposed Scheme. At Dalehouse Lane, works to realign the road and construct a new overbridge will encroach slightly into the frontages of five residential properties along this road; these impacts are assessed as not significant at a community level. The properties affected at Dalehouse Lane are: Four Winds, the Dalehouse; and the three residential units at Dalehouse Farm.

5.4.14 A further two residential properties in the Kenilworth part of the study area will also lose land permanently to the Proposed Scheme. One property is affected at each location; the effects are not significant at a community level. The properties that will be affected are: Birches Wood Farm at Crackley Lane and Eskasoni, at Hurstwood Farm, Crackley Lane.

5.4.15 Permanent access rights are required over land to the south of Dalehouse Lane and near Crackley Lane. However, these are not expected to result in the loss of any land from the properties affected.

Open Spaces and recreational PRoW

5.4.16 The Kenilworth Golf Club will be affected by a slight permanent loss of land from the eastern edge of the course and along its boundaries with the A46 Kenilworth Bypass to the south and Dalehouse Lane to the north. Whilst this loss of land will partially impair the resource, the main playing area of the fairways, tees and greens, including those planned for the golf course extension in the vicinity of New Kingswood Farm will be largely unaffected. Overall, the effects associated with this loss of land on users of the course are assessed as minor and not significant.

5.4.17 The 'Connect2Kenilworth' recreational PRoW route W164/Sustrans NCR No. 52, to the north of Kenilworth near Canley Brook will be affected by the requirement for land to construct the Proposed Scheme. Approximately 600m of the route falls within the boundary of land that will be required permanently. The scheme design requires the route to be permanently diverted around the earthworks for the Canley Brook diversion. This will add about 250m to the length of this part of the route. As a recreational route this 250m increase in length is assessed as giving rising to a minor adverse effect on its users, which is not significant at a community level.

Edge of Coventry

Temporary effects

Residential properties

5.4.18 Works to construct the new railway, the A429 Kenilworth Road overbridge and the realignment of Canley Brook will result in significant adverse visual effects on the residents of Gibbet Hill. There will also be a significant increase in HGV construction traffic using the A429 Kenilworth Road. The combination of significant visual and HGV traffic effects over approximately four years, will give rise to a major adverse effect on the amenity of the residents of Nos. 160-170 Kenilworth Road (even numbers), which is significant.

Burton Green

Temporary effects

Residential properties

5.4.19 At Cromwell Lane, in the centre of the village, a group of 14 residential properties either side of the tunnel construction area and works to reconstruct the Cromwell Lane bridge are likely to be affected by a combination of significant noise and/or vibration and visual effects. These combined effects are expected to last for approximately 8 to 12 months and the change in amenity for residents is assessed as a major adverse effect, which is therefore significant. The properties that are likely to be affected by a combination of significant amenity effects are nos. 293-301 (odd numbers) and no. 402, which are situated to the north of the Proposed Scheme; and nos. 307-323 (odd numbers) which are situated to the south of the Proposed Scheme.

5.4.20 It is noted that No. s 301 and 402 Cromwell Lane, which are located immediately alongside the route to the north of the Proposed Scheme and either side of the road,

will also be affected by a temporary loss of land during construction, these impacts are assessed as not significant at a community level.

5.4.21 The occupiers of a group of approximately 21 residential properties on Hodgett's Lane are likely to be affected by a combination of significant noise and visual effects during construction of the Burton Green green tunnel and the works to build the Burton Green auto-transformer feeder station on the north-western edge of the village. Eleven of these dwellings, located immediately adjacent to the Proposed Scheme, will also experience vibration effects for 8 months. These works are likely to last for up to two years and the combination of effects on the amenity of residents is assessed as giving rise to a major adverse effect which is significant. The properties that are likely to be affected are: Nos. 3 – 23 (odd numbers) which are located immediately adjacent to the boundary of the tunnel works; and Nos. 22-46 (even numbers) which are located on the north side of Hodgett's Lane.

5.4.22 During the construction period, many of Burton Green's residents will be affected by works to demolish and reinstate the bridge at Cromwell Lane. It is anticipated that these works will be phased in such a way as to enable part of the tunnel roof structure to be constructed ahead of the existing road bridge structure being dismantled. These works will act as a substantial visual barrier through the centre of the village and will lead to disruption to journeys, including journeys made on foot, through the centre of the village. Significant pedestrian severance has also been identified along Hob Lane/Cromwell Lane due to significant increases in HGV traffic. This would affect journeys to access the Burton Green Church of England Primary School on the south side of the construction works and Two Oaks Day Nursery and Hedgerow Day Nursery on either side of the Proposed Scheme at Cromwell Lane and Red Lane. It will also affect journeys made by residents of the village visiting others located on the opposite side of the construction works. The disruption at Cromwell Lane, which is anticipated to last for about six months, is assessed as giving rise to a major adverse isolation effect on the community of Burton Green, which is significant. However, access to the village itself will not be significantly affected.

5.4.23 A further five residential properties at two locations on Hob Lane to the south-west and west of the village will be within the boundary of land which may be required temporarily for works to existing utilities in the area. In these cases, the effects are assessed as not significant at a community level. The properties at Hob Lane that will be affected are: Moat Farm, Moat Lodge and Oakwood, Hob Farm and Beanit Farm.

Community facilities

5.4.24 As concluded above, someof the pupils of Burton Green Church of England Primary School who reside in the village will be subject to major adverse isolation effects. For the remaining 64% of pupils who travel from further afield, no significant effects on road traffic have been reported by the traffic and transport assessment, and therefore no significant isolation effects have been identified.

5.4.25 The Two Oaks Day Nursery is situated immediately adjacent to the boundary of land required for the construction and operation of the Proposed Scheme. Given its proximity to the works, the Nursery will also be affected by a combination of significant visual and noise effects during the construction period, which could last for a period of about 2 months. The Two Oaks Day Nursery operates on a daily basis

throughout the year and makes significant use of the grounds at the site for early years/foundation stage education and play activities and has been awarded a "Forest School" status. The change in amenity at the Nursery during the construction period will impair the use of the resource and is assessed as giving rise to a moderate adverse effect on users of the nursery, which is significant.

5.4.26 HS2 Ltd will work closely with Warwickshire County Council, Burton Green Church of England Primary School, Hedgerow Day Nursery and Two Oaks Day Nursery to identify reasonably practicable measures to help mitigate significant residual isolation and amenity effects, including discretionary measures identified in the draft CoCP.

Recreational PRoW

5.4.27 During construction, a temporary diversion route for the Kenilworth Greenway will be provided at Burton Green as part of the Proposed Scheme. This will also serve as a diversion route for the Coventry Way and Sustrans NCR No. 523 which share the same route as the Greenway through Burton Green. This temporary route will diverge from the existing Greenway alignment to the south of Cromwell Lane, to run along a section of Red Lane, crossing Hob Lane and running around the perimeter of fields to the south-west of the route of the Proposed Scheme. The route is relatively circuitous and users will have to negotiate traffic at the junction with Red Lane and Hob Lane, where a significant increase in HGV construction traffic is predicted during the works. Access to the Greenway during the construction period will be at the junction with Hob Lane and Red Lane, which is some 300m south of its present position in the centre of the village at Cromwell Lane. The temporary diversion route is likely to be required for a period of about four or five years. Whilst there is no overall loss of a route for the Greenway during this time, its temporary alignment is unlikely to be so well suited to cyclists. Taken together with the loss of a convenient access point in the centre of the village and the requirement to cross through construction traffic, the construction works for the Proposed Scheme will impair the functional value of the Greenway as a key pedestrian and cycle route. This is assessed as giving rise to a temporary moderate adverse effect on users of this locally important resource.

5.4.28 The temporary realignment has been designed to avoid the construction works wherever practicable so as to reduce significant amenity effects on users. However, this is unavoidable at Red Lane where the Kenilworth Greenway will need to share the access track for approximately 450m with vehicles accessing the materials transfer and stockpiling area that is proposed to the south of the village and where the route runs alongside the Cromwell Lane satellite compound. Here, users of the temporary Kenilworth Greenway realignment will also be affected by significant visual effects due to the operation of plant and machinery in this area and a significant increase in HGV traffic at the junction of Red Lane and Cromwell Lane for up to five years in total. It is recognised that users of the route will also be subject to noise impacts as a result of proximity to the construction works, but given the transitory nature of the route, the impacts of construction noise are not assessed as being significant. The combined visual and HGV traffic effects are assessed as giving rise to a major adverse effect on the amenity of people using the Greenway in this location, which is significant.

Permanent effects

Residential properties

5.4.29 Three residential properties in the centre of the village at Cromwell Lane will need to be demolished during construction of the Proposed Scheme. Ordinarily, the loss of three dwellings from a village comprising of about 260 homes, would be assessed as a not significant at a community level. However, in this case, the loss of these properties will leave a clearly evident gap in a prominent location at the heart of the village and the loss is assessed as a moderate adverse effect which is therefore a significant effect in this situation. The properties that will need to be demolished at Cromwell Lane are: Nos. 303 and 305 on the south-east side of Cromwell Lane, immediately to the south-east of the tunnel works; and No. 404 which is located on the north-west side of Cromwell Lane, again immediately to the south-east of the tunnel works.

5.4.30 A further four residential properties at Burton Green will be affected by a slight permanent loss of land for the construction and operation of the Proposed Scheme. These impacts are not considered significant at a community level. The properties that will be affected are: No. 301 at Cromwell Lane, Le Van at Red Lane, and Lanthorn House and Kilrenny House, at Red Lane.

5.4.31 An outbuilding within the curtilage of No. 301 Cromwell Lane, which is located immediately to the north of the Proposed Scheme and on the east side of the road, will also need to be demolished to allow for the construction of the Proposed Scheme.

Community infrastructure

5.4.32 The Burton Green village hall will need to be demolished to facilitate construction of the Proposed Scheme. The hall is a well used and valued community resource, with regular bookings on a daily basis for a range of private and group events, including sports and leisure groups, art classes, parish council meetings, resident association meetings and use by the Burton Green Congregation as a place of worship once per month. The charitable trust which manages the hall estimates that the hall has 29 groups which use the hall on a regular basis for organised events and that over 14,000 people have visited the hall in the period September 2011 to September 2012. There are no other community halls or meeting venues in the village; with the nearest alternative being more than 2km away at Westwood Heath on the edge of Coventry. Neither the Peeping Tom public house on the north side of the village at Cromwell Lane, nor the School at Hob Lane have function rooms which are available for private bookings and community events. The demolition of the hall will therefore leave Burton Green without any facilities available for community use and will leave some members of the community without convenient access to other alternative organised activities and events or opportunities to meet or participate in social gatherings, including religious worship, for which there are also no other alternatives locally. Given the importance and value of the village hall to the local community the loss is assessed as giving rise to a major adverse effect, which is significant.

5.4.33 It is proposed to use the powers within the hybrid Bill to mitigate the effects on the community arising from the demolition of the Burton Green village hall. The limits of land identified in the Bill make provision to acquire an area of land adjacent to the primary school in the village on which a replacement facility could be provided. HS2

Ltd is willing to work with the village hall trustees to assist them with the provision of a replacement facility in another location if this is their preferred option.

Recreational PRoW

5.4.34 The Kenilworth Greenway, which also forms part of the Sustrans NCR No. 523 and the Coventry Way long distance trail is crossed by the boundary for the Proposed Scheme from a point about 500m south of Cromwell Lane, northwards to the boundary of this part of the study area. The Proposed Scheme follows the alignment of the Kenilworth Greenway initially above ground and then passing beneath it in tunnel through the centre of Burton Green.

5.4.35 The scheme design makes provision to reinstate the Greenway on top of the tunnel structure once the works are completed. At Cromwell Lane, a new signal controlled crossing will be provided for users of the Greenway to cross the road at-grade, rather than beneath the road as is presently the case. The Greenway will also be permanently diverted from its current position to pass around both of the portal structures at either end of the tunnel section.

5.4.36 Whilst there is therefore no permanent severance or loss of use of the Greenway, users will have to negotiate additional crossings of the access road to the south portal and Cromwell Lane in the centre of the village, which will impair the value of what is currently an off-road recreational route. The Proposed Scheme will also require some changes to the gradient of the Greenway where it rises up to cross Cromwell Lane above the new tunnel structure, which may affect the enjoyment for some users. Access to the Greenway at Cromwell Lane will be at-grade which may offer some benefit for users with impaired mobility compared with the sloping pathway which currently provides access down to the Greenway alongside No. 301 Cromwell Lane. Overall, having regard to the importance and value of this route locally, the permanent realignment of the Greenway is assessed as giving rise to a moderate adverse effect on users, which is significant.

Beechwood

Temporary effects

Residential properties

5.4.37 The Proposed Scheme crosses the B4101 Waste Lane between Catchems Corner to the west and Beechwood to the east. During construction, a group of 16 residential properties at the B4101 Waste Lane on either side of the Proposed Scheme are likely to be affected by a combination of visual effects together with significant increase in HGV construction traffic using the road. The works, which include the construction of the B4101 Waste Lane overbridge, the formation of a temporary route for the Kenilworth Greenway together with the operation a satellite construction compound on the west side of the Proposed Scheme are expected to last for at least 12 months. During this time, the combination of significant visual and HGV traffic effects will give rise to a major adverse effect on the amenity of residents in this area. Properties at Waste Lane that are likely to be affected by a combination of significant amenity effects include: Little Beanit Farm, Squirrels Jump, Field House, Fairways, Batavia House, Almond House, Gillingwood, Brendon Cottage, Saddlestones, Braeburn, Castlemorton, Burnley Gap, Brentwood, Fieldgate, Silver Birches and Old Hall.

Recreational PRoW

5.4.38 The Kenilworth Greenway passes beneath the B4101 at Waste Lane. During the construction period, provision is made within the scheme design for a temporary diversion of the route in this area, approximately 200m west of its current alignment, with access being adjacent to Dragonflies and High Close instead of the current point adjacent to Little Beanit Farm. Works to construct the B4101 Waste Lane overbridge and the new railway in this area are expected to last for about 12 months and during this time users will have to cross Waste Lane, which is predicted to experience a significant increase in HGV construction traffic during the works. This will impair the functional value of the Greenway in this area, as a key off-road route. The impact of the Proposed Scheme is assessed as giving rise to a temporary moderate adverse effect on users of the Greenway.

5.4.39 Users of the Greenway in this area will also be subject to significant adverse visual effects during the 12 month construction period. The combination of significant visual and HGV traffic effects during the 12 month construction period will impair user enjoyment of the resource, giving rise to a major adverse effect on users, which is significant. It is also recognised that users of the route will be subject to noise impacts as a result of proximity to the construction works for the Proposed Scheme, but given the transitory nature of the route, the impacts of construction noise are not assessed as being significant.

Permanent effects

Residential properties

5.4.40 One residential property at Waste Lane, namely Odnaull End Farm and its associated outbuildings, will need to be demolished to allow for the construction of the Proposed Scheme and specifically the B4101 Waste Lane overbridge and road realignment. The loss of a single dwelling in this area is not assessed as significant at the community level.

5.4.41 A further five residential properties on both sides of the works at the B4101 Waste Lane will also be affected by a slight permanent loss of land from their residential curtilage primarily to facilitate the realignment of B4101 Waste Lane. This is not significant at a community level. The properties that will be affected at Waste Lane are: Dragonflies, Maple Field House and Little Beanit Farm on the south-west side of the works; and Crabmill Farm and Squirrels Jump on the north-east side of the works.

Recreational PRoW

5.4.42 The Proposed Scheme also requires the Millennium Way long distance Footpath (PRoW M198) to be rerouted permanently to cross the Proposed Scheme via the B4101 Waste Lane overbridge. The diverted route then runs northwards alongside the east side of the new railway to reconnect to the original footpath alignment about 240m north of the B4101 Waste Lane. Users following the Coventry Way, which shares the same route as the Greenway to then join with the Millennium Way about 250m north of the B4101 Waste Lane will also need to leave the Greenway at the new B4101 Waste Lane overbridge and join the permanent diversion route for the Millennium Way, via the B4101 Waste Lane.

5.4.43 Whilst the permanent routing along the public highway for 100m will not offer a comparable quality of experience, there is little evidence of this being a well used PRoW and it is therefore assessed as giving rise to a minor adverse effect on users, which is not significant.

Cumulative effects

5.4.44 At Burton Green, the central location of the Proposed Scheme within the village and the consequent isolation impact across the whole village, combined with significant amenity effects at Cromwell Lane and Hodgett's Lane, it is likely that the majority of the community will be affected in some way during construction of the Proposed Scheme which has been assessed as giving rise to a community wide effect.

Other mitigation measures

5.4.45 The assessment has concluded there are significant adverse effects arising during construction in relation to community resources. No further mitigation is proposed.

Summary of likely residual significant effects

5.4.46 Construction of the Proposed Scheme will give rise to a number of residual significant effects on community resources within the Stoneleigh, Kenilworth and Burton Green area.

5.4.47 In the south of the area will be due to land required for construction of the Proposed Scheme the public open space to the south of Stoneleigh Park, Stoneleigh Park showground and five dwellings at East Gate will be subject to significant effects as a result of land required to construct the Proposed Scheme.

5.4.48 Further north, due to land required for the construction of the Proposed Scheme the 'Connect2Kenilworth' PRoW, Sustrans NCR No. 52, Kenilworth Greenway and the Millennium Way PRoW will be subject to significant effects as a result of rerouting both temporarily and permanently. The loss of three properties at Cromwell Lane will have a significant effect on the community of Burton Green.

5.4.49 At Burton Green, due to land required for the construction of the Proposed Scheme the village hall will be demolished giving rise to a major adverse significant effect, although land has been identified within Bill limits which could be used to reprovide the facility and remove this effect if this is acceptable to the village hall trustees. The construction works associated with reconstructing the Cromwell Lane Bridge and significant pedestrian severance at Hob Lane/Cromwell Lane single will give rise to a significant isolation effect on the community during the construction period in particular for those attending Burton Green Primary School and Hedgerow day nursery.

5.4.50 The amenity for residents of a group of residential properties at Kenilworth Road, Cromwell Lane, Hodgett's Lane and B4101 Waste Lane will be affected by a range of effects arising temporarily from the construction of the Proposed Scheme. Similarly the amenity for the users of the Kenilworth Greenway at Burton Green and Waste Lane and Two Oaks Day Nursery will be affected significantly when construction takes place.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 The following measures have been incorporated into the Proposed Scheme's design as part of the design development process to avoid or reduce environmental effects during operation:

- routeing of the Proposed Scheme in tunnel where it passes through the community of Burton Green to reduce the environmental effects of the new railway;
- the provision of raised earthworks and/or landscaping along the route to provide screening and help integrate the Proposed Scheme within the wider landscape;
- the incorporation of retained cuttings within the scheme design to provide noise screening;
- the provision of noise barriers to reduce effects on the occupiers of nearby properties;
- planting along the route of the Kenilworth Greenway at Burton Green to recreate 'greenway' character and maintaining a gap between the realigned route and the new railway to reduce potential amenity effects on users from the operation of trains; and
- moving the position of the south portal of the Burton Green green tunnel further south to reduce the potential environmental impacts on people living nearest to this structure.

Assessment of impacts and effects

Burton Green

Residential properties

5.5.2 A combination of significant noise and visual effects are likely to be experienced by the residents of nine properties at the north end of Red Lane, where the south portal will be evident in views and train noise audible as they approach the tunnel entrance. The combination of two significant effects is assessed as giving rise to a major adverse effect on the amenity of the residents, which is significant. The properties which are likely to be affected are: Stonegate; 4 Seaton Field; Coniston; Lanthorne House; Kilrenny House; Ashorne; 1 and 2 The Hollies; and Cornerways.

Cumulative effects

5.5.3 No cumulative effects have been identified during operation.

Other mitigation measures

5.5.4 As no further mitigation is practicable, residual effects will remain the same as described in the assessment of operational effects.

Summary of likely residual significant effects

5.5.5 The amenity for the residents of nine residential properties at Red Lane and 10 dwellings at Hodgett's Lane will be affected permanently by the location, views and expected noise arising from the operation of the Proposed Scheme.

6 Cultural heritage

6.1 Introduction

6.1.1 This section of the report provides a description of the current baseline for heritage assets and reports the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme. Consideration is given to the extent and heritage value (significance) of assets including archaeological and palaeo-environmental remains; historic buildings and the built environment; and historic landscapes.

6.1.2 With regard to heritage assets, the main issue is the extent to which designated and non-designated assets are affected by the Proposed Scheme. Impacts on assets as a result of the Proposed Scheme will occur largely through the physical removal and alteration of assets and changes to their setting.

6.1.3 Maps showing the location of the key environmental features can be found in Volume 2: Community Forum Area (CFA) map books. Maps showing the location of all designated and non-designated heritage assets can be found in CFA18 Volume 5: Map Book – Cultural heritage CH-01 to 03. Detailed reports on the cultural heritage character and surveys undertaken within the local area are contained in the Volume 5 Appendices. These include:

- Appendix CH-001-018 – Baseline report;
- Appendix CH-002-018 – Gazetteer of heritage assets;
- Appendix CH-003-018 – Impact assessment table; and
- Appendix CH-004-018 – Survey reports.

6.1.4 Throughout this section, assets within the study areas are identified with unique reference code, STNXXX, further detail on these assets can be found in the Gazetteer in Volume 5: Appendix CH-002-018.

6.1.5 Engagement has been undertaken with the Warwickshire County Council (WCC) planning archaeologist with regard to the nature of the cultural heritage assets within the local area.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the cultural heritage assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-0001-000/1) and the SMR Addendum (Volume 5: Appendix CT-0001-000/2). This report follows the standard assessment methodology.

6.2.2 The setting of all designated heritage assets up to 2km from the centre line of the Proposed Scheme has been considered. The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out, is defined as the land required, temporarily or permanently, to construct the Proposed Scheme plus 500m.

6.2.3 The cultural heritage methodology includes the consideration of the intra-project effects of a number of technical topic assessments, for example, Section 9, Landscape and visual, Section 7, Ecology, and Section 13, Water resources and flood risk. Consequently, these interactions have been included in the assessment of impacts and effects.

6.2.4 In undertaking the assessment the following limitations were identified:

- the LiDAR[20] data examined did not encompass the full extent of the study area; and
- not all the areas as identified in the archaeological risk model[21] as requiring survey were accessible.

6.2.5 However, non-intrusive field survey was undertaken in a number of areas to provide data regarding the nature of sub-surface archaeological assets. Information from other sources of data, including the Historic Environment Record and local archives was utilised to provide information relating to the potential archaeological assets that may be present.

6.3 Environmental baseline

Existing baseline

6.3.1 In compiling this assessment, documentary baseline data was collected from a variety of sources as set out in Volume 5: Appendix CH-001-018.

6.3.2 In addition to collation of this baseline data, the following surveys were undertaken:

- walkover and site reconnaissance from areas of public access or in locations where access was granted. This was undertaken to understand the character and form of heritage assets and the historic landscape, to review the setting of assets, and to identify previously unknown assets;
- desk-top review of remote sensing data including LiDAR, aerial photographs and hyperspectral data (see Volume 5: Appendix CH-004-018); and
- a programme of non-intrusive surveys including geophysical surveys (see Volume 5: Appendix CH-004-018).

Designated assets

6.3.3 The following designated heritage assets are located partially or wholly within the land required, temporarily or permanently, for the construction of the Proposed Scheme (see Volume 5: Maps CH-001-108 to CH-01-111):

- the Grade II* listed Stoneleigh Abbey Registered Park and Garden (STN012); and
- three areas of ancient woodland: Crackley Wood (STN052), Roughknowles Wood (STN060), and Broadwells Wood (STN064).

[20] Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.
[21] The archaeological risk model is an approach that enables the identification of those areas of the Proposed Scheme where archaeological assets.

6.3.4 The following designated assets are located within 2km of the centreline (see Volume 5: Maps CH-02-106 to CH-02-107):

- five Grade I listed buildings all within the Stoneleigh Park Estate and village (STN013, STN025 and STN022 which has three buildings under one asset number);
- five Grade II*listed buildings (STN022 – three buildings within the western part of Stoneleigh Park under this asset number, STN053, a listed building in Warwick University and STN079 Moat Farm);
- eighty one Grade II listed buildings; many of these are in Stoneleigh village and Stareton village, but listed buildings are found in the scattered large farms, which form a notable element of this area;
- two scheduled monuments: Glasshouse Wood Roman Settlement (STN034) and Stare Bridge (STN013);
- four conservation areas: Stoneleigh (STN023), Kenilworth Road (STN046); Ashow (STN026); and Kenilworth (STN051); and
- five areas of ancient woodland: Waverley Wood (STN003), Decoy Spinney (STN009), Motslowhill Spinney (STN029), Kings Wood (STN032), and Black Waste Wood (STN074).

Non-designated assets

6.3.5 Limited elements of the Bytham River deposits (STN004) may exist at the southern edge of the Stoneleigh, Kenilworth and Burton Green area (CFA18). These deeply buried deposits relate to the former course of a c. 500,000 year old river and may contain evidence of early human occupation or environmental data. This is the only non-designated asset of high value that lies wholly or partially within the extent of the land required for the construction of the Proposed Scheme.

6.3.6 The following non-designated assets of moderate value lie wholly or partially within the land required, temporarily or permanently, for the construction of the Proposed Scheme:

- two important hedgerows[22]: Hedgerow adjacent to Stare Bridge, Stoneleigh Park (STN014); and Hedgerow to south of Broadwells Wood (STN073); and
- five archaeological assets: a possible castle site (STN030), a Romano-British settlement at Crewe Farm (STN031), earthworks south of Dale House Farm (STN041), Millburn deserted medieval settlement (STN047) and a moated site at Bockendon Grange (STN066).

6.3.7 The following identified non-designated assets of low value lie wholly or partially within the land required, temporarily or permanently, for the construction of the Proposed Scheme:

[22] Are those deemed to be 'important' under criteria 1 to 5 of Schedule One, Part II of the *1997 Hedgerows Regulations*, i.e. those hedgerows which are important for historic/archaeological reasons.

- ten archaeological assets (STN008, STN049, STN057, STN077, STN085, STN099, STN100, STN103, STN104 and STN107)); and
- one area of historic landscape, Crackley Assarted Woodland (STN106).

6.3.8 All non-designated heritage assets within 500m of the land required, temporarily or permanently, for the construction of the Proposed Scheme are listed in the gazetteer in Volume 5: Appendix CH-002-018 and identified in Volume 5 Map Book-Cultural Heritage, Maps CH-01-108 to CH-01-111. A number of built heritage assets exist, the setting of which have been considered, for example:

- Furzen Hill Farm (STN001);
- Leicester Lane cottages (STN006);
- Crewe Farm (STN033);
- Crewe Gardens (STN035);
- Kingswood Farmhouse (STN036);
- Dale House, Dalehouse Lane (STN040);
- Millburn Grange (STN045);
- Crackley Gate (STN050);
- Oak Tree Cottage, Cryfield Grange Road (STN056);
- Crackley Farm (STN058);
- Dunns Pitts Farm (STN059);
- Bockenden Grange (STN067);
- Pools Cottage, Crackley Lane (STN069);
- The Hollies, Burton Green (STN076); and
- Nailcote Farm (STN084).

Cultural heritage overview

6.3.9 The study area crosses the two main historical sub divisions of this part of Warwickshire: Dunsmore and Arden. These two regions have differing geologies, soils and topographies which have subsequently been influenced by human habitation to create two contrasting environments.

6.3.10 Dunsmore, which reaches into the far south-east corner of the study area, is centred on an area of former heathland associated with a low plateau of glacial deposits. These glacial deposits have led to the creation of thin soils which were exhausted in the prehistoric period, rapidly creating the heathlands which dominated the area until improvements in agricultural practice and techniques led to these areas being bought back into productive use over the past two centuries.

6.3.11 Arden is a farmland landscape covered with a pattern of small fields and dispersed isolated settlements. At the core of the area is a landscape of low rounded hills, steep

scarps and incised valleys. The section of the Arden crossed by the study area includes the River Avon and a small tributary known as the Finham Brook. The area is located mostly on mudstone formations. There are Arden Sandstones outcrops amongst this mudstone which form prominent escarpments.

6.3.12 A Palaeolithic site of national and potentially international importance has been identified at Waverley Wood Farm Pit approximately 2.1km to the north-east of the Proposed Scheme. The channel of the former Bytham River (STN004), on which the Waverley Wood Farm Pit lies at the southern edge of the study area, follows a band of Mercia mudstone. The Bytham River crossed southern Britain on a north-east/south-west axis in the Pleistocene period (c. 500,000 Before Present (BP)). The Bytham valley was probably one of the main entry points for the first humans who inhabited the area. Lower and Middle Palaeolithic artefacts have been recovered along the Avon Valley in Warwickshire.

6.3.13 There is very sparse evidence for human habitation in the study area during the Middle Palaeolithic, with humans apparently absent between c. 186,000 and 60,000 BP. Isolated handaxe finds have been made in the gravel terraces of the Avon, dating from c. 60,000 BP. No assets have been identified in the study area from the Later Palaeolithic through to the Bronze Age. This does not mean there was no activity in the study area during this time-span, but merely that evidence has not yet been identified.

6.3.14 The floodplain of the Avon Valley along with associated upland areas appear to have been cleared of woodland in the Later Bronze Age. This clearance allowed exploitation of the land for agriculture, which then appears to have led to the development of the extensive heathland which dominated much of Warwickshire up to the 18th century.

6.3.15 There are no known Iron Age sites in the study area. A scatter of coins known as staters, dating from the Iron Age, has been recorded around Crackley Wood (STN052).

6.3.16 In the Romano-British period, the West Midlands was located between the extensively settled south of Britain and the militarised north and west. The Avon Valley appears to have been culturally more akin to southern and eastern Britain, with more extensive civilian settlements and fewer military sites. There is considerable evidence of Romano-British activity in the study area, particularly around Finham Brook. A Romano-British settlement has been identified at Crewe Farm (STN031), just to the south of Kenilworth Golf Club. A further scatter of Roman finds was recorded 150m to the north of Crackley Wood.

6.3.17 The remains of an enclosure, a Roman building and a cremation burial (STN034), have been found at Glasshouse Wood, suggesting that this was the site of a Romano-British settlement. A field system, probably associated with this settlement (STN034), consists of banks, ditches and lynchets which survive as upstanding earthworks within Glasshouse Wood. A further possible settlement (STN039) has been identified to the west of Thomas de Pipes Mill. Evidence for a Roman building (STN037) has also been identified within Kenilworth Golf Club.

6.3.18 There is little evidence for Early Medieval activity, although it is possible that some of the existing historic settlements, such as Stoneleigh and certainly Kenilworth, have their origins in this period. The study area is rich in later medieval settlements and field systems. This period saw a steady growth in population, the expansion of settlements, the development of the manorial system and the growth in power of the church, together with the attendant development of the parishes which are crossed by the study area. These developments are most clearly seen in the wider landscape around the former Stoneleigh Abbey, which now lies within the grounds of the registered park and garden (STN012). This wider landscape includes granges, mills, fishponds and moated sites within the study area.

6.3.19 Three deserted medieval settlements have been identified within the study area: Stareton (STN011), Hurst (STN062) and Millburn (STN047). The site at Stareton (STN011) consists of a number of raised house platforms. A series of linear cropmarks were noted from aerial photographs adjacent to this site and are likely to be associated with this. The deserted settlement at Hurst (STN062) and the large settlement at Millburn (STN047) survive as low earthworks.

6.3.20 The study area crosses a rural landscape and so archaeological evidence tends to reflect the nature of medieval land-use as well as isolated and nucleated settlements. For example, a total of 14 plots of surviving ridge-and-furrow earthworks have been recorded across the study area; many are in the northern or southern extents of the CFA, but they occur throughout most of the study area (STN 044, 057, 060, 062, 064, 066, 072, 077, 086, 092-094, 095, 097 and 102).

6.3.21 Three medieval mill sites (STN011, 019, 055) have been recorded within the study area. Although these no longer survive as standing buildings, they may partially survive as sub-surface deposits and features. The site of the former Grange Mill (STN019) is located near the Stoneleigh estate, while a second watermill (STN055) close to Cryfield Grange is located to the south of the house. A probable mill site (STN011) is found with associated ponds and leats to the south of Stoneleigh Abbey registered park and garden, while a possible later windmill site has been identified at Stareton (STN018).

6.3.22 Stare Bridge (STN013) dates from the 15th century and is a scheduled monument. It was in the ownership of the monastery and is an important survival of the wider infrastructure of the Abbey. The stone built bridge over the River Avon has three main arches with a further five extending across the floodplain. The bridge is currently not in use for vehicles as it has been by-passed by a modern structure to the east which carries the B4113 Stoneleigh Road across the River Avon.

6.3.23 Stoneleigh Abbey, which lies within the registered park and garden (STN012) was founded by the Cistercian order in 1155 on the banks of the River Avon and is located immediately to the south-west of Stoneleigh Business Park (formerly known as the National Agricultural Centre). The Abbey itself and its attendant Grange Farm are located immediately to the south-west of the study area. Stoneleigh Abbey acted as a focus of, at times intense activity and this means that the study area is populated by a number of medieval sites which were once part of, or served the abbey complex. These include granges, i.e. farms that were owned by the Abbey namely Millburn Grange (STN045), Cryfield Grange (STN054) and Bockendon Grange (STN066).

This latter grange has three surviving sections of moat. Three other medieval earthworks sites in the study area have also been identified. The site of a possible early castle (STN030) is located 700m north-east of Glasshouse Wood. Earth banks have been recorded within Crackley Wood (STN052). A series of possible house platforms (STN086) have been identified by LiDAR survey (see Volume 5, Appendix CH-004-018) at the far north-west end of the Stoneleigh, Kenilworth and Burton Green area. Other medieval sites exist within the study area and further details can be found in the baseline report (see Appendix CH-001-018 in Volume 5).

6.3.24 The Reformation and the consequent break-up of the monastic estates and their transfer to secular ownership particularly affected the Stoneleigh, Kenilworth and Burton Green area, where monastic land ownership had been dominant for many centuries. The Stoneleigh Park Estate with its great house, granges and mill, continued to function under new ownership although gradually parts of the former estate were sold or disbursed. The shrunken medieval settlement at Hurst continued into the post-medieval period (STN062). This was located to the north-west of the medieval core of Hurst.

6.3.25 The expansion of domestic and overseas trade had a profound impact on the region, especially affecting the extractive industries. From the late 18th century onwards the Industrial Revolution led to the rapid expansion of the region's towns and the creation of canal and railway networks and resulted in the formation of the character of the West Midlands which is seen today. The former Kenilworth and Berkswell Branch Railway (STN105) was constructed in the mid-19th century, the earthworks associated with the cuttings and embankments of this railway still largely survive. Light industry is represented by the site of a former watermill which is located to the north of Dale House (STN042), where a series of cropmarks have also been identified which may be associated with water management channels.

6.3.26 The expansion of Coventry in this period also saw the development of suburbs into the north-eastern edges of the study area. Coal exploitation, influenced by the location of the canals, began to develop in the 19th century. Mining villages appeared across the Arden which in turn attracted coal-powered industries. Coking and smelting industries developed, as well as power stations by the end of the 19th century. Birmingham expanded rapidly from its medieval core, with a ring of suburbs developing after the construction of the railway.

6.3.27 One of the more notable post-medieval assets in the study area is Stoneleigh Park (part of Stoneleigh Abbey registered park and garden: STN012). This designed landscape was developed from the earlier abbey site from the 16th century onwards. The 1597 estate map shows that the area to the north and west of the former medieval abbey had been transformed into a deer park. In the 17th century licences to empark a further c. 780 acres were granted. The property and park were extended and remodelled in the early 18th century and in the early 19th century Humphrey Repton was commissioned to design new gardens and parkland.

6.3.28 Stareton is a typical estate settlement with a number of farms and cottages built along the road. Earthworks indicate long history of occupation, although the earliest buildings which survive are probably 17th (or possibly 16th) century in origin.

6.3.29 The legibility of the original demesne lands of Stoneleigh Abbey was severely compromised in the mid-20th century by the development of the now defunct National Agricultural Centre, which bisects Stoneleigh Abbey and Park grounds. Part of the historic landscape of the Park is also obscured by its conversion into a golf course.

6.3.30 The 20th century saw the continued rapid expansion of industrial centres such as Birmingham and Coventry, as well as smaller settlements such as Kenilworth. The growing population of the region, and the attendant commuting between cities, suburbs and surrounding villages, also saw a rapid rise in the populations of the small nucleated settlements across the study area, with new housing estates constructed around the fringes of Burton Green.

Future baseline

Construction (2017)

6.3.31 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017. None of the identified developments affect the assessment of the Proposed Scheme's likely construction impacts on heritage assets.

Operation (2026)

6.3.32 No committed developments have been identified in this local area that will materially alter the baseline conditions in 2026.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft CoCP sets out the provisions that will be adopted to control effects on cultural heritage assets. The provisions include the following (see Volume 5: Appendix CT-003-000):

- management measures that will be implemented for assets that are to be retained within the land required for the construction of the Proposed Scheme (draft CoCP, Section 8);
- the preparation of project wide principles, standards and techniques for works affecting heritage assets (draft CoCP, Section 8);
- a programme of archaeological investigation and recording to be undertaken prior to/or during construction works affecting the assets (draft CoCP, Section 8); and
- a programme of historic building investigation and recording to be undertaken prior to modification or demolition of the assets (draft CoCP, Section 8).

6.4.2 The following measures have been incorporated into the design of the Proposed Scheme to reduce impacts on assets:

- the alignment of the Proposed Scheme avoids key areas of the Grade II* listed Stoneleigh Abbey registered park and garden (STN012), an asset of high value; and

- planting in the historic landscape to the south of Stoneleigh Park responds to the landscape structure.

Assessment of impacts and effects

Temporary effects

6.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts will occur to assets both within the land required for the construction of the Proposed Scheme and assets in the wider study area due to the visibility of plant, cranes and equipment and other construction factors.

6.4.4 Significant effects that will occur as a result of temporary impacts on the setting of designated or non-designated heritage assets in the period between May 2017 and January 2023 are described in the following paragraphs.

6.4.5 The setting of Leicester Lane cottages (STN006), an asset of low value, will be altered by the proximity of the construction works for the Proposed Scheme including the construction of large earthworks, the realignment of the A445 Leicester Lane approximately 20m to the east and the presence of a material storage area; these will last for approximately 1 year, 9 months. This will constitute a high adverse impact and moderate adverse effect.

6.4.6 The setting of East Lodge (STN015), an asset of moderate value, will be temporarily affected by the excavation of a deep cutting approximately 20m from its northern edge and realignment of the B4113 Stoneleigh Road approximately 60m to the south-east as well as other construction works in its immediate vicinity; these activities are anticipated to last for approximately three years and nine months. The setting of the asset has already been altered by the presence of Stoneleigh Business Park and consequently the scale of impact on its significance as a result of the temporary works only results in a medium adverse impact and moderate adverse effect.

6.4.7 The setting of the ancient woodland at King's Wood (STN032), an asset of high value, will be affected during construction with land to the south-west of the asset being used for a compound and materials storage area. These works are expected to last the duration of the construction period. This will temporarily degrade the current largely open rural setting of the asset, resulting in a low adverse impact and moderate averse effect.

6.4.8 The setting of Millburn Grange (STN045), an asset of low value, will be altered by the four Coventry to Leamington Spa overbridge construction compounds which will be sited close to the asset. There will also be sustained construction activity in the immediate environs of the asset relating to the excavation of the cutting and rail overbridge works. Overall, these works are anticipated to last approximately 5years and 6 months. These works will result in a temporary high adverse impact and moderate adverse effect.

6.4.9 The setting of South Hurst farm cottages and South Hurst (STN063), an asset of moderate value, will be temporarily altered by construction activity and the Crackley Lane overbridge satellite compound. These works are anticipated to last

approximately 5 years, 6 months; this will result in a medium adverse impact and moderate adverse effect.

6.4.10 The predominately rural setting of Dale House Farm (STN042), an asset of moderate value, will be altered during the construction of the Proposed Scheme in its immediate vicinity and by the presence of the Finham Brook viaduct satellite compound. These works are anticipated to last approximately 5 years, 6 months. This will result in a temporary high adverse impact and major adverse effect.

Cumulative effects

6.4.11 It is not considered that there will be any cumulative effects from temporary impacts on heritage assets within the study area.

Permanent effects

6.4.12 Significant effects that will occur as a result of physical impacts on heritage assets within the land required for the construction of the Proposed Scheme are described in the following paragraphs.

6.4.13 A portion of ancient woodland at Broadwells Wood (STN064), an asset of high value, will be removed to enable the creation of a cutting though the south-west end of the woodland. This will constitute a high adverse impact and a major adverse effect.

6.4.14 A very small portion of ancient woodland at the far north of Crackley Wood (STN052), an asset of high value, will be removed to allow the creation of a cutting as well as a footbridge. This will constitute a low adverse impact and a moderate adverse effect.

6.4.15 A small area of ancient woodland at Roughknowles Wood (STN060), an asset of high value, will be removed allow the construction of an access track along its edge. There will be a permanent change to the rural setting of the woodland. This will constitute a low adverse impact and a moderate adverse effect.

6.4.16 Approximately 50m of an important hedgerow adjacent to Stare Bridge (STN014), an asset of moderate value, will be removed to enable the construction of the cutting for the mainline. This will constitute a medium adverse impact and moderate adverse effect.

6.4.17 A substantial portion of the archaeological deposits associated with an area of ridge-and-furrow earthworks at Stonehouse Farm (STN008), an asset of low value, will be removed by the construction of the Proposed Scheme, its associated earthworks and structures. This will constitute a high adverse impact and a moderate adverse effect.

6.4.18 A substantial portion of earthworks to south of Dalehouse Farm (STN041), an asset of low value, will be removed prior to construction of the railway and the Dalehouse Lane overbridge. This will constitute a high adverse impact and moderate adverse effect.

6.4.19 Cropmarks east of Crackley (STN049), an asset of low value, will be largely removed by the construction of the railway, its associated earthworks and structures. This will constitute a high adverse impact and moderate adverse effect.

6.4.20 Cropmarks adjacent to Crackley Woods (STN057), an asset of low value, will be largely removed by the construction of the railway, its associated earthworks and structures. This will constitute a high adverse impact and moderate adverse effect.

6.4.21 Boundary features/former routeways identified by LiDAR at Kingswood (STN104), an asset of low value, will be partially removed by the construction of the railway, its associated earthworks and structures. This will constitute a high adverse impact and moderate adverse effect.

6.4.22 The Romano-British settlement at Crewe Farm (STN031), an asset of moderate value, will be partly removed by the realignment of the A46 Kenilworth Bypass and associated planting. This will constitute a high adverse impact and major adverse effect.

6.4.23 Archaeological deposits associated with the deserted medieval settlement at Hurst (STN062), an asset of moderate value, will be removed by the construction of a cutting and earthworks. This will result in a high adverse impact and a major adverse effect.

6.4.24 Archaeological deposits associated with a possible early castle site (STN030), an asset of moderate value, will be removed by a cutting, the realignment of the B4115 Ashow Road and the creation of a balancing pond. This constitutes a high adverse impact and a major adverse effect.

6.4.25 Archaeological deposits associated with a former windmill (STN018), an asset of low value, will be removed due to the realignment of Stareton Road. This will constitute a high adverse impact and a moderate adverse effect.

6.4.26 The farmstead ranges west of Gilberts Spinney (STN021), an asset of low value, will be demolished during the construction of a deep cutting. This will constitute a high adverse impact and a moderate adverse effect.

6.4.27 The Grade II* listed Stoneleigh Abbey registered park and garden (STN012) is divided into two main sections (east and west); these are joined by a very narrow strip of registered land to the south. The area between the two areas of parkland houses the former National Agricultural Centre (referred to within this assessment as Stoneleigh Business Park). The construction of the Proposed Scheme will result in the loss of a small area of historic parkland at the southern tip of one half of the registered parkland landscape; it will also sever the existing designated area that links the two halves of the landscape. The location of the Proposed Scheme within the former National Agricultural Centre, and in retained cutting, means that it will not be a major visual intrusion into the areas of registered parkland to the east and west. Belts of trees and hedges, topography and intervening built form will screen much of the Proposed Scheme from the asset. The corridor along which the Proposed Scheme runs has undergone substantial change in the 20th century and further change within it will not degrade the fabric and character of the registered parkland.

6.4.28 Overall, the Proposed Scheme will have limited adverse physical impacts on the registered parkland and will only slightly affect its visual setting, although it will slightly increase the severance between the two halves. These changes will slightly degrade the significance of the asset. The Proposed Scheme will result in a medium adverse impact and major adverse effect.

6.4.29 The important hedgerow to south of Broadwells Wood (STN073), an asset of moderate value, will be largely removed by the excavation of a cutting for the Proposed Scheme. This will sever a long established boundary and will detract from its significance and the continuity of the historic landscape resulting in a high adverse impact and major adverse effect.

6.4.30 A part of Millburn Deserted Medieval Settlement (STN047), an asset of moderate value, will be removed by the creation of the Canley Brook diversion and the realignment of the A429 Kenilworth Road. This will constitute a medium adverse impact and a moderate adverse effect.

6.4.31 Crackley Assarted Woodland (STN106), an asset of low value, will be traversed by the Proposed Scheme at grade and in cutting. This will remove elements of the feature, sever its grain and alter its form. This will constitute a high adverse impact and a moderate adverse effect.

6.4.32 Significant effects that will occur as a result of permanent impacts on the setting of heritage assets are described in the following paragraphs.

6.4.33 The Grade II listed Stonehouse Farm (STN007), an asset of medium value, will have its largely rural setting altered by the creation of a cutting and associated earthworks which will be situated approximately 150m from the asset. The Proposed Scheme will noticeably change the setting of the farm, severing the relationship with the wider estate of which it has always formed a part. This will result in a medium adverse impact and a moderate adverse effect.

6.4.34 The Stare Bridge (STN013), a scheduled monument, an asset of high value, is situated in an area of open parkland adjacent to Stoneleigh Business Park. The development of the centre has already compromised elements of the setting of this asset particularly in the remodelling of its approach from the south. The construction of the Proposed Scheme will not substantially alter the visual appearance of the bridge's setting in views southwards. It will however further slightly sever the relationship between the bridge and the associated estate and lands to the south. This severance will further adversely affect the setting of the asset, resulting in a low adverse impact and moderate adverse effect.

6.4.35 The setting of East Lodge (STN015), an asset of moderate value, has already been considerably altered by the development of Stoneleigh Business Park, including planting and the addition of numerous modern buildings. The excavation of a deep cutting and remodelling of the B4113 Stoneleigh Road and Stareton Road in its immediate vicinity will further degrade the setting of this asset. This will constitute a medium adverse impact and moderate adverse effect.

6.4.36 South Hurst Farm and Cottages (STN063), assets of moderate value, will have their predominately rural setting considerably altered by the construction of the Proposed Scheme with embankments and cutting dominating views to the south and severing relationships between the asset and local fieldscape. This will constitute a high adverse impact and major adverse effect.

6.4.37 The largely rural settings of listed buildings in Stareton village (STN010), assets of moderate value, will be altered by the presence of the railway and there will be some views of the railway from the village, particularly in areas which lie on the brow of the

hill. These views will change the essentially rural nature of the asset which lies within the wider Stoneleigh Park Estate, historically a rural agricultural area. This will constitute a medium adverse impact resulting and moderate adverse effect.

6.4.38 Crabmill Farmhouse (STN087), an asset of moderate value, will have views of the northern part of the Proposed Scheme although a false cutting will mask some of the railway from the asset. These views will alter its current rural setting and disrupt its relationship with the fields which form part of its setting on the north and west sides. This will constitute a medium adverse impact and moderate adverse effect.

6.4.39 The setting of the non-designated Leicester Lane cottages (STN006), an asset of low value, will be considerably altered by the proximity of the Proposed Scheme, including large earthworks for the realignment of the A445 Leicester Lane which will lie almost adjacent to the property and the railway itself which will lie some 60m to the north-east. This will constitute a high adverse impact and moderate adverse effect.

6.4.40 The setting of Kingswood Farmhouse (STN036), an asset of low value, will be altered by the proximity of the Proposed Scheme which will lie approximately 80m to the south-west. The setting of the farm is already compromised by modern development and the nearby road but still retains something of the historic rural setting. This will result in a high adverse impact resulting in a moderate adverse effect.

6.4.41 The setting of Millburn Grange (STN045), an asset of low value, will be altered by the proximity of the Proposed Scheme with a noise fence and the railway located approximately 20m to the south of the asset. Despite the presence of an existing railway (the Coventry to Leamington Spa Line), this will change the rural nature of the asset, resulting in a high adverse impact and a moderate adverse effect.

6.4.42 Cryfield Grange Farm (STN054), an asset of moderate value, will have clear views to the south of the realigned Canley Brook. This will alter the current open rural setting of the farm. This will constitute a medium adverse impact and moderate adverse effect.

6.4.43 The setting of Dale House Farm (STN042), an asset of moderate value will be altered by the construction of Proposed Scheme which will run at grade next to the house. Currently the house lies in a semi rural setting which, despite some new dwellings, retains its essentially agricultural character. There will also be a cutting and the Dalehouse Lane Bridge in the immediate vicinity. This will constitute a high adverse impact and major adverse effect.

Cumulative effects

Permanent cumulative effects

6.4.44 There are no cumulative effects on cultural heritage.

Other mitigation measures

6.4.45 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme or included in the draft CoCP will be considered during detailed design 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 assets; and
- locations where the physical impact on below ground assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

6.4.46 A range of archaeological assets will be permanently lost due to the construction of the Scheme. These assets include several prehistoric cropmark sites, earthworks south of Dale House Farm and at Kingswood, areas of ridge-and-furrow earthworks, portions of deserted medieval settlements at Hurst and Millburn, a Romano British site at Crewe Farm, a possible early castle site north of Stoneleigh, and a former windmill. A programme of archaeological works will be prepared to investigate, analyse, report and archive these assets.

6.4.47 The Proposed Scheme will result in the demolition of non-designated farmstead buildings at Gilberts Spinney. A programme of built heritage works will be prepared to investigate, analyse, report and archive these assets.

6.4.48 The Proposed Scheme will sever elements of the historic landscape, for example hedgerows and ancient woodland. The Grade II* listed Stoneleigh Abbey registered park and garden will be bisected by the Proposed Scheme. Part of an important hedgerow south of Broadwells Wood will be permanently removed, as will portions of three ancient woodlands. In addition, elements of the Proposed Scheme such as cuttings and embankments will affect the setting of historic settlements and buildings such as the Stare Bridge scheduled monument, the Grade II listed Stonehouse Farm, as well as several non-designated buildings and groups of buildings, and a non-designated area of historic landscape.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 The following measures have been incorporated into the design of the Proposed Scheme to reduce the impacts on assets:

- noise mitigation measures within the scheme design to reduce potential impacts on identified assets; and
- landscape planting will increasingly reduce impacts on the setting of the designated assets within the study area as it matures during the operational phase.

Assessment of impacts and effects

6.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent. There will 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, albeit that they will 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.

6.5.3 Significant environmental effects will occur as a result of permanent changes to the setting of the following assets arising from the impacts of railway operation and are detailed in the paragraphs below.

6.5.4 Leicester Lane cottages (STN006) is an asset of low value. Noise levels will change at the asset but significant adverse impacts are not predicted (see Appendix 5 Map SV-02-47). A false cutting will largely obscure trains to the north, but some glimpses will remain. These will also be the introduction of train noise. Operational changes will result in a low adverse impact. The combined permanent presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a high adverse impact and moderate adverse effect.

6.5.5 Stonehouse Farmhouse (STN007) is an asset of moderate value. The proximity of the Proposed Scheme means that the trains will clearly be visible on the raised section to the south and the asset will be in an area with an increase in noise. These changes will alter the predominately rural setting of the asset, resulting in a medium adverse impact. There will also be a medium adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter some characteristics of the setting of this asset, resulting in a medium adverse impact and a moderate adverse effect.

6.5.6 Stoneleigh Abbey registered park and garden (STN012) is an asset of high value. Impacts to its visual setting due to proximity of the Proposed Scheme will be mitigated by deep cutting and planting design. Areas of the eastern segment of the park will experience noise from the operational railway. The western section (including the main house and ancillary buildings) will not experience notable noise impacts. Trains will be visible on the River Avon viaduct from some parts of both halves of the park. The operational changes will result in a low adverse impact. There will also be a medium adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter some characteristics of the setting of this asset, resulting in a medium adverse impact and major adverse effect.

6.5.7 Stare Bridge (STN013) is an asset of high value. Visual impacts are lessened by deep cutting and planting, but there will notable noise levels which will have a low adverse impact on the parkland setting of the asset. There will also be a low adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter some characteristics of the setting of this asset, resulting in a low adverse impact and a moderate adverse effect.

6.5.8 East Lodge (STN015), an asset of medium value. Although trains will not be visible from the lodge's new setting it will be in an area of increased noise. These will result in a medium adverse impact on the asset. There will also be a medium adverse

permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a high adverse impact and a major adverse effect.

6.5.9 Kingswood Farmhouse (STN036) is an asset of low value. The complex lies close to the existing A46 Kenilworth Bypass and noise from the Proposed Scheme will not result in notable additional noise impacts. Trains may be visible for a short stretch on the viaduct; this will slightly change the setting of the asset. There will be a low adverse operational impact. There will also be a high adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter some characteristics of the setting of this asset, resulting in a high adverse impact and a moderate adverse effect.

6.5.10 Dale House, Dalehouse Lane, (STN040) is an asset of low value. There will be a noise and visual impact due to the proximity of the railway. The house will have views of railway with operational trains as it comes out of cutting. This and the noise increase will have an effect upon the historic setting of the house resulting in a high adverse operational impact. There will also be a medium adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter several key characteristics of the rural setting of this asset, resulting in a high adverse impact and moderate adverse effect.

6.5.11 Dale House Farmhouse, Dalehouse Lane, (STN042) is an asset of moderate value. There will be a notable change in noise levels at the asset at the asset and trains will be visible on the viaduct and at grade adjacent to the buildings. These changes constitute a high adverse impact. There will also be a high adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter the rural/semi-rural setting of this asset, resulting in a high adverse impact and a major adverse effect.

6.5.12 Millburn Grange (STN045) is an asset of low value. Trains will be visible approximately 100m to the north-east on the flyover bridge. There will also be increased noise as a result of the proximity of the Proposed Scheme. These changes will result in a medium adverse impact. There will also be a high adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter several key characteristics of the rural setting of this asset, resulting in a high adverse impact and a moderate adverse effect.

6.5.13 Crackley Wood (STN052) is an asset of high value. The northernmost part of the wood will experience noise from the Proposed Scheme. Trains will be visible from the northern extremity of the wood. This will constitute a low adverse impact. There will also be a low adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter several characteristics of the rural setting and character of this asset, resulting in a low adverse impact and a moderate adverse effect.

6.5.14 Roughknowles Wood (STN060) is an asset of high value. The asset will experience noise from the Proposed Scheme. Trains will be visible from the edge of the wood. This will constitute a low adverse impact. There will also be a low adverse permanent construction impact. The combined presence and operation of the Proposed will

adversely alter the rural character and setting of this asset, resulting in a low adverse impact and a moderate adverse effect.

6.5.15 South Hurst Farm and Cottages (STN063) is an asset of moderate value. There will be views of the trains and an increase in noise during the operation of the Proposed Scheme. This will result in a high adverse operational impact. There will also be a high adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter several key characteristics of the rural setting of this asset, resulting in a high adverse impact and a major adverse effect.

6.5.16 Broadwells Wood (STN064) is an asset of high value, trains will be visible from the edges of the woodland and the asset will experience noise from the Proposed Scheme. This will constitute a low adverse impact. There will also be a medium adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter the rural setting and character of this asset, resulting in a high adverse impact and a major adverse effect.

6.5.17 A moated site at Bockenden Grange (STN066) is an asset of moderate value. Trains will not be visible from the asset due to extensive embankments. However, there will be a notable increase in noise, resulting in a low adverse impact. There will also be a low adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter several key characteristics of the rural setting of this asset, resulting in a medium adverse impact and a moderate adverse effect.

6.5.18 Crabmill Farm (STN087) is an asset of moderate value. There will be a notable change in noise levels which will affect the character and setting of the farm, resulting in a medium adverse impact. There will also be a medium adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will change several characteristics of the semi-rural setting of this asset, resulting in a medium adverse impact and a moderate adverse effect.

6.5.19 Crackley Assarted Woodland (STN106) is an asset of low value. There will be a noise impact from the Proposed Scheme. Trains will be visible in several places, together these will result in a medium adverse impact. There will also be a high adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter several key characteristics of the setting of this asset, resulting in a high adverse impact and moderate adverse effect.

Cumulative effects

6.5.20 During the operational phase of the Proposed Scheme, cumulative development projects described in Section 2.1 and Volume 5: Appendix CT-004-000 include construction of HS2 Phase Two. Assessment of cumulative effects on cultural heritage assets arising from the interaction of the Proposed Scheme with cumulative development projects has been undertaken. No significant cumulative effects have been identified in relation to cultural heritage.

Other mitigation measures

6.5.21 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. Potential opportunities for further mitigation have not been identified, but will be considered as part of the detailed design process.

Summary of likely residual significant effects

6.5.22 No mitigation beyond that described above has been identified and consequently the residual effects are the same as those reported in assessment of impacts and effects.

6.5.23 The setting of several historic settlements, buildings and landscapes will be affected visually and by noise once the Proposed Scheme becomes operational. This includes the Stoneleigh Abbey Park, the Stare Bridge, the Stonehouse Farmhouse, several non-designated buildings and groups of buildings, and areas of ancient woodland at Crackley Wood, Roughknowles Wood, and Broadwells Wood. In due course visual effects will reduce as planting matures and the railway assimilates into the landscape.

7 Ecology

7.1 Introduction

7.1.1 This section describes the ecological baseline and identifies likely impacts and significant ecological effects that will arise from the construction and operation of the Proposed Scheme. These include impacts on species, habitats and sites designated for their importance for nature conservation.

7.1.2 The principal ecological issues in this area are: loss of habitat from Broadwells Wood Local Wildlife Site (LWS), which is ancient woodland, and from Black Waste Wood LWS; loss of woodland habitat within Crackley Wood North and Birches Wood; a major diversion of the Canley Brook; loss of breeding ponds and terrestrial habitat for great crested newts; the loss of veteran trees and habitat within Stoneleigh Business Park and loss of foraging habitat used by barn owls near Kenilworth.

7.1.3 Volume 5 of the ES contains supporting information to the ecological assessment reported in this section, including:

- results of ecological surveys (Volume 5: Appendix EC-001-003, EC-002-003, EC-003-003 and EC-004-003); and
- register of local/parish level effects which are not described individually in Volume (Volume 5: Appendix EC-005-003).

7.1.4 As well as survey data, the assessment draws on existing information gathered from national organisations and from regional and local sources including: Warwickshire County Council (Warwickshire Biological Records Centre); Warwickshire Wildlife Trust; Butterfly Conservation (Warwickshire Branch); and the Environment Agency.

7.2 Scope, assumptions and limitations

7.2.1 The scope and methodology of the ecological assessment are introduced in the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2). Further detail, including the study area for individual surveys, is provided within the SMR Addendum. The assessment methodology is summarised in Section 8 of Volume 1 of the ES, along with route-wide assumptions and limitations. Limitations associated with particular surveys are described within the relevant baseline survey report in Volume 5: Appendices EC-001-003, EC-002-003, EC-003-003, and EC-004-003.

7.2.2 A Water Framework Directive assessment has been undertaken in conjunction with the environmental assessment. Details of this assessment are presented in Volume 5: Appendix WR-001-000.

7.2.3 Access was not obtained to all of the land area where general habitat survey (Phase 1 habitat survey) was proposed. Locations with the potential to support key ecological receptors where access could not be gained for survey include: woodland at Hares Parlour adjacent to the area of land required for the construction of the Proposed Scheme and Brick Kiln Spinney located on the south-eastern side of Stoneleigh Business Park; part of Crackley Wood; water bodies requiring amphibian survey, and an unnamed tributary of the River Avon for aquatic surveys. Further details are

provided in Volume 5: Appendices EC-001-003, EC-002-003, EC-003-003 and EC-004-003.

7.2.4 Where data are limited, a precautionary baseline has been built up according to the guidance reported in the SMR Addendum (Volume 5: Appendix CT-001-000/2). This constitutes a 'reasonable worst-case' basis for the subsequent assessment.

7.2.5 A precautionary approach to the assessment has been adopted to identify the likely significant ecological effects of the Proposed Scheme.

7.3 Environmental baseline

Existing baseline

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports presented in Volume 5: Appendix EC-001-003 EC-004-003 and Volume 5: Ecology Map Book – Map series EC-01 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5, Map Book – Ecology, Maps EC-01.

7.3.2 Land required for the construction of the Proposed Scheme and that adjacent to it consists predominantly of gently rolling arable farmland and pasture bounded by intact hedgerows with mature oaks, notably in areas of former parkland, and tree lines. The River Avon and its tributaries with their narrow river corridors are in the east of the area. There are areas of floodplain, improved and semi-improved grassland, together with fragmented blocks of woodlands ranging from ancient semi-natural woodland to conifer plantations.

Designated sites

7.3.3 There are three statutory designated sites located within 500m of the land required for the construction of the Proposed Scheme. Each is considered to be of county/metropolitan value. They are:

- Kenilworth Common Local Nature Reserve (LNR) – located on the northern and western slopes of a sandstone hill, the site comprises diverse woodland dominated by oak, beech and birch, with holly and hawthorn in the scrub layer. There is a little relict heathland with gorse and heather within the LNR. This designated site is approximately 500m to the south-west of the land required for the construction of the Proposed Scheme;

- Wainbody Wood and Stivichall Common, Kenilworth Road Spinney LNR – the three parcels of land making up this LNR: Kenilworth Road Spinney, Wainbody Wood and Stivichall Common, all lie to the north-east of the land required for the construction of the Proposed Scheme. Kenilworth Road Spinney, which is also part of an LWS with Wainbody Wood, extends north-eastwards along both sides of the A429 Kenilworth Road and at its closest point is approximately 50m from the land required for the construction of the Proposed Scheme. The other two sections of the LNR are over 1km from the land required for the construction of the Proposed Scheme and are not considered relevant to the assessment. A description of habitats within Kenilworth Road Spinney and Wainbody Wood LWS section of the LNR is given below; and

- Crackley Wood LNR – this area of ancient semi-natural woodland to the south-west of the dismantled Kenilworth to Balsall line (the Kenilworth Greenway), comprises a mosaic of stands of broadleaved trees, grassy glades, ponds, ditches and a boundary hedgerow. It is particularly noted for its plants, fungi and invertebrates, including a rare sawfly and three notable hoverflies and is located approximately 220m south-west of the land required for the construction of the Proposed Scheme. This site is also an LWS.

7.3.4 There are seven LWS relevant to the assessment in the Stoneleigh, Kenilworth and Burton Green area; each is of county/metropolitan value. They are:

- River Avon LWS – the habitats associated with this LWS include the River Avon, an unnamed tributary of the River Avon, woodland, meadows, scrub and ruderal areas. The river retains many natural features, including several islands, remnant channels and abundant diverse bank side vegetation. A section of the River Avon and one unnamed tributary within the LWS are crossed by the route of the Proposed Scheme;

- Kenilworth Road Spinney and Wainbody Woods LWS – the Kenilworth Road Spinney component of this LWS comprises strips of deciduous woodland with some larch trees along both sides of the A429 Kenilworth Road which is approximately 50m from the land required for the construction of the Proposed Scheme. Wainbody Wood is dominated by sessile oak, downy birch and hazel; however, the Wainbody Wood part of the site is approximately 960m north of the land required for the construction of the Proposed Scheme and not considered relevant to the assessment;

- Crackley Wood LWS – is an area of mixed woodland comprising species such as ash, beech, holly and larch, together with an area of hazel coppice. It is approximately 220m south-west of the land required for the construction of the Proposed Scheme, but is contiguous with woodland within the land required for the Proposed Scheme;

- Broadwells Wood LWS – comprises two areas of ancient semi-natural woodland joined by an area of replanted ancient woodland. It has historically suffered from cattle grazing, but is known to support at least 108 species of vascular plants. Most of these are characteristic of lowland damp oak-birch woodland, and six are characteristic of ancient woodland. The southern section of this LWS is bisected by the land required for the construction of the Proposed Scheme and the northern section is bisected by an access track;

- Black Waste Wood LWS – partly ancient semi-natural woodland; much of which is reported to have been covered in spoil when a nearby pumping station was constructed in the early 1960s. Despite this, the LWS site evaluation form notes the presence of ancient woodland indicators and a rich field layer in most parts of the wood. The southern part of this LWS, which is not ancient woodland, lies within the land required for the construction of the Proposed Scheme;

- Big Poors and Little Poors Wood LWS – comprising two small separated blocks of oak woodland with bracken and bramble understory at Burton Green. Little

Poors Wood is partly located within the land required for the construction of the Proposed Scheme and Big Poors Wood is adjacent to the land required for the construction of the Proposed Scheme; and

- Beanit Farm Hedge LWS – comprising a 0.75km long north-south hedgerow and nearby ponds. The hedgerow is believed to be of ancient origin and stands on a substantial bank with associated ditch. Trees present include pedunculate oak, ash, small-leaved lime and wild pear. Two sections of this hedgerow, each approximately 10m in length are within the land required for the construction of the Proposed Scheme.

7.3.5 In addition to the areas of ancient woodland which fall within designated sites, a further three areas of ancient semi-natural woodland are considered relevant to the assessment: Kings Wood, Crackley Wood North and Roughknowles Wood. These ancient woodlands represent an irreplaceable resource.

Habitats

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

Woodland

7.3.7 Broadwells Wood lies south of Crackley Lane and is bisected by the land required for the construction of the Proposed Scheme. The majority of the wood comprises a mix of ancient semi-natural and ancient replanted woodland. Warwickshire is amongst those counties with the lowest coverage of woodland in Britain[23] and although there are a number of woodlands within this area, woodlands of the size of Broadwells Wood are uncommon. Phase 1 habitat and National Vegetation Classification (NVC)[24] surveys have been undertaken within Broadwells Wood in support of the assessment. The NVC surveys identified the majority of the broadleaved woodland in Broadwells Wood, and woodland in the surrounding area, as pedunculate oak with bracken and bramble understorey (W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus*) which is lowland mixed deciduous woodland, a habitat of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[25]. The woodland habitat is also a Warwickshire, Coventry and Solihull Local Biodiversity Action Plan (LBAP) priority habitat. Broadwells Wood is of county/metropolitan value.

7.3.8 Crackley Wood ancient semi-natural woodland, designated as Crackley Wood LNR/LWS, lies south of the Kenilworth Greenway and supports lowland mixed deciduous woodland, a habitat of principal importance is. No access was available to survey this woodland but it is considered to be of county/metropolitan value.

7.3.9 Black Waste Wood lies south-east of Burton Green and within the area of land required for the construction of the Proposed Scheme. Part of the woodland outside of the Proposed Scheme is ancient. An area of woodland and scrub on the opposite side of the Kenilworth Greenway is not within the LWS citation but is continuous with the woodland habitats within Black Waste Wood and can be considered as part of the woodland unit. These habitats are of county/metropolitan value.

[23] Steven J. Falk (2009), *Warwickshire's Wildflowers The wildflowers, shrubs & trees of historic Warwickshire*; Warwickshire County Council.
[24] NVC is a detailed survey and classification system that is used to compare plant communities with a range of defined community types.
[25] Her Majesty's Stationery Office (2006), *Natural Environment and Rural Communities Act 2006* (Chapter 16). London.

7.3.10 Crackley Wood North, north of the Kenilworth Greenway, is not designated but contains ancient semi-natural woodland; supports lowland mixed deciduous woodland, a habitat of principal importance; and is contiguous with Crackley Wood. This woodland is of county/metropolitan value.

7.3.11 Roughknowles Wood, comprising ancient semi-natural woodland and supporting lowland mixed deciduous woodland, a habitat of principal importance. The south-western edge of the woodland is within the land required for the construction of the Proposed Scheme. Given the size of the ancient woodland and its position close to other pockets of ancient and broadleaved woodland it is considered to be of county/metropolitan value.

7.3.12 A broadleaved woodland to the north of Crackley Wood North (not named on Ordnance Survey (OS) maps but called Birches Wood for the purposes of assessment). Birches Wood is not listed as ancient woodland on the Natural England inventory but is shown on historic maps as part of a larger ancient woodland block; this is also indicated by the woodland flora present. This woodland is of district/borough value.

7.3.13 A narrow strip of broadleaved woodland alongside the Kenilworth Greenway is contiguous with Crackley Wood and Crackley Wood North and provides a linear wildlife corridor linking woodland habitats between Crackley and Burton Green. The woodland, scrub and grassland habitats along the Kenilworth Greenway form a mosaic which collectively are considered to be of district/borough value;

7.3.14 Little Poors Wood at Burton Green is within the area of land required for the construction of the Proposed Scheme. Only the north-western part of the wood, outside of the land required for construction of the Proposed Scheme is ancient woodland. Although Little Poors Wood forms one part of an LWS, it is a small area of secondary woodland which has been replanted with larch and contains common shrub and herb species and parts of the wood are affected by residential gardens, footpaths, the introduction of cultivated garden species, and the dumping of garden waste. Little Poors Wood is part of a complex of woodlands around Burton Green linking to the Kenilworth Greenway, but individually is considered likely to be up to district/borough value.

7.3.15 There are a number of woodlands associated with the Stoneleigh area including Kings Wood, an area of ancient woodland formerly known as the Firth to the west of the village of Stoneleigh. The woodland is adjacent to the land required for the construction of the Proposed Scheme. Due to access constraints, surveys were not undertaken but the woodland is likely to support the habitat of principal importance: lowland mixed deciduous woodland and is considered to be of up to district/borough value.

7.3.16 Hares Parlour Wood and Brick Kiln Spinney to the south-east of Stoneleigh Business Park are approximately 70m from the land required for the construction of the Proposed Scheme. These woodlands are not listed as ancient woodland. Due to access constraints, surveys were not undertaken but the woodlands are likely to support the habitat of principal importance: lowland mixed deciduous woodland and are considered to be of up to district/borough value.

7.3.17 A strip of sycamore and beech broadleaved woodland east of Birches Wood Farm is of local/parish value.

Parkland

7.3.18 Remnant areas of parkland and a former deer park are associated with Stareton and Stoneleigh between the B445 Leicester Lane and the B4115 Ashow Road. The range of habitats include woodland, arable, pasture, ponds, amenity grassland, veteran trees, the River Avon and a golf course. There are six veteran trees within the land required for construction of the Proposed Scheme, which include the species pedunculate oak, Turkey oak and hazel. The Stareton and Stoneleigh area is reported in the Warwickshire, Coventry and Solihull LBAP as probably the best site in Warwickshire for veteran trees[26]. This includes the largest collection of veteran oaks (115 trees) and a group of veteran sweet chestnut trees near Stare Bridge on the River Avon. However, 40oha of the former parkland and deer park have now been developed into the Stoneleigh Business Park exhibition and conference facility, a golf course and some 16ha along the southern edge of the former deer park has been developed into Abbey Park office park. The remaining areas of parkland and those areas still supporting veteran trees are considered to be of up to county/metropolitan value.

Grassland

7.3.19 The false oat-grass grassland NVC community (MG1b *Arrhenatherum elatius*) is an integral part of the mosaic of habitats present along the Kenilworth Greenway which are collectively of district/borough value.

7.3.20 Phase 1 habitat surveys have been carried out on five small areas of improved and semi-improved grassland within the Stoneleigh, Kenilworth and Burton Green area. None were found to be notable and these have negligible value.

Hedgerows

7.3.21 Within the Stoneleigh, Kenilworth and Burton Green area, 32 hedgerows have been noted within or adjacent to the land required for the construction of the Proposed Scheme that meet the wildlife criteria of the Hedgerows Regulations 1997[27], and thus qualify as habitat of principal importance. These include Beanit Farm Hedge LWS (Volume 5: Map Book EC-10-099, F8), which is of county/metropolitan value, and hedgerows along Dalehouse Lane (Volume 5: Map Book EC-10-096, I6) and Crackley Lane (Volume 5: Map Book EC-10-097, C5)

7.3.22 Whilst the remaining hedgerows surveyed are generally species poor due to the wildlife corridors created by hedgerows, the overall hedgerow network within the land required for the construction of the Proposed Scheme is considered to be of district/borough value.

Watercourses

7.3.23 The River Avon LWS, an unnamed tributary watercourse of the River Avon, the Finham Brook, Canley Brook and three unnamed tributary watercourses of the Canley

[26] The Warwickshire, Coventry and Solihull LBAP defines veteran trees as over 300 years old with some probably exceeding 500 years old.
[27] *The Hedgerows Regulations 1997* (1997 No. 1160). London. Her Majesty's Stationery Office.

Brook will be crossed by the Proposed Scheme. The Warwickshire, Coventry and Solihull LBAP lists rivers and streams as priority habitats. They also provide wildlife corridors.

7.3.24 The River Avon is designated as a LWS on account of the natural features it supports, including several islands, remnant channels and abundant diverse riparian vegetation. The River Avon LWS includes an unnamed tributary which runs west to east approximately 175m north of Glasshouse Wood and discharges to the Avon approximately 550m north-west of Stoneleigh Abbey. These watercourses are considered to be of county/metropolitan value.

7.3.25 The Finham Brook and Canley Brook have meandering channels which support a range of in-channel habitats. Both are considered to be of district/borough value.

7.3.26 Other minor watercourses (tributaries) have been historically straightened and deepened. Due to the limited range of habitats supported they are considered to be of local/parish value.

Water bodies

7.3.27 There are 26 water bodies within the land required for the construction of the Proposed Scheme.

7.3.28 Based on habitat alone, each of the surveyed water bodies is considered to be of local/parish value. However, some ponds were unable to be surveyed due to access restrictions and, using a precautionary assessment, these are considered to be up to district/borough value.

Other habitats

7.3.29 Other habitats, such as scrub, are found mostly around field edges, alongside ditches and around ponds. There are building complexes within the land required for construction of the Proposed Scheme at Stoneleigh Business Park, at Hope Barn and properties at Burton Green. These features are each of local/parish value.

7.3.30 The Phase 1 habitat data derived from aerial mapping show that the Stoneleigh, Kenilworth and Burton Green area is dominated by arable fields with occasional trees and narrow field margins. No species rich arable margins have been noted and the arable land largely comprises heavily managed large fields with few features of interest to wildlife. This habitat has negligible value.

Protected and/or notable species

7.3.31 A summary of the species relevant to the assessment is provided in Table 13.

Table 13: Protected and/or notable species

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
Bats	Regional	Population of Daubenton's and brown long-eared bat using a roost at a bridge along the River Avon, within land associated with Stoneleigh Business Park	A maternity roost for Daubenton's at a bridge along the River Avon within approximately 20m of land required for the construction of the Proposed Scheme had a peak emergence of 23 Daubenton's. The proximity of the roost to the River Avon and areas of adjacent woodland make it likely that species may use the river and woodland crossed by the route of the Proposed Scheme for commuting and foraging. Daubenton's is a 'rarer'[28] bat species within England based on distribution and population size. The roost was also found to support a maternity colony of brown long-eared bat with a peak emergence of 63 bats. Brown long-eared bat is common and widespread within the UK but is a species of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[29].
	Up to regional	Potential assemblage of bats associated with tree roosts at Crackley Wood South and woodland habitat within land on the east side of Crackley Lane	No access has been available to this section of Crackley Wood South and land on the east side of Crackley Lane between land required for the construction of the Proposed Scheme and 100m from the boundary of the land required, to survey potential tree roosts. Activity and static surveys within adjoining parts of Crackley Wood confirmed a range of activity by species including *Myotis* species, noctule and Leisler's which may roost within trees within both areas of woodland habitat. Leisler's bat, along with many *Myotis* species, is considered to be a rarer bat within England and rare within Warwickshire. As a precaution it is assumed that Crackley Wood South could support maternity roosts of both common and rarer species based upon the assemblage recorded within the area.
	County/ metropolitan	Assemblage of bats using roosting, foraging and commuting habitats at Stoneleigh Business Park, including the River Avon	River corridor and adjacent woodland habitats within land required for the Proposed Scheme support high levels of bat activity including common pipistrelle, soprano pipistrelle, Daubenton's, noctule, brown long-eared bat and calls identified as *Myotis* species. Noctule, brown long-eared bat and soprano pipistrelle are species of principal importance. A low level of Leisler's bat activity has been recorded during static surveys, a species considered to be a rarer bat species within England and rare within Warwickshire. No roosts for this species have been identified within land required for the construction of the Proposed Scheme. Static surveys also identified low levels of activity by serotine, a rarer species in England. Bat activity was particularly associated with the corridor of the River Avon and an area of woodland between the River Avon and the B4115 Ashow Road.

[28] Numbers of bats between 10,000 and 100,000 individuals based on Wray S, Wells D, Long E and Mitchell-Jones T. (2010) Valuing bats in ecological impact assessment. In Practice. December 2010. P23-25.
[29] *Natural Environment and Rural Communities Act* 2006 (Chapter 16). Her Majesty's Stationery Office.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
			Four buildings within land required for the construction of the Proposed Scheme were found to support summer (non-breeding) roosts for soprano pipistrelle and brown long-eared bats with peak emergence of one or two individuals. A further five buildings within 100m of land required for the construction of the Proposed Scheme were found to support individuals of commoner bats: brown long-eared, common pipistrelle and soprano pipistrelle, with a peak emergence of one or two individuals.
	County/ metropolitan	Populations of common pipistrelle and soprano pipistrelle using a roost within Stoneleigh Business Park	A common pipistrelle and soprano pipistrelle maternity roost within the land required for the construction of the Proposed Scheme. Emergence survey of this residential building recorded a peak emergence of 53 common pipistrelle and 24 soprano pipistrelle.
	County/ metropolitan	Assemblage of bats using foraging and commuting woodland habitat including Crackley Wood, Roughknowles Wood, Broadwells Wood and Black Waste Wood together with adjacent habitats including the Kenilworth Greenway	Common pipistrelle, soprano pipistrelle, brown long-eared, Daubenton's, noctule and *Myotis* species identified by activity surveys in habitats within the land required for construction of the Proposed Scheme. A small number of calls confirmed as Leisler's were recorded during static surveys. No confirmed tree roosts were found within land required for the construction of the Proposed Scheme at Roughknowles Wood, Broadwells Wood and Crackley Wood North but a low density of trees with high or moderate potential to support tree roosts were identified predominantly associated with Crackley Wood North. Some woodland areas were unable to be surveyed, including Crackley Wood South and within land on the east side of Crackley Lane, due to access restrictions and could support roosts of rarer bat species. A residential property near Crackley Lane within 100m of land required for the construction of the Proposed Scheme was found to support Brandt's and common pipistrelle, confirmed through DNA analysis of droppings only. The number of droppings found is indicative of a summer (non-breeding) roost. The loft was separated into three separate roof voids of which two were found to contain a small pile of droppings. One pile was confirmed as Brandt's and the second was confirmed as common pipistrelle. The potential for bats to be roosting underneath roofing felt was noted which may have concealed bats in situ and further droppings. The proximity of the woodlands to the roosts makes it likely that these species use these habitats for foraging and commute along the linking hedgerows. Static surveys along the Kenilworth Greenway indicate it supports a diverse assemblage of bat species including noctule and Nathusius' pipistrelle (rare in Warwickshire). Activity along Kenilworth Greenway was found to be higher away from the urban areas surrounding Burton Green.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	Up to county/ metropolitan	Assemblage of bats associated with three tree roosts located within the area	Within land required for the construction of the Proposed Scheme three trees have been confirmed to support roosting bats: one at Stoneleigh Business Park; one within land between Dalehouse Lane and A429 Kenilworth Road; and one within land between Leicester Lane and Stoneleigh Road. Species unknown and droppings found were too degraded for DNA analysis, but these trees potentially support individuals of rarer bat species in England that have been confirmed as present within this area.
	District/borough	Assemblage of bats using foraging and commuting habitats between A445 Leicester Lane and Stoneleigh Road	Surveys found these habitats support moderate levels of activity by a more diverse assemblage of bat species including noctule, *Myotis* species and Leisler's bat. Low level of activity by Leisler's has been recorded during transect surveys, a species considered to be a rarer within England and rare within Warwickshire. A low level of activity by serotine was confirmed during static surveys, a rare bat species in England and uncommon within Warwickshire. One tree roost was confirmed, species unknown.
	District/borough	Assemblage of bats using foraging and commuting habitats associated with land between Dalehouse Lane and A429 Kenilworth Road	Common pipistrelle, soprano pipistrelle, brown long-eared, Daubenton's, noctule and *Myotis* species identified by activity surveys in habitats within the land required for construction of the Proposed Scheme. A single pass by Leisler's bat was recorded in May and August 2013 during static surveys.
	District/borough	Assemblage of bats using roosting, foraging and commuting habitats within and adjacent to Little Poors Wood and Big Poors Wood, including Burton Green	Low levels of commuting and foraging activity by common pipistrelle and soprano pipistrelle. Both species are widespread and common within Warwickshire and England. Summer (non breeding) building roosts were found at ten residential buildings at Burton Green, each found to support individual or small numbers of common pipistrelle, soprano pipistrelle or brown long-eared bats.
	Local/parish	Assemblage of bats using foraging and commuting habitats north of B4115 Ashow Road	These habitats, which are within the land required for construction of the Proposed Scheme support low levels of activity by common and soprano pipistrelle bats and brown long-eared bats, species which are common and widespread both within Warwickshire and in England.
	Local/parish	Assemblage of bats using foraging and commuting habitats south of Dalehouse Lane, adjacent to Kenilworth Golf Course	Surveys identified moderate levels of activity by more common bat species including common pipistrelle and soprano pipistrelle in habitats within the land required for construction of the Proposed Scheme.
	Local/parish	Populations of common and soprano pipistrelle at two tree roosts on the Stoneleigh Business Park	Roosts found to support individuals of soprano pipistrelle with a peak emergence of one, and a roost with either an individual common pipistrelle or soprano pipistrelle observed during a detailed inspection.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
Amphibians	County/ metropolitan	Great crested newt metapopulation[30] AMP8[31] south-east of Stoneleigh Business Park near Decoy Spinney	AMP8 has a total of five water bodies, four of which have been surveyed. The metapopulation supports a medium breeding population size class of great crested newt. Great crested newt is a species of principal importance. Water bodies within the metapopulation also support other amphibians (smooth newt, palmate newt, common frog and common toad). Common toad is a species of principal importance and palmate newt is not common within Warwickshire. This metapopulation is partially within the land required for construction of the Proposed Scheme. The records provided from Warwickshire Biological Records Centre indicate that great crested newt appears to be abundant within Warwickshire and is likely to be widespread within this area. However, the Warwickshire LWS selection criteria give breeding populations of great crested newts as a reason for selection of LWS which are of county/metropolitan value.
	County/ metropolitan	Great crested newt metapopulation AMP9, east of Kenilworth north-west of A46 Kenilworth Bypass	AMP9 has a total of five water bodies, of which three received complete surveys. The metapopulation supports a breeding medium population size class of great crested newt. All water bodies within AMP9 also support other amphibians (smooth newt, common frog and common toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.
	County/ metropolitan	Great crested newt metapopulation AMP10, north-east of Kenilworth south-east of A46 Kenilworth Bypass	AMP10 has a total of six water bodies, five of which have been surveyed (three complete and two incomplete). The metapopulation supports a medium breeding population size class of great crested newt. Water bodies within AMP10 also support other amphibians (smooth newt and common toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.
	County/ metropolitan	Great crested newt metapopulation AMP12, east of Crackley Wood	AMP12 has a total of five water bodies, three of which had full surveys. The metapopulation supports a medium breeding population size class of great crested newt. Water bodies within AMP12 also support other amphibians (smooth newt, palmate newt, common frog and common toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.

[30] A great crested newt metapopulation is a group of associated populations made up from newts which both breed in the ponds and live in the terrestrial habitat around a cluster of ponds. The newts are likely to return to the same pond each year; however, there may be some interchange of newts between the ponds within the metapopulation. Assumed metapopulations (AMP) have currently been identified based on a combination of desk based information and survey results. Details of AMP are given in Volume 5: Appendix EC-002-003.

[31] There are 13 assumed great crested newt metapopulations present in the Stoneleigh, Kenilworth and Burton Green area; AMP8 – AMP20.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	County/ metropolitan	Great crested newt metapopulation AMP15, north of Broadwells Wood west of Brockendon Road	AMP15 has a total of four water bodies, three of which have been surveyed (one complete and two incomplete). The metapopulation supports a medium breeding population size class of great crested newt. Water bodies within AMP15 also support other amphibians (smooth newt, common frog and common toad). This metapopulation is outside of the land required for construction of the Proposed Scheme.
	Up to county/ metropolitan	Great crested newt metapopulation AMP14, east of Broadwells Wood	AMP14 has a total of four water bodies, three of which received completed surveys. AMP14 contains a small population size class of great crested newts but due to incomplete surveys could support a medium population size class). It also supports an exceptional population size class of smooth newt, a good population size class of palmate newts, along with common frog and common toad. This metapopulation is partially within the land required for construction of the Proposed Scheme.
	Up to county/ metropolitan	Great crested newt metapopulation AMP16, south-east of Black Waste Wood	AMP16 has a total of three water bodies, two of which have received complete surveys. The metapopulation supports a small breeding population size class of great crested newt, but due to incomplete surveys could support a medium population size class. This metapopulation is partially within the land required for construction of the Proposed Scheme.
	Up to county/ metropolitan	Great crested newt metapopulation AMP19, south of Beanit Spinney	AMP19 has a total of nine water bodies, four of which have been surveyed (three complete one incomplete). Due to the presence of great crested newts (two small population size classes) found during incomplete surveys it is assumed that this species is breeding in these water bodies and a medium population size class could be present. AMP19 also supports other amphibians (smooth newt, common frog and common toad). This metapopulation is outside of the land required for construction of the Proposed Scheme.
	Up to county/ metropolitan	Great crested newt metapopulation AMP20, Hodgett's lane, Beechwood, south of Carol Green	AMP20 has a total of seven water bodies, three of which have been surveyed (one complete and two incomplete). The metapopulation supports a small breeding population size class of great crested newt. However, due to incomplete surveys a medium population size class of great crested newts could be present. The other two surveyed water bodies within AMP20 also support other amphibians (smooth newt and common frog and toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.
	Up to county/ metropolitan	All water bodies not subject to full survey outside of great crested newt metapopulations	Using a precautionary approach, water bodies which have not been surveyed could support breeding populations of great crested newts of medium population size class.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	District/borough	Great crested newt metapopulation AMP17, south of Burton Green between Red Lane and Kenilworth Greenway	AMP17 has a total of two water bodies, both of which had full surveys. The metapopulation supports a small breeding population size class of great crested newt. The water bodies within AMP17 also support other amphibians (one with smooth newt and palmate newts and the other with common frog and common toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.
	District/borough	Great crested newt metapopulation AMP11, north-west of A429	AMP11 has a total of two water bodies, one of which has been surveyed on six occasions. The metapopulation supports a small breeding population size class of great crested newt (peak count of one). This water body also supports other amphibians (smooth newt, common frog and common toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.
	District/borough	Great crested newt metapopulation AMP13, between Blind Lane and Crackley Wood	AMP13 has a total of two water bodies. The metapopulation supports a small population size class of great crested newts found in both water bodies (peak count of one) following incomplete surveys. AMP13 also supports smooth newt and common frog in both water bodies. This metapopulation is outside of the land required for construction of the Proposed Scheme.
	District/borough	Great crested newt metapopulation AMP18, Burton Green	AMP18 has a total of five water bodies, all of which have received completed surveys. Great crested newts have been found in one water body (one small population size class (peak count of one). AMP18 also supports other amphibians (smooth newt, common frog and common toad). This metapopulation is partially within the land required for construction of the Proposed Scheme.
	Local/parish	Populations of common amphibian species in 22 individual water bodies which lie outside of assumed great crested newt metapopulations	A total of 22 water bodies received full surveys and were found not to contain great crested newt. These water bodies support other amphibian species: smooth newt (14 water bodies); common frog (14 water bodies); and common toad (11 water bodies). All of these species are considered to be widespread within Warwickshire and within the Stoneleigh, Kenilworth and Burton Green area.
Birds	County/ metropolitan	Barn owl pair on farmland near Kenilworth	A traditional barn owl nest site[32] was identified within a farm near Kenilworth. The nest site is outside the land required for construction of the Proposed Scheme. A pair of barn owl constitutes more than 1% of the estimated county breeding population. Barn owl is a Schedule 1 species[33].
	County/ metropolitan	Hobby breeding pair near Crackley	A pair of hobbies is thought to have bred within or near a site near Crackley. The nest site was not located during surveys and is not thought to be within the land required for construction of the Proposed Scheme. A pair of hobbies constitutes more than 1% of the estimated county breeding population. Hobby is a Schedule 1 species.

[32] A traditional nest site is one that has been regularly used in previous years but not found to be occupied at the time of the current surveys.
[33] Schedule 1 birds receive full protection under the *Wildlife and Countryside Act 1981* (as amended). In addition to the protection from killing or taking that all birds, their nests and eggs have under the Act, Schedule 1 birds and their young must not be disturbed at the nest.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	District/borough	Population of breeding yellow wagtail at Park Farm, Stareton	Up to four yellow wagtail breeding territories (three confirmed; one probable/possible) were recorded. Yellow wagtail is on the red List Bird of Conservation Concern (BoCC)[34] species and a species of principal importance, and is thought to be widespread in the regional farmland landscape.
	District/borough	Population of wintering lesser redpoll at Milburn Grange, Kenilworth	Large numbers of lesser redpolls were recorded during three winter visits (maximum count 30 birds). This Red List BoCC species and species of principal importance are thought to be widespread in the regional farmland landscape during the winter months.
	Local/parish	Assemblage of breeding birds at Park Farm, Stareton	Field surveys recorded 51 bird species within this area, of which 23 are notable. Seventeen notable species are thought to have bred on site, including species such as tree sparrow and yellowhammer, both of which are species of principal importance. Species recorded (with the exception of yellow wagtail whose population at the site is of district/borough importance) are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of breeding birds at Stoneleigh Business Park, south of Stoneleigh	Field surveys recorded 71 bird species within this area of which 33 are notable. Twenty-two notable species are thought to have bred on site, including species such as kingfisher near the River Avon, and lapwing. Kingfisher is a Schedule 1 species and lapwing is a species of principal importance. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of breeding birds at Milburn Grange, Kenilworth	Field surveys recorded 56 bird species within this area of which 26 are notable. Seventeen notable species are thought to have bred on site, including species such as cuckoo, a species of principal importance, and yellow wagtail. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of breeding birds at Cryfield Grange, near Crackley	Field surveys recorded 45 bird species within this area of which 19 are notable. Thirteen notable species are thought to have bred on site, including species such as marsh tit, a species of principal importance, and yellow wagtail. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of breeding birds at Crackley Farm, near Crackley	Field surveys recorded 49 bird species within this area of which 25 are notable. Fifteen notable species are thought to have bred on site, including species such as tree sparrow and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.

[34] Gregory RD, Wilkinson NI, Noble DG, Robinson JA, Brown AF, Hughes J, Proctor DA, Gibbons DW and Galbraith CA (2002) The population status of birds in the United Kingdom, Channel Islands and the Isle of Man; an analysis of conservation concern 2002 – 2007. British Birds 95: 410-450.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	Local/parish	Assemblage of breeding birds at an area of Crackley Wood, Crackley	Field surveys recorded 25 bird species within this area of which six are notable. Three notable species are thought to have bred on site, including species such as dunnock and song thrush, both species of principal importance. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of breeding birds within arable fields and Broadwell's wood, south-of Crackley Lane	Field surveys recorded 51 bird species within this area of which 23 are notable. Seventeen notable species are thought to have bred on site, including species such as marsh tit and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of breeding birds associated with grassland fields and the adjacent Roughknowles Wood, south-west of Coventry	Field surveys recorded 37 bird species within this area of which 11 are notable. Ten notable species are thought to have bred on site, including species such as linnet and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of wintering birds at Park Farm, Stareton	Field surveys recorded 47 bird species within this area of which 20 are notable, including species such as lesser redpoll and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of wintering birds at Stoneleigh Business Park, south of Stoneleigh	Field surveys recorded 58 bird species within this area of which 26 are notable, including species such as kingfisher and lesser redpoll. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of wintering birds at Milburn Grange, Kenilworth	Field surveys recorded 56 bird species within this area of which 26 are notable, including species such as brambling and kingfisher. Species recorded (with the exception of lesser redpoll whose population at this site is of district/borough importance) are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of wintering birds at Cryfield Grange, near Crackley	Field surveys recorded 40 bird species within this area of which 15 are notable, including species such as lesser redpoll and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Assemblage of wintering birds at Crackley Farm, near Crackley	Field surveys recorded 39 bird species within this area of which 16 are notable, including species such as lesser redpoll and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	Local/parish	Assemblage of wintering birds at an area of Crackley Wood, Crackley	Field surveys recorded 21 bird species within this area of which three are notable; marsh tit, redwing and song thrush. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
Terrestrial invertebrates	Up to county/ metropolitan	Assemblage within Stoneleigh Business Park	Habitats surveyed within remnant areas of parkland and a former deer park between the B445 Leicester Lane and the B4115 Ashow Road centred on Stoneleigh Business Park. Despite having fewer than five notable species recorded during the surveys, including a nationally scarce ant and a nationally scarce deadwood beetle, the precautionary value of up to county/metropolitan value has been allocated as the habitats contain a number of mature and veteran oak trees in a parkland setting that could attract scarce flies and beetles that are difficult to detect. The habitat supporting the assemblage is partially within the land required for construction of the Proposed Scheme.
	District/borough	Assemblage within Broadwells Wood	Mature oak woodland supporting notable species including a nationally scarce deadwood cranefly and a nationally scarce ant. Broadwells Wood is partially within the land required for construction of the Proposed Scheme.
	Local/parish	Assemblage within Black Waste Wood and Little Poors Wood	Woodlands of lesser diversity, but which contain trees that are likely to be of increasing habitat value for terrestrial invertebrates as they mature.
Reptiles	Up to county/ metropolitan	Populations of adder at Kenilworth Common and suitable linked habitats	No adder was identified during surveys within the Stoneleigh, Kenilworth and Burton Green area. Kenilworth Common (where the most recent adder record occurred in 1998) is one of the three reported sites in the Warwickshire, Coventry and Solihull LBAP considered likely to offer suitable habitat for adder, a species of principal importance. This site is approximately 500m south of the Proposed Scheme, although is connected to habitats within land required for the construction of the Proposed Scheme. Reptile surveys were not possible on all of the habitats which are connected to Kenilworth Common.
	Local/parish	Populations of grass snake at Stoneleigh Business Park, on land south-east of Dalehouse Lane, Cryfield Grange Farm and Roughknowles Wood	Grass snake populations of low population size class were recorded during surveys within the land required for construction of the Proposed Scheme. Grass snake is likely to be common, but restricted to suitable habitats including within and adjacent to woodland and watercourses such as the River Avon. Grass snake is widespread within Warwickshire and a species of principal importance.
Notable plants	District/borough	Thin-spiked wood-sedge in Birches Wood	Plant, identified during surveys in two locations in Birches Wood within the land required for construction of the Proposed Scheme, which is locally rare in Warwickshire[35].

[35] Warwickshire rare plants are those found in three sites or less in the county.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
	Up to district/borough	Orpine in Roughknowles Wood	Plant identified from desk study along the edge of Roughknowles Wood at the junction of Cryfield Grange Lane and Crackley Lane, which is locally scarce in Warwickshire[36]. Only known to occur in two sites in Warwick District so qualifies as a feature which is scarce within the district/borough. Roughknowles Wood is partially within the land required for construction of the Proposed Scheme.
Aquatic macro-invertebrates	District/borough	Assemblage at Hares Parlour pond east of Stoneleigh Business Park	Supports a taxon-rich macro-invertebrate community indicative of good biological water quality. The pond is outside of the land required for construction of the Proposed Scheme.
	Local/parish	Assemblage at Canley Brook downstream of Proposed Scheme crossing point	Presence of locally important (widely distributed but not common) caseless and cased species of caddisflies.
	Up to local/parish	Assemblages on all other watercourses within this area	In discussion with the Environment Agency, no other watercourses were identified as requiring survey although they may provide suitable habitat for commonly occurring species.
Fish	District/borough	Assemblage within the Finham Brook (at Proposed Scheme crossing) and Canley Brook (upstream of Proposed Scheme crossing)	Surveys identified the presence of a mixed coarse fishery with salmonids, namely brown trout, a species of principal importance, in the Finham Brook and Canley Brook, along with species of conservation interest, namely bullhead.
	District/borough	Assemblage within the River Avon (at Proposed Scheme crossing)	The desk study and survey of the River Avon identified the presence of a mixed coarse fishery, with species of conservation interest, namely European eel (a critically endangered species of principal importance).
	Up to local/parish	Populations in all other watercourses	In discussion with the Environment Agency no other watercourses were identified as requiring survey although they may provide suitable habitat for commonly occurring species.
Otter	District/borough	Population of otter on the River Avon catchment	Survey results indicate the presence of otter, from spraints, on the River Avon although no holt was found. Desk study results included footprints indicating the presence of juvenile otters at Stoneleigh Business Park, suggesting that nearby reaches of the river are within the territory of a breeding female otter. There was also evidence of otter presence on the River Sowe, and both upstream and downstream of the Proposed Scheme on the Canley Brook. Four potential holts were identified on tributaries of the Canley Brook, outside of the land required for construction of the Proposed Scheme, and eight terrestrial sites were identified as having potential to support breeding habitat for otter. There was also evidence of presence on the Finham Brook. Otter is a species of principal importance.

[36] Warwickshire scarce plants are those found in four to 10 sites in the county.

Species/ species group	Value	Receptors	Baseline and Rationale for Evaluation
Badger	Local/parish	At least 11 separate badger social groups with territories wholly or partly within the area surveyed	Of the seven groups with setts within the land required for the construction of the Proposed Scheme, none had main setts, two had subsidiary setts and five only had outlier setts. Badgers are widespread throughout Warwickshire and the UK. The badger social groups within the area are not likely to form a critical part of the county or of the district population.
White-clawed crayfish	Negligible	Potential populations using watercourses in the area	Surveys of all suitable watercourses for white-clawed crayfish, a species of principal importance, found no evidence of presence. The desk study did not identify any current records of white-clawed crayfish within 5km of the route of the Proposed Scheme. The data search and survey work revealed the presence of signal crayfish, a non-native species. Non-native crayfish are likely to have a detrimental effect on any white-clawed crayfish present through the spread of disease and by out-competing white clawed crayfish for resources, making it less likely that native white-clawed crayfish would be present. White-clawed crayfish are assumed to be absent.
Water vole	Negligible	Potential populations using watercourses in the area	No direct evidence of water vole activity was recorded on any of the watercourses surveyed in the area, including the River Avon, River Sowe, Finham Brook, Canley Brook, two unnamed tributaries of the Canley Brook and four other unnamed watercourses. No direct evidence of presence was detected on 15 ponds within the area, despite suitable habitat being present. The desk study revealed records of presence on the Canley Brook, the closest record being approximately 320m north-east of the land required for the construction of the Proposed Scheme. Therefore water vole, a species of principal importance, is assumed to be absent from the area of works.
Hazel dormouse	Negligible	Potential populations using woody habitat within the area	There are no records of hazel dormouse, a species of principal importance, in the desk study or from surveys of suitable habitat within 100m of the land required for the construction of the Proposed Scheme. There are few records of hazel dormice within Warwickshire which is at the north-western boundary of the known range of this species in the UK. Therefore hazel dormouse is assumed to be absent from the area of works.

Future baseline

Construction (2017)

7.3.32 A summary of the known developments which are assumed to be mostly built and occupied prior to construction of the Proposed Scheme is provided in Section 2.1 of this report, with further details provided in Volume 5: Appendix CT-004-000. It is not expected that these developments will significantly affect the character and value of ecological resources within this area. This includes development of Stoneleigh Business Park although this development is assumed not to change the baseline value of the habitats relevant to the assessment.

7.3.33 Crackley Wood LNR is being managed by the Warwickshire Wildlife Trust to gradually remove introduced exotic species of coniferous tree and reinstate coppicing. This is not expected to change the baseline value of the habitats relevant to the assessment.

Operation (2026)

7.3.34 There are no known committed developments or changes to management in the Stoneleigh, Kenilworth and Burton Green area that will affect the operational baseline.

7.4 Effects arising during construction

Avoidance and mitigation measures

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

- aligning local road diversions to reduce land required for the Proposed Scheme in ancient woodlands, including Roughknowles Wood;
- three viaduct crossings will negate the need for culverting of the River Avon, Finham Brook and Canley Brook. This will retain wildlife connectivity along these watercourses for species such as otter and bats;
- the detailed design will ensure that the realigned channel of Canley Brook is sufficiently sized, and will maintain the floodplain connection to the Finham Brook and the River Avon. Consideration will be given in the design to the objectives of the Water Framework Directive as described in the River Basin Management Plan. This may include the use of soft engineering solutions for bank design, and the inclusion of natural forms such as berms or incorporation of a two-stage channel, riffles and pools and marginal planting;
- avoidance of in-channel structures associated with viaducts and bridges will prevent impacts to watercourse habitat, form and function;
- minimising culvert lengths at crossing locations on three unnamed tributaries of the Canley Brook through minor watercourse realignment works to reduce the extent of stream habitat loss and the degree of habitat severance; and
- making all culverts suitable to allow passage for mammals such as otter, taking into account flood events; or will have an alternative dry tunnel installed where this is not possible.

7.4.2 The assessment assumes implementation of the measures set out within the draft CoCP (see Volume 5: Appendix CT-003-000), which includes translocation of protected species where appropriate.

Assessment of impacts and effects

Designated sites

7.4.3 Approximately 4.3ha (25%) of the 17.4ha Broadwells Wood LWS will be lost as a result of the construction of the Proposed Scheme. The loss will include 2.8ha of ancient semi-natural woodland and 0.4ha of replanted ancient woodland with the rest being woodland not listed on the ancient woodland inventory. The retained sections of the woodland will be fragmented with approximately 11.2ha of replanted and ancient semi-natural woodland to the north of the land required for construction of the Proposed Scheme and approximately 1.9ha to the south of which 1.2ha is ancient semi-natural woodland. There will be an upgrade of an existing track from South

Hurst Farm affecting the central replanted ancient woodland section of Broadwells Wood although habitat loss will be kept to a minimum. The main impacts will include direct habitat loss and severance of irreplaceable ancient woodland resource including potential loss of plant species for which the woodland is designated; reduced size of remnant blocks causing increased vulnerability to edge effects such as wind throw. These impacts will result in a permanent adverse effect on the integrity of the LWS that will be significant at a county/metropolitan level.

7.4.4 The land required for the construction of the Proposed Scheme will result in the loss of approximately 1.1ha (11%) of the 9.95ha Black Waste Wood LWS along its western edge affecting lowland mixed deciduous woodland habitat of principal importance. The part of the LWS within the land required for construction of the Proposed Scheme has been partially clear felled and used for horse grazing. Many of the open cleared areas are dominated by bracken. Although the ancient woodland within the LWS will not be affected, the remnant woodland blocks will be reduced in size. The Proposed Scheme will also sever Black Waste Wood from woodland and scrub along the Kenilworth Greenway and from the woodland and scrub on the opposite side of the Kenilworth Greenway. The combination of impacts is likely to result in an adverse effect on the integrity of the LWS which will be significant at a county/metropolitan level.

7.4.5 A strip of land will be required from the northern edge of Little Poors Wood in order to construct the Burton Green green tunnel. This will result in the loss of approximately 0.2ha (4.3%) of the 4.7ha Big Poors and Little Poors Wood LWS. There will be no habitat loss within Big Poors Wood and the small extent of loss along one edge of Little Poors Wood will not lead to increased fragmentation. Little Poors Wood has been replanted with larch and contains common shrub and herb species and parts of the wood are affected by residential gardens, footpaths, the introduction of cultivated garden species, and the dumping of garden waste. The impacts will not result in an adverse effect on the integrity of the LWS.

7.4.6 The cutting required for the Burton Green green tunnel (up to approximately 10m below ground level) may result in changes to local hydrology by lowering groundwater levels. Black Waste Wood LWS has no associated wetland features, although springs currently feed a stream that flows along the southern boundary of Black Waste Wood LWS and will be culverted. Big Poors and Little Poors Wood LWS contains springs at Big Poors Wood and a pond on the north-west side of Little Poors Wood. Section 13 describes mitigation measures, including sustainable drainage systems and/or injection of abstracted water which will ensure hydrological impacts on Black Waste Wood LWS and Big Poors and Little Poors Woods LWS do not result in a significant effect on the ecological integrity of either site.

7.4.7 There will be a temporary loss of approximately two 10m sections from Beanit Farm Hedge LWS during construction of the Proposed Scheme: one for the diversion of the Kenilworth Greenway during construction; and one for a diverted bridleway. This will result in loss of approximately 2.7% of the 750m hedgerow and although there will be some severance along the length of the hedgerow the gaps will be located to avoid trees. None of the field drains or ponds associated with the hedge will be affected. These impacts are unlikely to cause an adverse effect on the integrity of the LWS.

7.4.8 The extent and severity of shading of the viaduct crossing the River Avon is not expected to have an impact on interest features of the River Avon LWS. As a result, no significant adverse effects on the River Avon LWS are expected.

7.4.9 No impacts are expected on the following designated sites which form part of the baseline: Wainbody Wood and Stivichall Common, Kenilworth Road Spinney LNR, Kenilworth Road Spinney and Wainbody Woods LWS, and Crackley Wood LNR/LWS.

Habitats

7.4.10 There will be a total loss of 3.8ha of ancient woodland habitat within the area from: Broadwells Wood (2.8ha of ancient semi-natural woodland and 0.4ha of plantation on ancient woodland), Crackley Wood North (0.1ha of ancient semi-natural woodland) and Roughknowles Wood (0.5ha of planted ancient woodland). This will have an adverse effect on the conservation status of ancient woodland which will be significant in each case, at a county/metropolitan level.

7.4.11 In total, there are 21.5ha of woodland within the land required for the construction of the Proposed Scheme within the Stoneleigh, Kenilworth and Burton Green area. This comprises 10.2ha of broadleaved semi-natural woodland, 9.8ha of broadleaved plantation woodland, 0.1ha of coniferous plantation woodland and 1.4ha of mixed plantation woodland. This includes the loss within designated and ancient woodlands. Losses of lowland mixed deciduous woodland, a habitat of principal importance, within secondary woodland will include Birches Wood which will be bisected by the land required for the construction of the Proposed Scheme to leave only two small remnants, and woodland and scrub along the Kenilworth Greenway. The individual impacts on Birches Wood and broadleaved woodland alongside the Kenilworth Greenway would result in adverse effects on the conservation status of each woodland habitat that would be significant at a district/borough level.

7.4.12 The land required for the construction of the Proposed Scheme includes a corridor through Stoneleigh Business Park and the southwest corner of the former deer park at Stareton. This will result in the loss of parkland and six veteran trees. It will also result in greater severance and isolation of the remaining areas of remnant parkland to the north of the River Avon and in the vicinity of Stoneleigh Abbey to the south-west of the route of the Proposed Scheme. These impacts could lead to a permanent adverse effect on the conservation status of parkland habitat that will be significant up to a county/metropolitan level.

7.4.13 There are approximately 36km of hedgerow within the land required for the construction of the Proposed Scheme. This includes approximately 3.5km from 32 individual hedgerows that meet the wildlife criteria of the Hedgerows Regulations 1997, including approximately two 10m sections of Beanit Farm Hedge LWS. The final length of hedgerow to be lost will depend on the detailed design and hedgerows will be retained where practical. Taking a precautionary approach to the assessment, it is assumed that all of the hedgerows will be lost. Hedgerows form wildlife corridors and within a largely arable landscape and are important for habitat connectivity. The combined loss and severance of hedgerows within the Proposed Scheme will cause an adverse effect on the conservation status of the hedgerow network which will be significant at a district/borough level.

7.4.14 Major realignment works on the Canley Brook will result in the permanent loss of approximately 760m of existing channel habitat which will result in a temporary adverse effect on the conservation status of the Canley Brook that will be significant at a district/borough level. Appropriate channel design will result in the establishment of functional habitats within two to five years. Whilst localised shading impacts are expected as a result of the proposed structures, any impact on watercourse habitat and function is considered likely to be offset by the increase in channel extent within the realigned section, which will be approximately 1km. No significant long-term adverse effects on watercourse habitat and function will result from the proposed works and the design of the realigned channel could be beneficial.

7.4.15 In the absence of survey data due to access constraints and taking a precautionary approach to the assessment, the loss of ponds within the land required for the construction of the Proposed Scheme could lead to a permanent adverse effect on the conservation status of water bodies that will be significant, in each case, at up to the district/borough level.

7.4.16 It is considered unlikely that any other effects of habitat receptors at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-003.

Species

7.4.17 The removal or disturbance of habitat features that are utilised by bats during breeding, hibernation or migrating between roosts, are considered to have the potential to result in adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to result in a significant adverse effect on the conservation status of the population concerned will differ dependent on the status of the species concerned.

7.4.18 Losses of other habitat within the land required for the construction of the Proposed Scheme may require some bats to travel further, and expend more energy during day to day foraging and movement throughout their home range for the duration of construction. However, such effects alone are for all species considered unlikely to result in sufficient disturbance of the populations concerned to result in an adverse effect on their conservation status.

7.4.19 The impact of disturbance on bat populations will generally be localised and limited to the period of construction. Bats utilising retained habitats may be subject to irregular and localised disturbance from lighting and noise during the construction period where works in autumn, winter and spring may be carried out for short periods after dusk or prior to dawn. These impacts would only temporarily deter bats from using foraging and commuting habitats.

7.4.20 There is a Daubenton's and brown long-eared bat maternity roost at a bridge which crosses the River Avon, approximately 20m from the land required for the construction of the Proposed Scheme. Noise and vibration arising during construction will result in a low level of disturbance and could lead to temporary displacement of bats from the roost. The adoption of measures within the draft CoCP will provide some controls to reduce the risk of displacement of bats and the loss of this roost. It is likely that the habitats associated with the River Avon will support commuting and

foraging activity by bats using this roost. Activity by Daubenton's bat was confirmed along the river corridor during transect surveys. The bats using this roost will not become isolated from key commuting and foraging provided along the river and connectivity along the watercourse will be retained both during and following construction. However, the proximity of the roost to construction makes it susceptible to disturbance from construction noise and lighting. These disturbance impacts could lead to an adverse effect on the conservation status of the population of Daubenton's and brown long-eared bats using the roost at the bridge that would be significant at a regional level for Daubenton's.

7.4.21 Due to a lack of access within Crackley Wood South and woodland habitat within land on the east side of Crackley Lane, there may be disturbance to bats using tree roosts within these woodlands adjacent to land required for the construction of the Proposed Scheme. These trees may be used by rare bats as maternity roosts. A diverse assemblage of bat species was recorded within adjacent accessible parts of the woodland including Leisler's bat. Noise and vibration arising during construction will result in a low level of disturbance and could lead to temporary displacement of bats from potential roosts. Connectivity between these areas of woodland and the Kenilworth Greenway, a key commuting route for the assemblage of bats identified, will be retained both during and after construction. The adoption of measures within the draft CoCP will provide controls to reduce the risk of displacement of bats and the loss of roosts.

7.4.22 Habitats within Stoneleigh Park support a diverse assemblage of bat species including common pipistrelle, soprano pipistrelle, Daubenton's, noctule, brown long eared, Leisler's, serotine and *Myotis* species. The loss of woodland habitat within Stoneleigh Park will result in the permanent loss and severance of bat commuting routes and foraging habitats although connectivity along the River Avon will be retained. One building within land required for the construction of the Proposed Scheme was found to support a maternity roost for common and soprano pipistrelle bat and will be lost. Four buildings found to support summer (non-breeding) roosts for commoner bat species, common pipistrelle, soprano pipistrelle and brown long-eared bat, lie within land required for the construction of the Proposed Scheme and will also be lost. Two tree roosts lie within land required for construction of the Proposed Scheme were found to support individuals of soprano pipistrelle and either common pipistrelle or soprano pipistrelle, both commoner bat species. A further potential tree roost could support individuals of rarer bat species which have been confirmed using habitats within the land required for the construction of the Proposed Scheme. The combination of these impacts will lead to an adverse effect on the conservation status of the bat assemblage using habitats within Stoneleigh Business Park that will be significant at a county/metropolitan level.

7.4.23 Habitats associated with Crackley Wood, Roughknowles Wood, Broadwells Wood and Black Waste Wood within land required for the construction of the Proposed Scheme support a diverse assemblage of bats including common pipistrelle, soprano pipistrelle, brown long-eared, Daubenton's, noctule, Leisler's, Brandt's and *Myotis* species. No confirmed bat tree roosts will be lost, although the majority of Crackley Wood could not be surveyed due to access restrictions and may support roosts of rarer bat species. Trees with high and moderate potential to be used by roosting bats are

located within land required for the construction of the Proposed Scheme particularly within Roughknowles Wood and Broadwells Wood. Woodland habitat is to be lost at Crackley Wood, Roughknowles Wood and Broadwells Wood, resulting in the permanent loss and severance of woodlands which have been identified as key commuting and foraging features. The network of hedgerows surrounding woodlands and the Kenilworth Greenway which have been identified as key commuting and foraging features will be crossed by the route of the Proposed Scheme. These severance impacts may deter bat species from using these habitats for foraging and commuting. While the impacts on areas of key commuting and key foraging habitat will be localised, these habitats support a diverse assemblage of bats, some of which are rare within the UK. These impacts will lead to an adverse effect on the conservation status of the bat assemblage concerned that will be significant at a county/metropolitan level.

7.4.24 Habitats between the A445 Leicester Lane and Stoneleigh Road are used by a diverse assemblage of bats including Natterer's, *Myotis* species, noctule, Leisler's and Nathusius' pipistrelle. One confirmed tree roost lies within the land required for construction of the Proposed Scheme and will be lost. The Proposed Scheme will result in the permanent loss and severance of woodland and hedgerows which have been identified as key foraging and commuting habitats. While the impacts on areas of key commuting and key foraging habitat would be localised, these habitats support a diverse assemblage of bats, some of which are rare within Warwickshire and within England including Leisler's and Nathusius' pipistrelle. The combinations of these impacts will lead to an adverse effect on the conservation status of the bat assemblage that would be significant at the district/borough level.

7.4.25 There will be permanent loss of hedgerows and water bodies identified as key commuting and foraging habitat used by the assemblage of bat species within land between Dalehouse Lane and the A429 Kenilworth Road, including common pipistrelle, soprano pipistrelle, brown long-eared, Daubenton's, noctule, *Myotis* species and Leisler's. Connectivity along Finham Brook will be retained. These impacts may deter bats from using the habitats and move bat populations away from foraging and commuting habitats. There are three buildings to be retained within land between Dalehouse Lane and the A429 Kenilworth Road found to support summer (non-breeding) roosts for individuals of commoner bat species including common pipistrelle, soprano pipistrelle and brown long-eared bat. It is likely that the habitats within the land required for the construction of the Proposed Scheme support these roosts. The loss of roost sites will be limited. Whilst the impacts on areas of key foraging and commuting habitat will be localised, these habitats support a diverse assemblage of bats, including Leisler's which is a rare bat species within Warwickshire. These impacts will lead to an adverse effect on the conservation status of bats that will be significant at up to a district/borough level.

7.4.26 Habitats within and adjacent to Little Poors Wood and Big Poors Wood, including Burton Green suggest an assemblage of species dominated by commoner bat species, common pipistrelle and soprano pipistrelle. Ten residential buildings at Burton Green outside of land required for the construction of the Proposed Scheme were each found to support individual or small numbers of common pipistrelle, soprano pipistrelle or brown long-eared species of bats. No building roosts would be lost and

connectivity between suitable foraging habitat at Big Poors Wood, Little Poors Wood and Black Waste Wood will be retained through the installation of the Burton Green green tunnel. The majority of habitats used by foraging and commuting bats lie outside of land required for the construction of the Proposed Scheme and will still be available for commuting and foraging during and following construction. These impacts are unlikely to lead to a significant adverse effect on the conservation status of the assemblage of bats concerned.

7.4.27 A population of orpine, a plant which is locally scarce in Warwickshire, is located on a roadside verge at the southern corner of Roughknowles Wood within the land required for the construction of the Proposed Scheme, and may be lost as a result of local road re-alignments. Taking a precautionary approach to assessment, this impact could lead to a permanent adverse effect on the conservation status of the population concerned that will be significant at up to a district/borough level. Thin-spiked wood-sedge has been found in two locations in the north and south of Birches Wood. Both locations are outside of the land required for the construction of the Proposed Scheme, and no impacts on this species are expected.

7.4.28 There will be loss of habitat supporting terrestrial invertebrates including the partial loss of Broadwells Wood. Due to the local lack of good woodland habitat for invertebrates within Warwickshire, this reduction in available habitat and increased fragmentation of suitable habitat could result in an adverse effect on the conservation status of the terrestrial invertebrate assemblage concerned that would be significant at a district/borough level.

7.4.29 At assumed great crested newt metapopulation AMP10 (south-east of the A429) two of the six water bodies and approximately one third of accessible terrestrial habitat will be lost. Fragmentation will isolate one water body to the south-west. The Proposed Scheme could therefore result in permanent adverse effects on the conservation status of a great crested newt metapopulation that would be significant at up to a county/metropolitan level.

7.4.30 There will also be loss of 20 water bodies outside of assumed great crested newt metapopulations but which may be suitable to support amphibians. Full surveys have been carried out on four of these water bodies; no great crested newts have been found, but three of the water bodies support other amphibian species (smooth newt, common frog and common toad). Two water bodies, which have incomplete surveys, found other amphibian species (smooth newt, common frog and common toad); the remaining water bodies were unable to be surveyed due to access limitations. Should great crested newt be present within any of the water bodies where no survey was possible, taking a precautionary approach to assessment, the Proposed Scheme could lead to a permanent adverse effect on the conservation status of amphibian populations that in each case would be significant at up to a county/metropolitan level.

7.4.31 The construction process will cause temporary loss of habitats used by breeding birds, together with disturbance of adjacent habitats. In areas of open farmland this will cause minimal effect as there is plenty of suitable alternative habitat nearby. However, for Broadwells Wood, which will be severed by the route of the Proposed

Scheme, some of the affected species will have less alternative habitat to utilise and the effect is considered to be significant at local/parish level.

7.4.32 The barn owl nest site on a farm near Kenilworth is outside the land required for the construction of the Proposed Scheme and will not be lost during construction. Whilst barn owls generally remain within their established home range throughout their lifespan, in the areas of open farmland near Kenilworth the impacts on foraging habitat will be localised and are expected to have a minimal effect as there is plenty of suitable alternative foraging habitat nearby.

7.4.33 The realignment of the Canley Brook will affect a length of watercourse identified as supporting a fish assemblage of district/borough value. Translocation of fish from the 760m channel section being lost to an unaffected stretch of the Canley Brook will prevent harm to existing fish populations during construction. In the short-term, fish populations may suffer increased competition for available resources. Taking a precautionary approach to assessment, these impacts could lead to a temporary adverse effect on the conservation status of fish populations that would be significant at the district/borough level.

7.4.34 Whilst no confirmed otter breeding or natal holts have been identified, the desk study highlighted the presence of juvenile otter footprints indicating a breeding territory on the River Avon. Due to the design of the viaducts there will be no permanent loss of accessible watercourse for otters. In addition, the bridging of these watercourses may offer further cover, resting and territorial marking sites for otters, dependent on the final design. The requirement to realign approximately 1km of the Canley Brook has the potential to temporarily restrict the movement of otters and reduce foraging opportunities. Construction activities in proximity of watercourses have the potential to cause disturbance to otters and potentially create temporary barriers to their movement. Taking a precautionary approach to assessment, these impacts could lead to a temporary adverse effect on the conservation status of the population concerned that would be significant at up to the district/borough level.

7.4.35 It is considered unlikely that any other effects on species receptors at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-003.

Other mitigation measures

7.4.36 This section describes additional measures designed to reduce or compensate for significant ecological effects.

7.4.37 A number of specific ecological compensation areas are proposed along the route of the Proposed Scheme in order to deliver compensation for loss of habitats. By creating large-scale compensation areas, multiple complex habitats can be created with links to the surrounding landscape and will benefit species such as otter, as well as species groups such as amphibians, reptiles, birds and bats. There are six main ecological compensation areas within the Stoneleigh, Kenilworth and Burton Green area:

- 0.9ha of woodland habitat creation to the south of Stareton Park Farm;

- an area of 0.7ha for a replacement bat roost and an otter holt adjacent to woodland on land to the south of the River Avon at Stoneleigh Business Park;
- an area of 1.2ha for replacement ponds and terrestrial habitat for reptiles and amphibians to the south of New Kingswood Farm;
- an area of 2.8ha for replacement ponds and terrestrial habitat for amphibians to the north of the Finham Brook;
- approximately 6ha of woodland habitat creation on both sides of the route of the Proposed Scheme in the vicinity of Crackley Wood; and
- an area of 13.2ha between Broadwells Wood and Burton Green to comprise woodland habitat creation, as well as a small area of grassland and ponds.

7.4.38 Ancient woodland is irreplaceable. The loss of ancient woodland within Broadwells Wood, Crackley Wood North and Roughknowles Wood will result in a significant adverse effect at a county/metropolitan. However, this loss of woodland will be compensated through a range of measures. Ancient woodland soil with its associated seed bank will be carefully removed and translocated to a 2.3ha receptor site which will link the retained southern area of Broadwells Wood with Crackley Wood via woodland along the Kenilworth Greenway. This will increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and shrub species of local provenance, and translocation of coppice stools and dead wood, will be undertaken as appropriate.

7.4.39 Compensation for the loss of secondary woodland habitats within this area will include woodland habitat creation south of Stareton Park Farm, adjacent to Crackley Wood and between Broadwells Wood and Burton Green. The target condition for these secondary woodlands will be the habitat of principal importance lowland mixed deciduous woodland. In addition landscape woodland and scrub planting will be provided adjacent to the realigned B4113 Stoneleigh Road; adjacent to the River Avon and between the Canley Brook viaduct and South Hurst Farm. Although it will take50 years or more for this planting to mature, in the long-term these areas of will have a beneficial effect on woodland habitats that will be significant at a county/metropolitan level.

7.4.40 New hedgerow creation will be undertaken and connected habitat is provided within the landscape scheme to compensate for losses of wildlife corridors that hedgerows provide. There will be temporary adverse effects whilst the new hedgerows become established and mature (approximately 15 years). Following establishment and maturation of planting it is expected that any adverse impacts on hedgerows and the wildlife corridors they create will be reduced to an adverse effect on the conservation status of the habitat that will be significant at a local/parish level.

7.4.41 Further mitigation to reduce the effects of habitat severance will include linear planting along the diverted Kenilworth Greenway and over the Burton Green green tunnel. These measures will reduce habitat severance impacts on bats. Connectivity of bat foraging and commuting habitat will also be maintained under the Proposed Scheme due to the presence of the River Avon, Finham Brook and Canley Brook viaducts; planting will be designed to try and direct bats to these crossing points.

There will also be a vegetated link along the B4113 Stoneleigh Road green overbridge. The reinstatement of planting removed during temporary works will also further reduce the effect of severance on bat populations. Mitigation measures to address temporary severance of habitats during construction will be provided as required in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). This may include the use of 'artificial hedgerows' to maintain connectivity. Habitat creation in the ecological compensation areas, and landscape planting, will provide new foraging and commuting habitat for bats.

7.4.42 Adoption of measures within the draft CoCP will provide controls on noise and vibration which will act to limit disturbance and displacement of bats from the maternity roost for Daubenton's and brown long-eared bats at a bridge along the River Avon. Temporary measures to limit disturbance will be provided in line with the principles of ecological mitigation within the SMR Addendum (Volume 5: Appendix CT-001-000/2) to further reduce disturbance at this location using a temporary fence during construction to screen the existing bat roost. The location and specification of this screen will be determined during detailed design. Replacement bat roosts will be provided adjacent to the River Avon, approximately 315m from the route of the Proposed Scheme and adjacent to an access track; this will mitigate for the bat roosts lost within Stoneleigh Business Park. Bat roosts will also be positioned in ecological compensation areas in accordance with the principles of ecological mitigation within the SMR Addendum (Volume 5: Appendix CT-001-000/2).

7.4.43 Following the implementation of the measures proposed it is expected that any adverse impacts on bats during the construction of the Proposed Scheme will be reduced to a level at which they will not result in any significant effect on the conservation status of the species concerned.

7.4.44 It is proposed that the loss of the population of orpine (a rare tall stonecrop) in Roughknowles Wood be mitigated either through the collection of seeds from the plant for dispersal within the ecological compensation areas or other retained areas or translocation of vegetative material, in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). Following the implementation of the measures proposed it is expected that any adverse impacts on the population of orpine during the construction of the Proposed Scheme will be reduced to a level at which they will not result in any significant effect on the conservation status of the population concerned.

7.4.45 The loss of six veteran invertebrate habitat trees from the former parkland at Stoneleigh will be mitigated through retention of the felled trees within the Proposed Scheme as a deadwood resource. Woodland creation elsewhere, including adjacent to Broadwells Wood will benefit terrestrial invertebrates through inclusion of relevant species of value to key terrestrial invertebrate species and deadwood habitat. Following the implementation of the measures proposed it is expected that any adverse impacts on terrestrial invertebrates during the construction of the Proposed Scheme will be reduced to a level at which they are unlikely to result in any significant effect on the conservation status of the species concerned.

7.4.46 Compensatory habitat to address impacts on great crested newt populations in the area will be provided within the aforementioned ecological compensation areas, particularly to the south of New Kingswood Farm, north of Finham Brook and between the Kenilworth Greenway and the route of the Proposed Scheme, in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). This will include the provision of replacement ponds, terrestrial habitat and hibernation habitat sufficient to maintain the favourable conservation status of the population affected.

7.4.47 Safe passage for otter will be retained during the construction works. Habitat enhancements will be undertaken along the 1km length of the Canley Brook to be realigned. This will incorporate appropriate measures such as in-channel design to enhance watercourse habitat quality and maintain habitat connectivity for fish, otters, and aquatic invertebrates. A new otter holt is proposed, to be located on land to the south of the River Avon close to the junction with the River Sowe, in accordance the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2. Following the implementation of the measures proposed it is expected that any adverse impacts during the construction of the Proposed Scheme will be reduced to a level at which they will not result in any permanent significant effect on the conservation status of fish, otters or aquatic invertebrates.

7.4.48 Mitigation measures to avoid the potential killing, injury and disturbance of badgers will be provided in accordance the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). This will include the provision of badger-proof fencing and replacement setts where necessary.

Summary of likely residual significant effects

7.4.49 The mitigation, compensation and enhancement measures described reduce the adverse effects to a level that it not significant except for the loss of 3.8ha of ancient woodland from Broadwells Wood, Black Waste Wood, Crackley Wood North and Roughknowles Wood.

7.4.50 There will be a permanent beneficial effect on woodland habitats due the increased area of secondary broadleaved woodland planting and woodland connectivity within this area.

7.5 Effects arising from operation

Avoidance and mitigation measures

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

- the placement of the route within cuttings, retaining walls and false embankments through the majority of this area (including the Stoneleigh Business Park retaining wall, Glasshouse Wood cutting, Kenilworth cutting, Canley Brook retaining wall, Roughknowles Wood cutting and Broadwells Wood embankment) will reduce the risk of bat species colliding with trains;
- connectivity will be maintained for wildlife including bats due to the presence of the green tunnel in Burton Green to reduce habitat severance along the Kenilworth Greenway, and Footpath W186 underpass through connecting

retained sections of Broadwells Wood under the route of the Proposed Scheme. Vegetated links along the B4113 Stoneleigh Road green overbridge will also maintain some habitat connectivity in Stoneleigh Business Park; and

- carrying the Proposed Scheme on viaducts over the River Avon, Finham Brook and Canley Brook will retain wildlife corridors along these watercourses which are used as foraging and commuting corridors by a wide range of wildlife, including bats.

Assessment of impacts and effects

7.5.2 The operation of the Proposed Scheme has the potential to result in a variety of impacts on bat populations including those as a result of collision with passing trains, turbulence and noise. The point at which such impacts are considered to result in a significant adverse effect on the conservation status of the population concerned will differ between species. As a consequence the following assessment of operational impacts takes into account the differing character and nature of the bat populations and/or assemblages concerned in determining the likely effects of the Proposed Scheme on each of these receptors.

7.5.3 Noise, vibration and lighting from passing trains have the potential to disturb bat species foraging and commuting within habitats close to the Proposed Scheme. Understanding of the impact of noise on bats caused by passing trains is limited. There is some evidence to suggest that gleaning bats, such as brown long-eared, will have reduced foraging success within areas where there is persistent noise from busy roads. However, noise generated from passing trains will be regular but temporary and as such will differ from that resulting from a busy road.

7.5.4 Due to the large areas over which bats forage it is likely that any loss of, or displacement from, suitable foraging habitat in the vicinity of the Proposed Scheme will in itself amount to only a small proportion of the wider available resource. However, the impact of any such disturbance or displacement could be greatly increased if bats are hampered in moving between breeding sites, hibernation sites and other roosts which they commonly utilise.

7.5.5 Where the route of the Proposed Scheme bisects, or is located in close proximity to existing features known to be utilised regularly by foraging or commuting bats, there is an increased risk that bats could be killed or injured as a result of collisions with passing trains or associated turbulence. The significance of any such effect will be dependent on both the flight habitat of the species or species concerned and the vertical alignment of the Proposed Scheme (i.e. is the railway in cutting, on embankment, on a viaduct, or at grade) at the point the impact occurs.

7.5.6 The following species have been identified within the area through surveys and desk study that could be at particular risk of collision with trains: Brandt's, noctule, pipistrelle, and brown long-eared. The mitigation measures that are included within the Proposed Scheme to reduce the impacts of habitat severance during construction will act to reduce the risk of collisions of bats with trains.

7.5.7 Three viaducts within this area will cross habitats used by foraging and commuting bats. Bats species may fly across the route of the Proposed Scheme along The River Avon, Finham Brook and Canley Brook. Most bat species will fly underneath structures

by following the watercourse under them whilst the higher flying noctule, Leisler's and serotine are likely to navigate over the structures. Although there is a risk of individual bats being killed or injured by collision with trains, the risks are considered to be minimal and are unlikely to result in significant effects on the conservation status of any of the bat species concerned.

7.5.8 The noise made by passing trains has the potential to disturb birds within habitats close to the Proposed Scheme. Birds habituate to loud noises that they hear regularly and frequently, and hence it is considered that this will not generally cause significant effects. There is some evidence to suggest that breeding bird densities can be reduced where there is persistent noise from busy roads due to birds being unable to hear each other's song. However, this is not expected to occur with the Proposed Scheme as trains will pass quickly. The effect of train noise on breeding birds is therefore considered not to be significant.

7.5.9 The majority of bird species that are known to be present in the area are not considered to be particularly vulnerable to collision with trains. However, barn owls are often killed by cars and trains. This is because they hunt low over the rough grassland habitats that are associated with road verges and railway embankments and are slow moving. Evidence suggests that such mortality is likely to result in the loss of all breeding populations of barn owls within 1.5km of the Proposed Scheme. Due to the proximity of the barn owl nest site on a farm near Kenilworth to the route of the Proposed Scheme, the barn owl pair using this nest is considered to be at risk of collision with trains where the Proposed Scheme passes through their foraging habitat. The loss of the barn owl pair through collision with trains would results in adverse effect on the conservation status of barn owl that would be significant at a county/metropolitan level.

7.5.10 It is considered unlikely that any other effects at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-003.

Other mitigation measures

7.5.11 No additional elements designed to reduce or compensate for significant ecological effects are identified in this area.

7.5.12 Train strike is likely to result in the loss of barn owls which nest close to the route. As part of the precautionary assessment it is assumed all territories close to the route could be lost and therefore adverse effects are likely to be significant at the county/metropolitan level for the barn owl pair on a farm near Kenilworth. To offset the likely loss of barn owls from the vicinity of the Proposed Scheme, opportunities to provide barn owl nesting boxes in areas greater than 1.5km from the route will be explored with local landowners. As the availability of nesting sites is a limiting factor for this species the implementation of these measures would be likely to increase numbers of barn owls within the wider landscape and thus offset the adverse effect.

Summary of likely residual significant effects

7.5.13 The mitigation, compensation and enhancement measures described above would reduce the effects to a level that is not significant except for barn owl. Train strike is likely to result in the loss of barn owls that nest close to the route resulting in a residual significant effect. However, if the proposed mitigation measures for barn owl

are implemented through liaison with landowners, the residual effect on barn owl would be reduced to a level that is not significant.

8 Land quality

8.1 Introduction

8.1.1 This section presents the baseline conditions that exist along the Proposed Scheme in relation to land quality and reports the likely impacts and any 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, mining or mineral resources point of view, including: geological sites of special scientific interest (SSSI), local geological sites (LGS), areas of current underground or opencast mining and areas of designated mineral resources. Mitigation measures are presented and any residual effects are summarised.

8.1.2 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. In addition, a review has been undertaken to establish whether the operation of the Proposed Scheme will lead to contamination of its surrounding environment and what needs to be done to prevent such contamination.

8.1.3 The main environmental features of this area include: the River Avon, Finham Brook and Canley Brook and widespread areas of bedrock-derived sand and gravel and deep coal, which represent local mineral resources.

8.1.4 The main land quality issues in this area include:

- areas of former or current potentially contaminative land use which the Proposed Scheme will intersect such as Stoneleigh Park, the Coventry to Leamington Spa Line, the dismantled Kenilworth to Balsall railway line (Kenilworth Greenway) and infilled pits and ponds; and
- five Mineral Safeguarding Areas (MSA) comprising three sand and gravel MSA (two of these underlie the majority of the south of the Proposed Scheme and the third is in an area immediately east of Gooseberry Hall), one deep clay MSA (this extends from Burton Green to the north of the route) and one building stone MSA (this extends from the southern edge of Stoneleigh to just south of Burton Green).

8.1.5 Details of baseline information and the land quality assessment methodology are outlined in the following appendices (presented in Volume 5):

- Appendix CT-001-000/1: the SMR and Appendix CT-001-000/2 the SMR Addendum; and
- Appendix LQ-001-018: Land quality appendix.

8.1.6 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 13. Issues

regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3, Section 14.

8.1.7 Engagement has been undertaken with Warwick District Council (WDC) and the Environment Agency (EA) regarding contaminated land and with Warwickshire County Council (WCC) regarding mineral resources.

8.2 Scope, assumptions and limitations

8.2.1 The assessment scope, key assumptions and limitations for the land quality assessment are set out in Volume 1 and in the SMR and its addendum presented in Volume 5 (Appendices CT-001-000/1 and 2). This section follows the standard assessment methodology.

8.2.2 Baseline data were reviewed for the area of land required to construct the Proposed Scheme together with a buffer extending out for a minimum of 250m and in the case of groundwater data up to 1km. This is defined as the study area.

8.2.3 The assessment that follows has not assessed new or diverted utilities that will be located within the boundaries of existing highways because with respect to land quality issues, utility works within the highway are a low risk construction activity, as most of the excavation works will be within the highway construction layers, and re-instatement will be undertaken with highway construction materials.

8.2.4 Familiarisation visits to the study area were made in October 2012 where the location of the Proposed Scheme was viewed from points of public access only. Due to access constraints not all sites considered to have the greatest potential for contamination were visited. However the purpose of site visits is to verify desktop information and the lack of complete site walkovers is considered unlikely to have substantially affected the land quality assessment.

8.3 Environmental baseline

Existing baseline

8.3.1 Unless otherwise stated, all features described in this section are presented in Volume 5 Map Book – Land quality, Maps LQ-01-047 to 050.

Geology

8.3.2 This section describes the underlying ground conditions within the study area. It first describes any made ground present, followed by near surface superficial deposits and lastly describes the deeper bedrock geology. The geological mapping is illustrated in Volume 5 Map Book – Water resources, Map WR-02-18.

8.3.3 The presence of made ground is not indicated on British Geological Survey (BGS) mapping, but there is likely to be made ground associated with the Coventry to Leamington Spa Line (which will be intersected by the Proposed Scheme), the dismantled Kenilworth to Balsall line (Kenilworth Greenway) and various small areas of infilling, including the infilled pits, infilled ponds and infilled domestic water wells scattered throughout the study area. There are likely to be other areas of made ground associated with highways and roads which will be intersected by the Proposed Scheme.

8.3.4 There are no landfills located in the study area.

8.3.5 Superficial deposits, predominantly fluvial in origin, are present sporadically along the Proposed Scheme associated with surface watercourses.

8.3.6 River terrace deposits (sand and gravel) and alluvium (silt and clay) are present associated with major surface watercourses to the north-west of Stoneleigh Park and to the north-west of Dalehouse Lane respectively.

8.3.7 Alluvium is also present associated with Canley Brook and one of its tributaries to the north-west of the A429 Kenilworth Road, and to the east of Birches Wood Farm.

8.3.8 A cover of the Oadby Till, a varied glacial deposit, extends from Burton Green to Little Beanit Farm in the north-west of the study area.

8.3.9 Sandstone of the Bromsgrove Sandstone Formation underlies the majority of the Proposed Scheme. Sandstones and occasional mudstones of the Kenilworth Sandstone Formation underlie the route from the south of the study area to Gooseberry Hall, Kenilworth. Northwards from Gooseberry Hall, the Proposed Scheme will be underlain by bedrock of the Tile Hill Mudstone Formation (mudstones with subordinate sandstones and rare lenses of conglomerate).

Groundwater

8.3.10 There are three categories of aquifer identified within the study area:

- groundwater present within the bedrock which underlies this entire section of the Proposed Scheme is classified as a Principal aquifer;
- the alluvial deposits are water-bearing, and are classified as a Secondary A aquifer; and
- the Oadby Till, present in the north of the study area, is classified as unproductive strata.

8.3.11 The Proposed Scheme will also pass through a total catchment groundwater Source Protection Zone (SPZ 3) between the southern edge of the study area and Decoy Spinney and again through a second SPZ3 between the River Avon and Broadwells Wood. These relate to groundwater abstractions outside the study area to the north of Cubbington and Kenilworth, respectively.

8.3.12 There is a licensed groundwater abstraction within the study area. This is located at Furzen Hill Farm; approximately 140m east of the area of land required to construct the Proposed Scheme and relates to use in general agriculture. There are three further licensed groundwater abstractions within 1km of the area of land required to construct the Proposed Scheme.

8.3.13 Further detail on the groundwater beneath the Proposed Scheme can be found in Section 13, Water resources and flood risk.

Surface water

8.3.14 The Proposed Scheme will cross the River Avon to the north-west of Stoneleigh Park and it will also cross the Finham Brook to the north-west of Dalehouse Lane.

8.3.15 Canley Brook and two of its tributaries will be crossed by the Proposed Scheme between the A429 Kenilworth Road and Broadwells Wood.

8.3.16 There are also numerous ponds present within the study area.

8.3.17 Further information on surface waters is provided in Section 13, Water resources and flood risk.

Current and historical land use

8.3.18 Current potentially contaminative land uses include Stoneleigh Park (including what are assumed to be fuel or oil tanks) located to the south-west of Stoneleigh (centred on Map LQ-01-047, B7), the Coventry to Leamington Spa Line (Map LQ-01-048, C6) and an electricity substation situated to the north of Burton Green (Map LQ-01-050, F6).

8.3.19 The principal historical potentially contaminative land use is the dismantled Kenilworth to Balsall line (Kenilworth Greenway) which is located just north of Crackley (Map LQ-01-050, G6). The Proposed Scheme follows the footprint of the dismantled railway almost to the northern end of the study area.

8.3.20 Other historical land uses identified within the study area with the potential to have caused contamination include several infilled ponds, infilled domestic water wells, infilled pits and an infilled quarry. The ponds, domestic water wells, pits and quarry may have been manually infilled with a variety of waste materials and could also give rise to landfill gases such as methane, carbon dioxide and volatile organic compounds (VOC).

8.3.21 All potentially contaminated sites (identified from both current and historical land uses) are shown in Volume 5 Map Book– Land quality, Maps LQ-01-047 to 050.

Other regulatory data

8.3.22 Regulatory data reviewed include pollution incidents, radioactive and hazardous substances consents and environmental permits (previously landfill, Integrated Pollution Prevention (IPC) and Integrated Pollution Prevention and Control (IPPC) licences). A number of these have been recorded in the study area, the most notable being a substantiated pollution incident registered in the north-west of Roughknowles Wood, approximately 80m east of the area of land required to construct the Proposed Scheme. The pollution incident was classified as Category 2: Significant (on land). There are no details relating to the source of the pollution incident.

Mining/mineral resources

8.3.23 The Minerals Local Plan for Warwickshire[37] aims to safeguard parcels of land where there are mineral resources of economic or conservation value (Policies MPS1 and MPS5). The Warwickshire Minerals Development Framework (MDF) Core Strategy is currently in development.

[37] Warwickshire County Council (1995) Minerals Local Plan for Warwickshire.

8.3.24 There are no active mining or mineral sites or Preferred Areas (PA)[38] within the study area.

8.3.25 The Proposed Scheme will intersect three areas forming sand and gravel MSA from the southern edge of the study area as far north as Gooseberry Hall, Kenilworth. Two of the MSA cover a large portion of the southern part of the study area and the third MSA covers a localised part of the study area immediately to the east of Gooseberry Hall (Volume 5 Map Book– Land quality, Map LQ-01-049, F6).

8.3.26 The northern extent of a brick clay MSA will be intersected by the Proposed Scheme from the south of the study area to Finham Brook (Volume 5 Map Book– Land quality, Map LQ-01-047 to 048).

8.3.27 The Proposed Scheme will also intersect a building stone MSA which underlies the majority of the study area from the southern edge of Stoneleigh to just south of Burton Green. The minerals local plan for Warwickshire lists the geological units which form the building stone MSA; in this area the MSA relates to either or both of the Bromsgrove Sandstone Formation and the Kenilworth Sandstone Formation.

8.3.28 A MSA for deep coal extends across the whole of the study area. Coal has, until recently, been mined from a single colliery, Daw Mill, situated near the village of New Arley, Warwickshire. The Proposed Scheme location is outside the current Daw Mill licence area but within the Daw Mill Extension Area (see Volume 5: Appendix LQ-001-018); the Coal Authority granted a mining licence for the Daw Mill Extension Area to UK Coal in 2012.

8.3.29 The Daw Mill Extension Area contains the Warwickshire Thick Coal as the workable seam approximately 5m to 7m thick at a depth of between 900m and 1.1km beneath the Proposed Scheme. Since issuing the licence extension, mining from Daw Mill colliery has been suspended due to a fire within the coal seam, and the site has passed from UK Coal to the Coal Authority, which is preparing to abandon the mine. There are no current plans for unconventional deep mining in this area e.g. by underground coal gasification, and it is considered unlikely that plans to mine this area will be developed in the foreseeable future.

Geo-conservation resources

8.3.30 There are no geo-conservation resources identified within the study area.

[38] Areas where mineral deposits are known to exist and where the County Council considers there would be least planning objection to mineral extraction taking place.

Receptors

8.3.31 The sensitive receptors that have been identified within this study area are summarised in Table 14:

Table 14: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents	High
		Workers	Moderate
	Controlled waters	Principal aquifers	High
		Secondary A aquifers	High
		Rivers	High
		Other surface watercourses and water bodies	Moderate
	Built environment	Buildings and property	Low to high
		Underground structures and services	Low
	Mineral resources	Sand and Gravel MSA	Moderate
		Deep Coal MSA	Moderate
		Building Stone MSA	Moderate
Impacts on mining/mineral sites (severance[39] and sterilisation of mineral sites)	Mining/mineral sites	Sand and Gravel MSA	Moderate
		Deep Coal MSA	Moderate
		Building Stone MSA	Moderate

Future baseline

8.3.32 There are currently no identified committed development sites within the study area which are likely to change the land quality baseline during either construction or operation of the Proposed Scheme. Although there are proposed changes to Stoneleigh Park, the overriding land use will remain the same or similar and will not change the overall baseline conditions against which the assessment is undertaken.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 The construction assessment takes in to account the mitigation measures contained within the draft CoCP (Volume 5: Appendix CT-003-001). The draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme. Its requirements in relation to work in contaminated areas will ensure the effective management and control of the work. Such requirements include the following:

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

- methods to control noise, waste, dust, odour gases and vapours (draft CoCP Sections 5, 7, 13 and 15);
- methods to control spillage and prevent contamination of adjacent areas (draft CoCP Section 5);
- the management of human exposure for both construction workers and people living and working nearby (draft CoCP Section 11);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (draft CoCP Sections 7 and 15);
- management of any unexpected contamination found during construction (draft CoCP Section 11);
- a post remediation permit to work system (draft CoCP Section 11);
- storage requirements for hazardous substances such as oil (draft CoCP Section 16); and
- a requirement for contractors to pay due consideration to the impacts of extreme weather events which may affect land quality during construction (draft CoCP, Section 5).

8.4.2 The draft CoCP requires that a programme of further investigations, which may include both desk based and site based work, will take place in order to confirm the full extent of areas of contamination and a risk assessment undertaken to determine what, if any, site specific remediation measures will be required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants (draft CoCP, Section 11). The investigation and detailed assessment of potentially contaminated sites will be undertaken in accordance with:

- Environment Agency CLR11 Model Procedures for the Management of Land Contamination (2004)[40]; and
- British Standard BS10175 Investigation of Potentially Contaminated Sites (2011)[41].

8.4.3 Where significant contamination is encountered, a remedial options appraisal will be undertaken to define the most appropriate remediation techniques. This appraisal will be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with Sustainable Remediation Forum UK's publication: A Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010)[42]. The preferred option will then be developed into a remediation strategy, in consultation with regulatory authorities prior to implementation.

8.4.4 Contaminated soils excavated from the site, wherever feasible, will be treated as necessary to remove or render any contamination inactive and reused within the

[40] Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[41] British Standard BS10175 (2011), *Investigation of Potentially Contaminated Sites*.
[42] Sustainable Remediation Forum UK (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation methods, soil washing and bio-remediation to remove oil contaminants. Contaminated soil disposed of off-site will be taken to a soil treatment facility, another construction site (for treatment, as necessary, and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

8.4.5 The majority of the Proposed Scheme through the study area will be constructed in cutting through gently rolling agricultural terrain. The main construction features through the study area will include three viaducts crossing the River Avon, Finham Brook and Canley Brook. The Canley Brook viaduct will carry the Proposed Scheme over the realigned Canley Brook and its floodplain. Another key construction feature is the Burton Green tunnel, which will be constructed in the north of the study area beneath Cromwell Lane.

8.4.6 Construction works will include earthworks, utility diversions, deep foundations, temporary dewatering and other activities. In addition, road infrastructure works will also be required within this section of the Proposed Scheme.

8.4.7 Construction compounds for the Stoneleigh, Kenilworth and Burton Green area will be located at various locations along the Proposed Scheme (see Section 2.3, Construction of the Proposed Scheme).

Land contamination

8.4.8 In line with the assessment methodology, as set out in the SMR and SMR Addendum, an initial screening process was undertaken (identified in the methodology as Stages A and B) to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. In total, 73 areas were considered during this screening process; 32 of these areas were taken forward to more detailed risk assessments (Stages C and D), in which the potential risks were assessed more fully. The majority of the areas undergoing the more detailed risk assessments were infilled domestic water wells and ponds. All areas assessed are shown in Volume 5 Map Book– Land quality, Maps LQ-01-047 to 050 and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.

8.4.9 Conceptual site models (CSM) have been produced for the 32 areas taken to Stage C and D assessments. The detailed CSM are provided in Volume 5: Appendix LQ 001-018, (Section 3) and the results of the baseline risk assessments are summarised in this section. Potentially contaminated areas have been grouped and considered together, where appropriate. The following factors have determined the need for Stage C and D assessments:

- whether the area is on or off the Proposed Scheme or associated offline works; e.g. roads;
- the vertical alignment, i.e. whether the Proposed Scheme is in cutting or on embankment;

- the presence of underlying Principal or Secondary A aquifers or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

8.4.10 A summary of the baseline CSM is provided in Table 15. The impacts and baseline risks quoted are before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, it is based on precautionary, worst-case assumptions and may therefore report a higher risk than that which actually exists.

Table 15: Summary of baseline CSM* sites which may pose a contaminative risk for the Proposed Scheme

Area reference number**	Area name	Main potential impacts	Main baseline risk
18-05 (Map LQ-01-047, F6)	Infilled pond	Potential impact to groundwater	Low
18-06 (Map LQ-01-047, E6)	Former nursery	Potential impact to off-site human receptors and groundwater.	Low
18-10 (Map LQ-01-047 D5)	Infilled well	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-11(Map LQ-01-047, D6)	Disturbed, possibly infilled ground	Potential impact to off-site human receptors, groundwater, surface water receptors and property receptors.	Low
18-13 (Map LQ-01-047, A7,)	Former tanks	Potential impact to off-site human receptors, groundwater, surface water receptors and property receptors.	Low
18-21 (Map LQ-01-048, D6)	Possible partially infilled pits	Potential impact to off-site human receptors, groundwater, surface water receptors and property receptors.	Low
18-23(Map LQ-01-049, H8)	Infilled pit	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-29 (Map LQ-01-049, A7)	Infilled quarry	Potential impact to on-site human receptors, off-site human receptors, groundwater and property receptors.	Low
18-30 Map LQ-01-049, A8)	Infilled pit	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-32 (Map LQ-01-050, I7)	Infilled pond	Potential impact to human health off-site, groundwater and property receptors.	Low
18-33 (Map LQ-01-050, centred on G6)	Dismantled Kenilworth to Balsall line	Potential impact to on-site human receptors, off-site human receptors and groundwater receptors.	Low
18-34 & 18-35 (Map LQ-01-050, H6)	Infilled wells	Potential impact to on-site human receptors, off-site human receptors, groundwater and property receptors.	Low
18-37 (Map LQ-01-050, G6)	Infilled pond	Potential impact to off-site human receptors, groundwater, surface water receptors and property receptors.	Low
18-38 (Map LQ-01-050, G6)	Infilled pond	Potential impact to groundwater and property receptors.	Low

Area reference number**	Area name	Main potential impacts	Main baseline risk
18-39 (Map LQ-01-050, G6)	Infilled pit	Potential impact to groundwater and property receptors.	Low
18-40 (Map LQ-01-050, F6)	Infilled pond	Potential impact to property receptors.	Low
18-44 (Map LQ-01-050, F7)	Infilled ponds	Potential impact to off-site human receptors, groundwater, surface water receptors and property receptors.	Low
18-45 (Map LQ-01-050, F6)	Infilled pond	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-47 (Map LQ-01-050, E6)	Infilled pond	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-48 (Map LQ-01-050, E7)	Infilled pond	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-49 (Map LQ-01-050, E6)	Infilled well	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-50 (Map LQ-01-050, E6)	Infilled well	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-51 (Map LQ-01-050, E6)	Infilled pond	Potential impact to off-site human receptors, groundwater and property receptors.	Low
18-52 and 18-53 (Map LQ-01-050, E6)	Infilled ponds	Potential impact to off-site human receptors, groundwater, surface water receptors and property receptors.	Low
18-57 (Map LQ-01-047, centred on B7)	Stoneleigh Park with tanks	Potential impact to on-site human receptors, groundwater and surface water receptors.	Low
18-58 (Map LQ-01-048, F6)	New Kingswood Farm	Potential impact to on-site and off-site human receptors and groundwater receptors.	Low
18-60 (Map LQ-01-048, E6)	Dalehouse Farm	Potential impact to on-site and off-site human receptors and groundwater receptors.	Low
18-63 (Map LQ-01-048, centred on C6)	Coventry to Leamington Spa Line	Potential impact to off-site human receptors and groundwater receptors.	Low
18-70 (Map LQ-01-050, centred on F6)	Berkswell electricity substation	Potential impact to on-site human receptors and groundwater receptors.	Low
18-73 (Map LQ-01-050, E6)	Odnaull End Farm	Potential impact to on-site and off-site human receptors and groundwater receptors.	Low

*CSM have been prepared as part of the detailed land contamination methodology (refer to Volume 5) for baseline, construction and post-construction.
** Each area is assigned a unique identification number (see Volume 5, Appendix LQ-001-018).

Temporary effects

8.4.11 An assessment of the effects of contamination has been undertaken by comparing the CSM developed for potential contaminated areas at baseline, construction and post construction stages. The baseline and construction CSM have been compared to assess effects at the construction stage.

8.4.12 Table 16 presents the summary of the construction effects obtained from a comparison of the baseline and construction impacts. The construction risk assessment takes into account the implementation of the mitigation measures set out in the draft CoCP. The details of these comparisons are presented in Volume 5 (Appendix LQ 001-018).

8.4.13 The baseline and construction CSM have been compared to determine the change in level of risk to receptors during the construction stage, and thus to define the level of effect at the construction stage. Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible. This will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the land required for the Proposed Scheme.

Table 16: Summary of temporary (construction) effects

Area ref	Area name	Main baseline risk	Main construction risk [1]	Temporary effect and significance
18-05	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-06	Former nursery	Low	Low	Negligible (not significant)
18-10	Infilled well	Low	Low	Negligible (not significant)
18-11	Disturbed possibly infilled ground	Low	Low	Negligible (not significant)
18-13	Former tanks	Low	Low	Negligible (not significant)
18-21	Possible partially infilled pits	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-23	Infilled pit	Low	Low	Negligible (not significant)
18-29	Infilled quarry	Low	Low	Negligible (not significant)
18-30	Infilled pit	Low	Low	Negligible (not significant)
18-32	Infilled pond	Low	Low	Negligible (not significant)
18-33	Dismantled Kenilworth to Balsall line	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-34 and 18-35	Infilled wells	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-37	Infilled pond	Low	Low	Negligible (not significant)
18-38	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-39	Infilled pit	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-40	Infilled pond	Low (property receptors)	Low (groundwater)	Negligible to minor adverse (not significant)
18-44	Infilled ponds	Low	Low	Negligible (not significant)
18-45	Infilled pond	Low	Low	Negligible (not significant)

Area ref	Area name	Main baseline risk	Main construction risk (1)	Temporary effect and significance
18-47	Infilled pond	Low	Low	Negligible (not significant)
18-48	Infilled pond	Low	Low	Negligible (not significant)
18-49	Infilled well	Low	Low	Negligible (not significant)
18-50	Infilled well	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-51	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-52 and 18-53	Infilled ponds	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-57	Stoneleigh Park (industrial) with tanks	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-58	New Kingswood Farm	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-60	Dalehouse Farm	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-63	Coventry to Leamington Spa Line	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
18-70	Berkswell electricity substation	Low	Low	Negligible (not significant)
18-73	Odnaull End Farm	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)

(1) The low/moderate main construction risk identified in the above table does not necessarily imply an unacceptable risk. Application of the processes and measures within the CoCP will ensure that site risks during the construction stage are controlled.

8.4.14 Table 16 indicates that based upon the assessment, no significant effects have been identified during the construction phase in relation to potential land contamination. However, potential temporary risks to groundwater have been identified at the following areas during construction:

- infilled ponds (ref 18-05, 18-38, 18-51, 18-52 and 18-53), infilled wells (refs 18-34, 18-35 and 18-50) and infilled pits (refs 18-21 and 18-39) which will be disturbed during construction;
- the dismantled Kenilworth to Balsall line (Kenilworth Greenway) along the route of which part of the Proposed Scheme will be constructed;
- Stoneleigh Park which will be intersected by the Proposed Scheme;
- New Kingswood Farm which will be intersected by the Proposed Scheme;
- Dalehouse Farm which will be disturbed during construction;
- the Coventry to Leamington Spa Line, beneath which the Proposed Scheme will pass in cutting; and
- Odnaull End Farm which will be disturbed during construction.

8.4.15 These risks relate to temporary mobilisation of soil contaminants during construction allowing a potential increase in migration of contaminants to groundwater. The risks are assessed as temporary minor adverse effects.

8.4.16 Construction compounds located in this study area will include staff welfare facilities, maintenance facilities for plant and machinery and fuel storage in bunded tanks. Construction compounds will store and use potentially contaminative materials such as fuels, oils and solvents, and the measures outlined in the draft CoCP will manage risks from the storage of such materials.

8.4.17 The main and satellite construction compounds may also be used for temporary storage of potentially contaminated soils. The measures outlined in the draft CoCP will manage risks from the storage of such materials. The location of these construction compounds are given in Section 2.3.

8.4.18 It is considered unlikely that additional remediation works will be required over and above the mitigation measures contained as standard within the draft CoCP.

8.4.19 There are anticipated to be no significant cumulative temporary effects from construction.

Permanent effects

8.4.20 Baseline and post-construction CSM have been compared to assess the permanent (post-construction) effects. The post-construction CSM assumes that all the required remediation has been carried out and validated.

8.4.21 The magnitude of the permanent effects and their significance have been determined by calculating the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible. This will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the land required for the Proposed Scheme.

8.4.22 Table 17 includes the summary of the permanent (post-construction) effects obtained from a comparison of the baseline and post-construction impacts and whether these are significant. The details of these comparisons are presented in Volume 5: Appendix LQ 001-018. The table shows that the Proposed Scheme results in either a reduction or no change in the level of risk already existing at each site for both on site and off site receptors.

Table 17: Summary of permanent (post construction) effects

Area ref	Area name	Main baseline risk	Main Post-construction risk	Post-construction effect and significance
18-05	Infilled pond	Low	Very low	Negligible to minor beneficial (not significant)
18-06	Former nursery	Low	Low	Negligible (not significant)
18-10	Infilled well	Low	Low	Negligible (not significant)
18-11	Disturbed possibly infilled ground	Low	Low	Negligible (not significant)

Area ref	Area name	Main baseline risk	Main Post-construction risk	Post-construction effect and significance
18-13	Former tanks	Low	Low	Negligible (not significant)
18-21	Possible partially infilled pits	Low	Low	Negligible (not significant)
18-23	Infilled pit	Low	Low	Negligible (not significant)
18-29	Infilled quarry	Low	Low	Negligible (not significant)
18-30	Infilled pit	Low	Low	Negligible (not significant)
18-32	Infilled pond	Low	Low	Negligible (not significant)
18-33	Dismantled Kenilworth to Balsall line	Low	Very low	Negligible to minor beneficial (not significant)
18-34 and 18-35	Infilled wells	Low	Very low	Negligible to minor beneficial (not significant)
18-37	Infilled pond	Low	Low	Negligible (not significant)
18-38	Infilled pond	Low	Very low	Negligible to minor beneficial (not significant)
18-39	Infilled pit	Low	Very low	Negligible to minor beneficial (not significant)
18-40	Infilled pond	Low	Low	Negligible (not significant)
18-44	Infilled ponds	Low	Low	Negligible (not significant)
18-45	Infilled pond	Low	Low	Negligible (not significant)
18-47	Infilled pond	Low	Low	Negligible (not significant)
18-48	Infilled pond	Low	Low	Negligible (not significant)
18-49	Infilled well	Low	Low	Negligible (not significant)
18-50	Infilled well	Low	Very low	Negligible to minor beneficial (not significant)
18-51	Infilled pond	Low	Very low	Negligible to minor beneficial (not significant)
18-52 and 18-53	Infilled ponds	Low	Very low	Negligible to minor beneficial (not significant)
18-57	Stoneleigh Park (industrial) with tanks	Low	Low	Negligible (not significant)
18-58	New Kingswood Farm	Low	Very low	Negligible to minor beneficial (not significant)
18-60	Dalehouse Farm	Low	Low	Negligible (not significant)
18-63	Coventry to Leamington Spa Line	Low	Low	Negligible (not significant)
18-70	Berkswell electricity substation	Low	Low	Negligible (not significant)
18-73	Odnaull End Farm	Low	Very low	Negligible to minor beneficial (not significant)

8.4.23 Table 17 shows that the Proposed Scheme results in either a reduction or no change in the level of risk already existing at each site for both on site and off site receptors. The table also indicates that following remediation, there will be overall neutral to minor beneficial impacts. Depending on the type of remediation undertaken, the beneficial effect could include an improvement in groundwater quality, the breaking of a ground gas migration pathway or the reduction in the volume of contaminants present in the soil.

8.4.24 As an example, where the Proposed Scheme directly intersects infilled ponds and pits in cutting, any waste or contaminated material encountered will be removed or remediated. This will prevent any further leaching to groundwater and will remove ground gas risks to property and humans.

8.4.25 There are anticipated to be no significant cumulative permanent effects.

Mining/mineral resources

8.4.26 Construction of the Proposed Scheme has the potential to impact existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource, direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[43] that may occur during the construction phase of the Proposed Scheme, possibly continuing through to the operation.

Temporary effects

8.4.27 Temporary adverse effects are anticipated on MSA where land will be temporarily used for construction and returned to the landowner after construction. In the Stoneleigh, Kenilworth and Burton Green area this includes construction compounds and satellite construction compounds which will overlie all the MSA during construction with the exception of the sand and gravel MSA at Gooseberry Hall.

8.4.28 Table 18 presents a summary of the assessment of temporary effects on the mining and mineral resources identified. As the construction compounds cover a very small area of the MSA for a temporary period the magnitude of impact is assessed as minor.

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

Table 18: Summary of temporary effects for mining and mineral resources

Site Name	Status	Description	Sensitivity value	Magnitude of impact	Effect and significance
Area of land underlying southern half of the Proposed Scheme section (Map LQ-01-047)	Mineral Safeguarding Area	Mineral Safeguarding Area for sand and gravel extraction	Moderate	Minor	Negligible (not significant)
Area of land underlying southern half of the Proposed Scheme section (Map LQ-01-047)	Mineral Safeguarding Area	Mineral Safeguarding Area for sand and gravel extraction	Moderate	Minor	Negligible (not significant)
Area of land east of Gooseberry Hall (Map LQ-01-049)	Mineral Safeguarding Area	Mineral Safeguarding Area for sand and gravel extraction	Moderate	Negligible	Negligible (not significant)
Majority of study area (Map LQ-01-047 to 050)	Mineral Safeguarding Area	Mineral Safeguarding Area for deep coal extraction	Moderate	Minor	Negligible (not significant)
Majority of the study area from southern edge of Stoneleigh to south of Burton Green (Map LQ-01-047 to 049)	Mineral Safeguarding Area	Mineral Safeguarding Area for building stone	Moderate	Minor	Negligible (not significant)
Area between south of study area and Finham Brook (Map LQ-01-047 to 048)	Mineral Safeguarding Area	Mineral Safeguarding Area for brick clay	Moderate	Minor	Negligible (not significant)

Permanent effects

8.4.29 The Proposed Scheme will be constructed in cutting through the three sand and gravel MSA, the brick clay MSA and through the building stone MSA shown on plans LQ 01-047 to 049.

8.4.30 In addition, the Proposed Scheme will cross an MSA for deep coal and the Daw Mill Colliery licence extension area. Mining is not currently operational at Daw Mill Colliery and the Coal Authority has no plans to re-open the colliery.

8.4.31 Table 19 presents a summary of the assessment of permanent effects on the mining and mineral resources identified.

Table 19: Summary of permanent effects for mining and mineral resources

Site Name	Status	Description	Sensitivity value	Magnitude of impact	Effect and significance
Area of land underlying southern half of the Proposed Scheme section (Map LQ-01-047)	Mineral Safeguarding Area	Mineral Safeguarding Area for sand and gravel extraction	Moderate	Minor	Negligible (not significant)
Area of land underlying southern half of the Proposed Scheme section (Map LQ-01-047)	Mineral Safeguarding Area	Mineral Safeguarding Area for sand and gravel extraction	Moderate	Minor	Negligible (not significant)
Area of land east of Gooseberry Hall (Map LQ-01-049)	Mineral Safeguarding Area.	Mineral Safeguarding Area for sand and gravel extraction	Moderate	Moderate	Minor adverse (not significant)
Majority of study area (Map LQ-01-047 to 050)	Mineral Safeguarding Area.	Mineral Safeguarding Area for deep coal extraction.	Moderate	Minor	Negligible (not significant)
Majority of the study area from southern edge of Stoneleigh to south of Burton Green (Map LQ-01-047 to 049)	Mineral Safeguarding Area.	Mineral Safeguarding Area for building stone	Moderate	Minor	Negligible (not significant)
Area between south of study area and Finham Brook (Map LQ-01-047 to 048)	Mineral Safeguarding Area	Mineral Safeguarding Area for brick clay	Moderate	Minor	Negligible (not significant)

8.4.32 There will be a minor adverse effect on the sand and gravel MSA near Gooseberry Hall as this resource will be partially lost and severed by the Proposed Scheme. There will be only a slight loss of resource on all other MSA.

8.4.33 No significant temporary effects are anticipated on the existing mineral resource.

8.4.34 There are anticipated to be no significant cumulative effects from construction on the existing mineral resource. The cumulative effects on mineral resource across the whole of the Proposed Scheme are discussed in the assessment of route-wide effects presented in Volume 3.

Geo-conservation resources

8.4.35 The Proposed Scheme at Crackley Lane, to the south of Roughknowles Wood, involves highway realignment and consequently Crackley Lane will be cut into the bedrock of the Kenilworth Sandstone Formation. There is potential for important geology to be exposed through construction which will provide an opportunity for study which could be of interest to academic groups, geological institutions and local enthusiasts.

8.4.36 There are anticipated to be no significant cumulative permanent effects from construction on geo-conservation sites.

Other mitigation measures

8.4.37 At this stage, no additional mitigation measures are considered necessary to mitigate risks from land contamination at the construction phase beyond those set out in the draft CoCP and instigated as part of required remediation strategies.

8.4.38 Mitigation of the effects on mineral resources can include prior extraction of the resource for use within the project or elsewhere. Extraction of surface resources may be limited to landscaping areas within the Proposed Scheme adjacent to rather than beneath the trackbed, which will require good founding conditions. A plan will be discussed and agreed in advance of the construction works with the landowner, the mineral owner, the mineral planning department at WCC and any other interested parties to assist in achieving an effective management of minerals within the affected location of the MSA.

8.4.39 With regards to the deep coal mineral resource, pre extraction of the coal is not appropriate due to the depth of the resource, the expense of extracting it and the subsequent potential for subsidence. Once the Proposed Scheme is operational, future mining works will require specific methods and mitigation to be employed (under and either side of the Proposed Scheme) and/or the sterilisation of a strip of land in which future mining would not be possible.

Summary of likely residual significant effects

8.4.40 No likely residual significant effects are anticipated with the application of the mitigation measures detailed above.

8.5 Effects arising from operation

8.5.1 Users of the Proposed Scheme (i.e. rail passengers), whilst within trains, will at all routine times be within a controlled environment, and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

8.5.2 Maintenance and operation of the Proposed Scheme will be in accordance with environmental legislation and good practice whereby appropriate spillage and pollution response procedures will be established.

Assessment of impacts and effects

8.5.3 The Furzen Hill auto-transformer substation will be situated approximately 10m to the north-east of the Proposed Scheme, approximately 130m to the north-west of the realigned A445 Leicester Lane. The Crackley auto-transformer substation will be situated to the east of the Proposed Scheme, north of the A429 Kenilworth Road. An auto-transformer substation can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, the proposed auto-transformer substations, in common with other modern substations, will use secondary containment appropriate to the level of risk.

8.5.4 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.

8.5.5 It is unlikely that there will be any cumulative effects on land quality or in-combination effects on receptors because of the environmental controls that will be placed on operational procedures.

Other mitigation measures

8.5.6 No other mitigation measures will be required beyond what has already been outlined relating to land quality in the Stoneleigh, Kenilworth and Burton Green study area.

8.5.7 There may be ongoing monitoring requirements following remediation works carried out during construction. Such monitoring, including monitoring of groundwater quality or ground gas, could extend into the operational phase of the Proposed Scheme.

Summary of likely residual significant effects

8.5.8 There are anticipated to be no residual significant land quality effects associated with the operation of the Proposed Scheme.

9 Landscape and visual assessment

9.1 Introduction

9.1.1 This section reports the assessment of the likely significant landscape and visual effects. It starts by summarising the baseline conditions found within and around the route of the Proposed Scheme and goes on to describe the significant effects that will arise during construction and operation on landscape character areas (LCAs) and visual receptors.

9.1.2 In this section, the operational assessment refers not just to the running of the trains, but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

9.1.3 Principal landscape and visual issues in the area include:

- temporary landscape and visual effects arising during construction from the presence of construction plant, construction compounds, removal of existing vegetation, severance of agricultural land and the construction of the Proposed Scheme; and
- permanent landscape and visual effects arising during operation from the presence of new engineered landforms cutting across the existing landscape, new viaducts, noise fence barriers, realigned highways, overhead line equipment and regular passing of high speed trains. In the main, such effects will reduce over time as planting established as part of the Proposed Scheme matures.

9.1.4 A separate but related assessment of effects on the setting of heritage assets is included in Section 6, Cultural Heritage. Further details on the landscape and visual assessment including engagement, baseline information and assessment findings, are presented in Volume 5: Appendix LV-001-018, which comprises the following parts:

- Part 1 Engagement with technical stakeholders;
- Part 2 Environmental baseline report;
- Part 3 Assessment matrices; and
- Part 4 Schedule of non-significant effects.

9.1.5 The extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages has been discussed with Coventry City Council (CCC), Warwickshire County Council (WCC) and Warwick District Council (WDC). Summer field surveys, including photographic studies of LCAs and visual assessment of viewpoints, were undertaken from May to October 2012 and from May to July 2013. Winter surveys were undertaken from November 2012 to March 2013.

9.2 Scope, assumptions and limitations

9.2.1 The assessment scope, key assumptions and limitations for the landscape and visual assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-0001-000/1)

and the SMR Addendum (Volume 5: Appendix CT-0001-000/2). This report follows the standard assessment methodology.

9.2.2 The study area has been informed by the construction and operational phase zones of theoretical visibility (ZTV), which are shown in Volume 5: Map Books – Landscape and visual assessment, Maps LV-07-072b to LV-07-077 and LV-08-072b to LV-084-077. The ZTV has been produced in line with the methodology described in the SMR Addendum (Volume 5: Appendix CT-0001-000/2), and is an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover will mean the actual visibility is substantially less than that shown in the ZTV. Tall construction plant (e.g. cranes and piling rigs) are excluded from the ZTV for the construction phase and overhead line equipment is excluded from the ZTV for the operational phase, but these are described and taken in to account in the assessment of effects on landscape character areas and visual receptors.

9.2.3 LCAs and visual receptors within approximately 2km of the Proposed Scheme have been assessed.

Limitations

9.2.4 During the baseline survey there were some areas which were inaccessible (such as private land, commercial premises and residential buildings). In these instances, professional judgement has been used to approximate the likely views from these locations.

9.3 Environmental baseline

Existing baseline

Landscape baseline

9.3.1 This is a generally low lying area of gently undulating landform which in part separates Kenilworth from Coventry. The land use is primarily agricultural, characterised by intermittent farms, large scale fields bounded by hedgerows and woodland blocks. The Rivers Avon and Sowe course in a narrow meander across the south of the area, bordering the former National Agricultural Centre, also known as Stoneleigh Business Park and the small scale nucleated settlement at Stoneleigh. The central part of the area is characterised by fields crossed by the Finham and Canley Brooks, settlement at Kenilworth and transport routes linking with Coventry. These transport routes include the A46 Kenilworth Bypass, Dalehouse Lane, the A429 Kenilworth Road and the Coventry to Leamington Spa Line. A key characteristic of this central area is the narrow separation between Kenilworth and Coventry at Gibbet Hill. To the north of the area the field pattern includes ancient woodland, (Crackley and Broadwells Woods), settlement at Burton Green and the University of Warwick campus. Overall, the area is crossed by many public rights of way (PRoW), most notably Kenilworth Greenway, a permissive bridleway which also forms part of the Coventry Way and Centenary Way long distance footpaths and which used to be the Kenilworth to Balsall railway line. This is a well vegetated route, alternating between cutting and embankment.

9.3.2 Landscape character areas have been determined with reference to Natural England's National Character Areas, (NCA)[44] and The Warwickshire Landscape Guidelines[45].

9.3.3 Descriptions of all LCAs are provided in Volume 5: Appendix LV-001-018 Part 2. For the purposes of this assessment the study area has been sub-divided into six discrete LCAs, four of which are most likely to be affected. A summary of these LCAs is provided below. The LCAs are shown in Volume 5: Map Book – Landscape and visual assessment, Maps: LV-02-072b to LV-02-077.

Bubbenhall Plateau Farmlands Landscape Character Area

9.3.4 The majority of this LCA is located within the adjoining Offchurch and Cubbington area (CFA17). The character is mainly rural, influenced by an almost flat plateau landform. This is most evident to the south of the LCA, adjacent to Cubbington, with the geometric field patterns, hedgerows and ancient woodlands of South and North Cubbington Woods. These key elements are in fair condition. The southern part of the area is crossed by a few main roads, the B4453 Rugby Road, D2213 Coventry Road and lanes such as Mill Lane. A number of PRoW, including Shakespeare's Avon Way (PRoW W130), exists within the LCA. The rural character is fragmented in the north of the LCA, where there is a noticeable presence of development with major infrastructure at Coventry airport. Overall, the presence of this major infrastructure results in a low tranquillity to the area. The LCA is likely to be valued at a regional level due to the green belt designation (covering all the LCA). Therefore, the area has a medium sensitivity to change.

Stoneleigh Parklands Landscape Character Area

9.3.5 The majority of this LCA is located within the Stoneleigh, Kenilworth and Burton Green area (CFA18) and overall the land use is predominantly agricultural, comprising an enclosed gently undulating landform with a pattern of large fields bounded by hedgerows, trees and woodland. Throughout this are many individual farms, such as Dalehouse Farm and Millburn Grange. The Rivers Avon and Sowe meander across the south of the LCA, with the Finham Brook and the Canley Brook coursing across the central section. These watercourses are narrow and often bordered by mature vegetation. Woodlands are typically large in scale, with Crackley Wood, Broadwells Wood and Black Waste Wood also ancient woodlands. These key components of fields, hedgerows and vegetation are in fair condition. Other land uses include Stoneleigh Business Park and recreation at Kenilworth Golf Club and the University of Warwick sport pitches. A number of transport routes cross the LCA, with the A46 Kenilworth Bypass, the A429 Kenilworth Road and the Coventry to Leamington Spa Line forming the main linkages between Kenilworth and Coventry. More minor routes include Dalehouse Lane, Crackley Lane and Red Lane, which are often bordered by residences. A key feature within the LCA is at Gibbet Hill, where a narrow 0.5km strip of open fields either side of the A429 Kenilworth Road separates Kenilworth and Coventry. There is a network of PRoW linking through the LCA, including the Kenilworth Greenway, Coventry Way and Centenary Way.

[44] Natural England, NCA Profile: 97 Arden, http://www.naturalengland.org.uk/publications/nca/default.aspx , Accessed 11 November 2013.
[45] Warwickshire County Council and The Countryside Commission (1993), The Warwickshire Landscape Guidelines, Warwickshire County Council, Warwick.

9.3.6 The tranquillity of the LCA is considered to be medium due to the fairly intense agricultural activities crossed by larger infrastructure routes. Historic influences within the study area are evident, with parklands, registered parks and gardens, and medieval architecture at Stoneleigh Abbey. The LCA is considered to be valued at a regional level due to these historic influences, the green belt designation (covering the majority of the LCA) and the network of PRoW. Therefore, this area has a medium sensitivity to change.

Coventry Rural Fringe Landscape Character Area

9.3.7 The LCA includes the remnants of agricultural land and isolated industrial areas and is designated green belt. Infrastructure includes the National Grid Berkswell substation adjacent the Kenilworth Greenway, National Grid pylons and the Rugby to Birmingham Line (which is to the north of this area). However, much of the LCA is characterised by undulating landform, an irregular and enclosed pattern of fields intermittent farms and small scale woodlands at Big Poors and Little Poors Woods. These key components are in good condition.

9.3.8 The tranquillity of the LCA is considered to be medium due to the presence of the National Grid pylons and the relatively light levels of traffic on Hodgett's Lane and Hob Lane within the agricultural landscape. A number of PRoW cross the LCA, including the Kenilworth Greenway. Areas of open space include Nailcote Hall Golf Course. The LCA is valued at a local level due to the network of PRoW. Therefore, this area has a medium sensitivity to change.

Balsall Common Rural Landscape Character Area

9.3.9 The majority of this LCA is located within the adjoining Balsall Common and Hampton-in-Arden area (CFA23). The rural character of this LCA is influenced by an irregular pattern of well-managed, small scale fields, often bounded by hedgerows and trees. The area provides the setting for the settlement of Balsall Common and is crossed by a number of major transport routes such as the Rugby to Birmingham Line and the A452 Kenilworth Road which reduce tranquillity locally. Due to the residential street lighting the tranquillity is medium. The LCA is considered to be in good condition and is valued at the borough level for its extensive network of PRoWs. Therefore, this area has a medium sensitivity to change.

Visual baseline

9.3.10 Descriptions of the identified representative viewpoints are provided in Volume 5: Appendix LV-001-018 Part 2. A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are shown in Volume 2: Map Book – Landscape and visual assessment, Maps LV-03-072b to LV-03-077a and LV-04-072b to LV-04-077a. The viewpoints are numbered to identify their locations. In each case, the middle number (xxx.X.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational 4: Transport and 6: Employment.

9.3.11 No protected views have been identified within the study area.

9.3.12 Residential receptors which have a high sensitivity to change are located on the edges of Kenilworth, Gibbet Hill and Burton Green, in addition to isolated groups of residences throughout the landscape. Views are typically across agricultural fields

with intermittent vegetation and field boundaries often shortening or partially filtering views.

9.3.13 Recreational receptors, also with a high sensitivity to change are located on PRoW throughout the study area, including the Kenilworth Greenway. Views are typically across agricultural fields, with intermittent vegetation often filtering views. Middle ground and background views often include built form, either as individual farm properties or larger settlements at Kenilworth and Coventry.

9.3.14 Viewpoints from people travelling along scenic roads are located on Crackley Lane and Hodgett's Lane and have a medium sensitivity to change. These views are characterised by roadside vegetation with filtered or intermittent views of fields and residences.

Future baseline

9.3.15 A summary of the committed developments that are assumed to be built and occupied prior to either the construction or operation of the Proposed Scheme is provided below, along with the consequential effect on the character of LCAs and nature of views. Developments which would introduce new visual receptors which may be significantly affected are also described. These developments are shown in Volume 5: Map Book – Cross topic, Maps CT-13-044 to CT-13-046.

Construction (2017)

9.3.16 The development/redevelopment of Stoneleigh Park (Planning reference: W/12/0766), into a science and business park is assumed to include new planting, which by the time of construction of the Proposed Scheme will not have established sufficiently to filter views. Although this is not considered to alter the sensitivity of the Stoneleigh Parklands LCA, as the development/redevelopment will occupy the same overall footprint as the existing Stoneleigh Business Park, it will introduce new visual receptors.

9.3.17 Whilst the change of use from agricultural land to an extension of Kenilworth Golf Club (Planning reference: W/13/0018) will retain the sensitivity of the Stoneleigh Parklands LCA, it will introduce a new recreational receptor. Proposals for the extension of the golf course include new planting; however, by the time of construction of the Proposed Scheme this is assumed to not be sufficient to filter views.

9.3.18 The conversion of a redundant cart store to studio holiday lets at Little Beanit Farm, (Planning reference: 2012/1400) will not alter the sensitivity of the Coventry Rural Fringe LCA, but will introduce new receptors.

Operation (year 1 – 2026)

9.3.19 There are no committed developments identified for the area that will be in operation at the same timeframe as the Proposed Scheme. The developments/ redevelopments identified within the Construction section are included as future baseline receptors within the assessment.

9.4 Temporary effects arising during construction

9.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works will be visible in many locations and will have the potential to give rise to significant temporary effects which 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 civil engineering works will take place, including establishment of compounds, main earthworks and structure works.

9.4.2 The effects associated with the peak construction phase in this CFA will generally be considered to be long term given the construction programme (see Section 2.3). Overall, civil engineering works in this CFA will be undertaken between the start of 2018 and the end of 2021. The A46 Kenilworth Bypass main compound will be in place for approximately six years. Satellite compounds will be in place for between approximately nine months and two years. The civil engineering works at most individual sites along the route in this CFA will occur for a period of between approximately nine and 18 months. Effects during other phases of works are likely to be lesser due to less construction equipment being required at the time and a reduced intensity of construction activity.

9.4.3 The construction works that have been taken into account in determining the effects on landscape and visual receptors are listed as follows:

- localised hedgerow and tree removal from fields, construction plant crossing the haul roads, the general earthworks and modifications of the landform and the presence of construction compounds;
- the presence of a temporary material stockpile within the fields, adjacent to the A445 Leicester Lane;
- excavation from within fields to form the cutting between the A445 Leicester Lane and the B4113 Stoneleigh Road with the construction of the Furzen Hill auto-transformer station, access road to the A445 Leicester Lane and railway drainage balancing pond;
- realignments to the A445 Leicester Lane, Stareton Road and B4113 Stoneleigh Road, construction of overbridges and approach embankments, balancing pond and pumping station;
- construction of the Stoneleigh Park retaining wall and Stoneleigh Park accommodation overbridge, new access roads and several demolitions to exiting residences within Stoneleigh Park;
- construction of the River Avon viaduct and approach embankments approximately 150m in length and approximately 10m in height above existing ground levels with the realignment of the B4115 Ashow Road and construction of the B4115 Ashow Road overbridge;

- the presence of a temporary material stockpile and the A46 Kenilworth Bypass overbridge main compound, situated between the B4115 Ashow Road and the A46 Kenilworth Bypass;
- the construction of the A46 Kenilworth Bypass overbridge;
- demolition of Kingswood Farm and excavation from the fields for the cutting, to an approximate depth of 14m and approximate width of 100m, the realignment of Dalehouse Lane, construction of Dalehouse Lane overbridge and construction of Finham Brook viaduct;
- construction of the Canley Brook retaining wall, the Millburn Grange Farm accommodation overbridge, the Kenilworth Road northbound roadhead and temporary material stockpile and the Coventry to Leamington Spa Line overbridge;
- the construction of the A429 Kenilworth Road overbridge the diversion of the Canley Brook and construction of the Crackley auto-transformer station;
- the excavation from fields and the embankment formation between the Canley Brook and Burton Green, including the removal of ancient woodland from Crackley Wood, Broadwells Wood and Black Waste Wood;
- the construction of bridleway W164 overbridge, the realignment of Crackley Lane and construction of the overbridge;
- the presence of a temporary material stockpile to the north of the Kenilworth Greenway;
- the construction of the Burton Green green tunnel, with porous portal structures with the diversion of the Kenilworth Greenway, and an extension to the existing National Grid Berkswell substation and construction of Burton Green auto-transformer feeder station; and
- the construction of the Burton Green retaining structure, demolition of Odnaull End Farm, the realignment of the B4101 Waste Lane, and the construction of the B4101 Waste Lane overbridge.

Avoidance and mitigation measures

9.4.4 Measures that have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction include the following (see Volume 5: Appendix CT-003-00/1):

- maximising the retention and protection of existing trees and vegetation where possible (draft CoCP Section 12);
- use of well-maintained hoardings and fencing (draft CoCP Section 5);
- designing of temporary lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses (draft CoCP Section 5);
- replacement of any trees intended to be retained that may be accidentally felled or die as a consequence of construction works (draft CoCP Section 12);

- appropriate maintenance of planting and seeding works and implementation of management measures, to continue through the construction period as landscape works are completed (draft CoCP Section 12); and
- a requirement for contractors to pay due consideration to the impacts of extreme weather events and related conditions which may affect landscape and visual resources during construction (draft CoCP, Section 5).

9.4.5 These measures have been taken account of in the assessment of the construction effects below.

Assessment of temporary impacts and effects

9.4.6 The most apparent changes to landscape character and viewpoints during construction will relate to the temporary presence of construction plant and the removal of existing landscape elements, such as trees, hedges and agricultural land. Changes will be most notable along the route at Stoneleigh Park, Dalehouse Lane, A429 Kenilworth Road, Burton Green and the Kenilworth Greenway. The height of the construction plant and viaducts and the close proximity of construction activities to viewpoints, coupled with the absence of intervening screening (apart from the site hoardings) will result in significant visual effects during construction. The landform in certain locations and the retention of intervening hedgerows and trees will partially screen low level construction activity.

Landscape assessment

9.4.7 The following section describes the likely significant effects on LCAs during construction. All LCAs within the study area considered to experience a non-significant effect (minor adverse or negligible) are described in Volume 5: Appendix LV-001-018 Part 4.

Bubbenhall Plateau Farmlands Landscape Character Area

9.4.8 The majority of this LCA is located within the adjoining Offchurch and Cubbington area (CFA17) and therefore the assessment of impacts on the LCA has included consideration of construction actives within both CFA17 and CFA18. With the exception of the realignment to the northern section of the D2213 Coventry Road, construction activity affecting this LCA is mainly located within the adjacent the Offchurch and Cubbington area. Construction will involve the excavation and construction of retained cutting and embankment formation within the fields, the partial removal of ancient woodland from South Cubbington Wood and hedgerows within the fields. The construction activity will also include the realignment of the B4453 Rugby Road and D2213 Coventry Road with construction of overbridges along them. There will also be a number of construction compounds and construction plant crossing the fields and on the haul roads.

9.4.9 The removal of ancient woodland at South Cubbington Wood is a partial loss to a key characteristic of the setting of the LCA. The scale and extent of the construction activity will reduce the tranquillity locally. Therefore the magnitude of change is considered to be medium.

9.4.10 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect.

Stoneleigh Parklands Landscape Character Area

9.4.11 The construction activity will be located across a large extent of the LCA, from the D2213 Coventry Road to Black Waste Wood at Burton Green. The activity will include the removal of hedgerows and trees from the fields and ancient woodland from Crackley Wood, Broadwells Wood and Black Waste Wood. There will be excavation within the fields to form the cuttings and retaining walls, the formation of embankments and demolitions within Stoneleigh Park. There will be a temporary culvert across the Finham Brook to enable construction plant to cross, while the Canley Brook will be realigned. These watercourses and the River Avon will have viaducts constructed across them, including the formation of approach embankments. There will be the construction of two auto-transformer stations with access roads and realignments of the A445 Leicester Lane, B4113 Stoneleigh Road, B4115 Ashow Road, A46 Kenilworth Bypass, Dalehouse Lane and the A429 Kenilworth Road. There will be the construction of the porous portal structure of the Burton Green green tunnel. A number of construction compounds will be located within the fields, including temporary material stockpiles and roadheads. There will be a temporary loss of agricultural land and disruption of field use, with construction plant on haul roads crossing the fields.

9.4.12 The gently undulating landform character will be locally affected by the earthworks. There will be a partial loss to key characteristic vegetation. The construction compounds will be at variance to the agricultural character of open fields. The scale and extent of construction activity will reduce the tranquillity locally. Therefore the magnitude of change is considered to be medium.

9.4.13 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect.

Balsall Common Rural Landscape Character Area

9.4.14 The majority of the construction activity affecting this LCA will be located in the adjacent Balsall Common and Hampton-in-Arden area (CFA23) and therefore the assessment of impacts on the LCA has included consideration of construction actives within both CFA23 and CFA18. Within CFA18, the construction activity will be located along and adjacent to the B4101 Waste Lane, with realignment of this road and a new overbridge. Within CFA23 the activity will include the loss and severance of agricultural land between the Kenilworth Greenway, the Rugby to Birmingham Line and the Proposed Scheme, isolating farmland. The character of the area will also be affected by the presence of large scale earthworks and construction of the Balsall Common viaduct and Carol Green Rail underbridge. Throughout the LCA, the scale and extent of construction activity will reduce the tranquillity locally.

9.4.15 Due to the removal of characteristic, long established landscape components and introduction of construction plant into the rural landscape, the magnitude of change is considered to be high.

9.4.16 The high magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a major adverse effect.

Visual assessment

9.4.17 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken during winter, 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, will be in leaf. Where residential receptors experience significant effects at night-time arising from additional lighting, these are also presented in this section. Representative viewpoints within the study area considered to experience a non-significant effect (minor adverse or negligible) are described in Volume 5 Appendix LV-001-018 Part 4.

9.4.18 The number identifies the viewpoint locations, which are shown in Volume 5: Map Book – Landscape and visual assessment, Maps LV-07-072b to LV-07-077a. In each case, the middle number (xxx.X.xxx) identifies the type of receptor that is present in this area– 2: Residential, 3: Recreational, 4: Transport, 5: Hotels and healthcare institutions, 6: Employment and 7: Active sports.

9.4.19 Where a viewpoint may represent multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity may be lower than those reported.

Viewpoint 261.2.001: View north-east from Leicester Lane Cottages

9.4.20 The embankment formation within the fields to the east of the A445 Leicester Lane and the localised removal of vegetation will be visible in the foreground, within the direct frame of view. The cranes constructing the A445 Leicester Lane overbridge, construction plant on the haul routes crossing the fields, the upper sections of a temporary material stockpile and the construction of the Furzen Hill auto-transformer station will be visible in the middle ground. This activity will contrast with existing views of open fields due to the noticeable increase in activity compared to general agriculture. These views are set within the context of existing views of the A445 Leicester Lane and therefore the magnitude of change is medium.

9.4.21 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

9.4.22 At night, the lighting of the A445 Leicester Lane overbridge satellite compound is considered to be non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 262.3.001: View south-west from PRoW (Footpath) W130b

9.4.23 A temporary material stockpile will be visible in the middle ground of the view, although partially screened by the intervening vegetation. The upper sections of cranes constructing the A445 Leicester Lane overbridge will be visible in the background of the view. These activities will result in a noticeable deterioration in the view compared to the existing views of fields. Therefore, the magnitude of change is considered to be medium.

9.4.24 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 262.2.004: View east and west from Furzen Hill Cottages adjacent the A445 Leicester Lane

9.4.25 To the east, vegetation removal, regrading of landform and embankment formation for the realignment of the A445 Leicester Lane will be visible in the foreground, crossing the fields. A temporary material stockpile will be located within the fields in the middle ground of the view. To the west, the construction of the railway drainage balancing pond, rail systems satellite compound and reprofiling of the landform will be visible in the foreground, adjacent the existing A445 Leicester Lane. The construction of Furzen Hill auto-transformer station and regrading of the agricultural landform will be visible in the middle ground. This activity will be at variance with existing views of open fields due to the noticeable increase in activity compared to general agriculture. The activity is in close proximity to the receptor and although viewed within the context of the A445 Leicester Lane, will be within the direct frame of view to the east and west of the receptor. Therefore, the magnitude of change is considered to be high.

9.4.26 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.27 At night, the lighting of the A445 Leicester Lane overbridge satellite compound is considered to be non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 263.2.003: View north-east from Stone House Farm

9.4.28 Woodland removal, excavation and reprofiling of the generally flat landform for the construction of the Stoneleigh Park retaining wall, the temporary 2.4m high construction fencing and construction plant on the haul roads will be in visible in the middle ground of the view, within the fields. This activity is a major alteration to existing views of woodland and open fields due to the noticeable increase in activity compared to general agriculture. The activity will be partially filtered by vegetation in the foreground. Therefore, the magnitude of change is considered to be medium.

9.4.29 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 264.3.003: View south-west from the track (green lane) between Stareton and the A445 Leicester Lane

9.4.30 The temporary earthwork stockpiles, temporary 2.4m high construction fencing and construction plant on the haul roads will be visible in the middle ground of the view. Also within this view will be the activity to construct the Stoneleigh Park retaining wall, woodland clearance and the reprofiling of the generally flat landform. Due to the open character of the fields in the foreground, this activity will be continuously highly visible and a substantial change from views of open fields and a marked increase in activity compared to general agriculture. Therefore, the magnitude of change is considered to be high.

9.4.31 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 266.3.001: View south-west from PRoW (Footpath) W171

9.4.32 The demolition of buildings within Stoneleigh Business Park and the construction of the Stoneleigh Park retaining wall will be visible in the middle ground, although partially filtered by the vegetation bordering the River Avon. The view will also include construction plant on the haul roads within Stoneleigh Business Park and realignment of the B4113 Stoneleigh Road. Viewed alongside existing vehicles and built form within the view, the construction activity, will be viewed as one of a series of components within Stoneleigh Business Park. Therefore the magnitude of change is considered to be medium.

9.4.33 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 266.3.003: View south-west from PRoW (bridleway) w157

9.4.34 The construction of the retained cutting through Stoneleigh Park, demolition of residences and the upper sections of cranes constructing the B4113 Stoneleigh Road green overbridge, Stoneleigh Park accommodation overbridge and the River Avon viaduct will be visible in the middle ground. This activity will be partially filtered by the vegetation bordering the River Avon and the views of the cranes are characteristic of views of the upper sections of transmissions masts within Stoneleigh Park, that extend above the intervening vegetation. Therefore, the magnitude of change is considered to be medium.

9.4.35 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoints 266.6.007: View south-west from Stoneleigh Park and 267.6.007: View north-east from Stoneleigh Park (future baseline)

9.4.36 The development/redevelopment of Stoneleigh Park is assumed to be completed in advance of the construction activity.

9.4.37 The construction of Stoneleigh Park retaining wall, earthworks and the cranes constructing Stoneleigh Park accommodation overbridge will be visible in the middle ground. This activity is considered to be highly visible due to the lack of intervening elements within the view and a substantial change compared to exiting views of the layout within the business park. Therefore, the magnitude of change is high.

9.4.38 The high magnitude of change assessed alongside the low sensitivity of the receptors will result in a moderate adverse effect.

Viewpoint 267.4.001: View north-east from the B4115 Ashow Road

9.4.39 Views of the construction of the new B4115 Ashow Road alignment, the embankments and overbridge will be visible in the foreground of the view. The upper section of the cranes constructing the River Avon viaduct and the approach embankments will be visible in the middle ground of the view. This activity will be partially filtered by roadside vegetation. The activity is considered to represent a partial alteration to existing views of open fields and woodlands by introducing additional vertical elements within the view and a noticeable increase in activity compared to general agriculture. Therefore, the magnitude of change is considered to be medium.

9.4.40 The medium magnitude of change assessed against the medium sensitivity of these receptors will result in a moderate adverse effect.

Viewpoint 267.2.005: View north-east from Crewe Farm

9.4.41 The temporary 2.4m high construction fencing for the realignment of the B4115 Ashow Road will be visible in the foreground of the view crossing the fields. The upper sections of cranes constructing the B4115 Ashow Road overbridge, the River Avon viaduct and a temporary material stockpile will be visible in the middle ground above the intervening vegetation and rising landform. This activity will be at variance to views of open fields but in the context of exiting views of the B4115 Ashow Road is considered to result in a medium magnitude of change.

9.4.42 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 267.2.006: View north-east from East Lodge and residences on Eastgate within Stoneleigh Business Park

9.4.43 The demolition of residences adjacent the receptor and the temporary 2.4m construction fencing will be in the middle ground of the view and will be partially filtered by mature vegetation along Avenue M (within Stoneleigh Business Park) in the foreground. While the temporary fencing will screen the main construction of the Stoneleigh Park retaining wall, it will also foreshorten existing views of the background. Therefore the magnitude of change is medium.

9.4.44 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 268.3.005: View south-west from PRoW (Footpath) W158

9.4.45 The upper sections of cranes constructing the B4115 Ashow Road and the River Avon viaduct, including construction plant forming the approach embankments, will be visible in the middle ground. This activity will partially alter the existing view of fields and a wooded ridge line by introducing additional vertical elements that are in the context of the two existing transmissions masts within Stoneleigh Park. Therefore, the magnitude of change is considered to be medium.

9.4.46 The view of the Proposed Scheme from this location during construction is illustrated on the photomontage shown in Figure LV-01-199 (Volume 2, CFA18 Map Book).

9.4.47 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoints 269.3.001: View north-east from PRoW (Footpath) K29 (Coventry Way) and 269.3.005 (future baseline): View north from Kenilworth Golf Course

9.4.48 With regard to 269.3.005 the expansion of the golf course is assumed to be completed in advance of the construction activity.

9.4.49 The demolition of New Kingswood Farm, the excavation for the extent of cutting within the fields, construction plant on the haul roads and the cranes constructing the Footpath K29 overbridge will be visible in foreground. This activity is considered to

represent substantial change compared to views of open fields and gently undulating landform due to the changes to the key elements of the view and the increase in activity compared to general agriculture. Therefore, the magnitude of change is considered to be high.

9.4.50 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 270.2.003: View west from Kingswood Farmhouse

9.4.51 Construction activity will be visible in the middle ground and partially filtered by intervening vegetation within the foreground. Views will include the upper sections of cranes constructing the A46 Kenilworth Bypass overbridge and the Footpath K29 overbridge, the excavation for the extent of cutting within the fields, construction plant on haul roads, hedgerow removal and demolition of New Kingswood Farm. This activity, although partially filtered, is considered to represent substantial change due to the partial loss of key vegetation and change to landform and the introduction of vertical elements within the view. Therefore, the magnitude of change is considered to be medium.

9.4.52 The medium magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a moderate adverse effect.

9.4.53 At night, the lighting of the A46 Kenilworth Bypass overbridge satellite compound is considered to be non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoints 270.2.005: View south-west from Four Winds and 270.2.007: View south from residential properties along Dalehouse Lane

9.4.54 Construction activity will be visible in the middle ground and partially filtered by garden and roadside vegetation. Views will be of the realignment of Dalehouse Lane, the upper sections of cranes constructing Dalehouse Lane overbridge and the excavation and earthworks within the fields including the construction of the ecological mitigation areas. As a result of this activity, the magnitude of change is considered to be medium.

9.4.55 The medium magnitude of change, assessed alongside the high sensitivity of the receptors, will result in moderate adverse effects.

Viewpoint 271.2.001: View east from Dale House Farm

9.4.56 The construction of Finham Brook viaduct, including cranes and construction vehicles crossing the haul routes and Finham Brook viaduct satellite compound will be visible in the foreground. This activity is considered to represent a substantial change due to the additional built form, vehicles and storage elements within the compound and the construction plant within the direct frame of view. Therefore, the magnitude of change is considered to be high.

9.4.57 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect.

9.4.58 At night the continuous lighting of the Finham Brook viaduct satellite compound will be visible in the foreground of the view in a landscape which is, at present, unlit. Due

to the proximity to the receptor the magnitude of change is high, giving rise to a major adverse effect.

Viewpoint 271.2.002: View north from Millburn Grange Farm

9.4.59 Construction plant crossing the haul roads, the construction of the Millburn Grange Farm overbridge with approach embankments and the Coventry-Leamington Spa Line overbridge (south-east) satellite compound will be visible in the foreground. This will introduce new built form, vehicles and construction plant within the direct frame of view. In addition, the view will include the cranes constructing the Coventry – Leamington Spa Line and Millburn Grange Farm overbridges. The construction plant within the fields constructing the Canley Brook retaining wall will be visible in the middle ground along with the crane constructing the A429 Kenilworth Road overbridge. As this activity will introduce new components that are in close proximity to the receptor the magnitude of change is considered to be high.

9.4.60 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.61 At night, the continuous lighting of the Coventry-Leamington Spa Line overbridge (south-east) satellite compound will be visible in the foreground of the view. Viewed in the context of intermittent lighting from trains on the Coventry to Leamington Spa Line and vehicles on the A429 Kenilworth Road, the magnitude of change is medium, giving rise to a moderate adverse effect.

Viewpoint 271.2.003: View north-east from residential properties along Highland Road

9.4.62 Views of cranes constructing the Coventry-Leamington Spa Line and Millburn Grange Farm overbridges and construction plant crossing the haul roads and construction of the Canley Brook retaining wall will be visible in the middle ground of the view. This will be a substantial change due to the introduction of vertical elements and the increase in activity compared to general agriculture, although this will be partially filtered by intervening vegetation. Therefore, the magnitude of change is medium.

9.4.63 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

9.4.64 At night, the lighting of the Finham Brook viaduct satellite compound is considered to be non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 273.2.001: View north from residential properties in Crackley Crescent

9.4.65 The realignment of the Canley Brook across the fields including for vegetation removal, the construction of the Canley Brook retaining wall, including cranes constructing the Canley Brook viaduct will be visible in the middle ground, although partially filtered by intervening vegetation. Therefore, the magnitude of change is considered to be medium.

9.4.66 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 273.3.002: View north from PRoW (bridleway) W164

9.4.67 The excavating and earthworks within the fields including vegetation removal for the construction of the Canley Brook realignment, balancing ponds and areas of new planting will be visible in the foreground. The upper sections of cranes constructing the Canley Brook viaduct will be visible in the middle ground. This activity will be in close proximity to the receptor and a substantial change compared to existing views of open fields being crossed by construction plant and with activity of a greater scale and extent than general agriculture. Therefore, the magnitude of change is considered to be high.

9.4.68 The high magnitude of change assessed alongside the high sensitivity of these receptors will result in major adverse effects.

Viewpoint 273.3.004: View north from PRoW (bridleway) W165x

9.4.69 The ancient woodland removal from Crackley Wood and the upper sections of cranes constructing bridleway W164 overbridge and the Canley Brook viaduct will be visible in the middle ground. The removal of vegetation and introduction of new vertical elements within the view are a partial change compared to views of a wooded ridge line. Therefore, the magnitude of change is considered to be medium.

9.4.70 The medium magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a moderate adverse effect.

Viewpoint 273.3.008: View north from the Coventry Way overbridge

9.4.71 The cranes constructing Millburn Grange Farm overbridge, the Coventry-Leamington Spa Line overbridge, the A429 Kenilworth Road overbridge and the Canley Brook viaduct will be visible in the middle ground. Views will also include construction plant on the haul roads and constructing the earthworks within the fields between Kenilworth and Gibbet Hill, Coventry. The cranes will be highly visible and a major alteration to the wooded ridge line by their vertical scale while the construction plant will contrast with the views of open fields. Therefore, the magnitude of change is considered to be high.

9.4.72 The high magnitude of change assessed against the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 274.2.001: View south from Oak Tree Cottage

9.4.73 The construction plant crossing the fields, the removal of hedgerows and the upper sections of cranes constructing the Canley Brook viaduct and diversion, the Kenilworth Road northbound roadhead and temporary material stockpile will all be visible in the middle ground of the view. These views will be partially filtered by vegetation in the foreground. Therefore the magnitude of change is medium.

9.4.74 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 274.4.002: View south-west from the A429 Kenilworth Road

9.4.75 The construction of the realigned A429 Kenilworth Road within the fields will be visible in the foreground of the view. The construction of the Crackley auto-transformer station and access road, the construction of the Canley Brook retaining

wall, Canley Brook realignment and the A429 Kenilworth overbridge will be visible in the middle ground of the view. This activity will result in new features that are continuously highly visible within the fields alongside the existing A429 Kenilworth Road, although views will be partially filtered by roadside vegetation. Therefore the magnitude of change is medium.

9.4.76 The medium magnitude of change assessed alongside the medium sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 274.4.005: View south-west from Cryfield Grange Road

9.4.77 The upper sections of cranes constructing the A429 Kenilworth Road overbridge and the Canley Brook viaduct will be visible in the middle ground of the view. Additionally, there will be view of construction plant crossing the haul roads, excavating the Canley Brook realignment within the fields and the construction of the Crackley auto-transformer station. While the removal of vegetation within the fields and the reprofiling of the landform will be a marked change compared to the existing views of the open fields, views of the cranes and auto-transformer station will be set against views of built form within Kenilworth. Therefore, the magnitude of change is considered to be medium.

9.4.78 The medium magnitude of change assessed alongside the medium sensitivity of these receptors will result in moderate adverse effects.

Viewpoints 274.2.007: View south-west from residential properties along the A429 Kenilworth Road and 274.2.008: View south-west from residences along Cryfield Grange Road

9.4.79 The removal of vegetation from within the fields and along the Canley Brook, the regrading of landform, construction plant on the haul roads and the upper sections of the cranes constructing the Canley Brook viaduct will be visible in the middle ground of the view. The view will also include the Kenilworth Road northbound roadhead and temporary material stockpile. This activity will be partially screened by garden vegetation. Therefore the magnitude of change is medium.

9.4.80 The medium magnitude of change assessed alongside the high sensitivity of the receptors will result in moderate adverse effects.

Viewpoints 275.2.001: View north-east from Birches Wood Farm and 276.3.001: View east from PRoW (bridleway) W165x

9.4.81 The removal of ancient woodland from the edge of Crackley Wood, the excavation from across the fields to form the extent of cutting, construction plant on the haul roads and the upper section of cranes constructing the Crackley Lane overbridge will be visible in the middle ground. This activity will result in a major alteration to the key character of woodland and open fields. Therefore, the magnitude of change is considered to be high.

9.4.82 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect.

Viewpoint 277.2.001: View north-west from residential properties in Rye Meadow

9.4.83 The formation of embankments and excavation within the fields, the construction plant on the haul roads, the Crackley Lane overbridge satellite compound and the cranes constructing the Crackley Lane overbridge will be visible in the middle ground. Also in the background of the view will be the removal of ancient woodland from Broadwells Wood. The reduction in woodland and the presence of the satellite compounds and construction plant will be at variance to views of open fields. While the construction activity will be located across the field of view, it will be partially filtered by garden vegetation in the foreground. Therefore, the magnitude of change will be medium. The view of the Proposed Scheme from this location during construction is illustrated on the photomontage shown in Figure LV-01-200 (Volume 2, CFA18 Map Book.

9.4.84 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoints 277.3.006: View north-east from the Kenilworth Greenway, (part of the Coventry Way), 277.3.007: View north-east from PRoW (Footpath) W168 and 279.3.006: View north-west from the Kenilworth Greenway (part of the Coventry Way)

9.4.85 The removal of hedgerows from the fields adjacent the Kenilworth Greenway and a temporary material stockpile will be visible in the foreground of the view. The embankment formation within the fields and the reprofiling of the landform will be visible in the background of the view. The elevated location of the receptor and the scale and proximity of area 7 within the view compared to existing views of agricultural fields will result in a marked deterioration in the view. Therefore the magnitude of change is high.

9.4.86 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 278.2.001: View south from South Hurst Farmhouse and South Hurst

9.4.87 Intervening hedgerows and trees will partially filter views of construction activity in the middle ground. Views will be of the formation of embankments and construction plant on the haul routes crossing the fields. Overall, the magnitude of change is considered to be medium.

9.4.88 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 279.2.003: View north-east from Le Van House and Two Oaks Nursery on Red Lane

9.4.89 The construction plant crossing the fields from Red Lane and the embankment formation for the realigned Kenilworth Greenway will be visible in the middle ground of the view. The upper sections of cranes constructing Burton Green green tunnel will be in the background. These views will be partially filtered by vegetation in the foreground. Therefore, the magnitude of change is considered to be medium.

9.4.90 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 279.2.004: View north-east from residential properties along Cromwell Road and Red Lane

9.4.91 The removal of ancient woodland from Black Waste Wood, the construction of the Kenilworth Greenway realignment and the Burton Green green tunnel will be visible in the middle ground. This activity is considered to represent a major alteration to the view through the introduction of new vertical elements and removal of key characteristic vegetation, all within the direct frame of view. Therefore, the magnitude of change is considered to be high.

9.4.92 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoints 280.3.001: View south-west from PRoW (Footpath) W168a and 280.2.012: View south from Bockendon Grange

9.4.93 The upgrade of the track and footpath, the removal of hedgerows from within the fields, construction of the railway drainage balancing pond and raised earthworks will be visible in the foreground. A temporary material stockpile will be visible in the middle ground. Due to the partial loss of key characteristic vegetation, the proximity of the activity and the scale and extent of the temporary material stockpile within the view, the magnitude of change is considered to be high.

9.4.94 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 280.2.002: View south from residential properties on Cromwell Lane

9.4.95 Construction activity will be visible in the middle ground and partially filtered by intervening vegetation or viewed obliquely from the receptor. Views will be of construction plant on Cromwell Lane and the construction of Burton Green green tunnel. Therefore, the magnitude of change is considered to be medium.

9.4.96 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 282.2.001: View south-west from residential properties on Hodgett's Lane

9.4.97 The construction plant on Hodgett's Lane will be visible in the foreground, albeit in the context of exiting traffic on the road. The temporary 2.4m high construction fencing will be visible in the foreground and screen the majority of the construction of Burton Green green tunnel. The exception will be the removal of vegetation from the Kenilworth Greenway, the demolition of Burton Green village hall and the upper sections of cranes in the middle ground of the view. Due to the removal of these key components and the foreshortening of views by the fencing within the context of existing views of Hodgett's Lane, the magnitude of change is medium.

9.4.98 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 282.3.006: View south-west from PRoW (Footpath) M186

9.4.99 The construction plant excavating for the Burton Green retaining structure and the removal of vegetation from along the Kenilworth Greenway will be visible in the foreground of the view. Therefore, the magnitude of change is considered to be high.

9.4.100 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 282.2.007: View south from residential properties along B4101 Waste Lane

9.4.101 The construction plant on the B4101 Waste Lane will be visible in the foreground of the view, albeit in the context of existing views of traffic. The realignment of the B4101 and construction of the B4101 Waste Lane overbridge will be in the middle ground of the view, although partially filtered by intervening vegetation. Therefore the magnitude of change is medium.

9.4.102 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 282.2.008: View south-west from residential properties along Hodgett's Lane

9.4.103 The removal of vegetation from the Kenilworth Greenway, the temporary 2.4m high construction fencing and construction of the Burton Green north porous portal will be located in the foreground, within the direct frame of view. Therefore, the magnitude of change is considered to be high.

9.4.104 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoints 282.2.009: View north-east from Little Beanit Farm and 282.6.012: View north from Little Beanit Farm Holiday Cottages (future baseline)

9.4.105 The removal of vegetation from alongside the B4101 Waste Lane and the Kenilworth Greenway, the construction of Burton Green retaining wall and the B4101 Waste Lane overbridge will be visible in the foreground. Therefore, the magnitude of change is considered to be high.

9.4.106 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.107 At night, the visibility of lighting from the B4101 Waste Lane overbridge satellite from viewpoint 282.2.009 is not considered to be significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Cumulative effects

9.4.108 Section 2.1 and Volume 5, Appendix CT-004-000 identifies developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will from part of the baseline for the construction of the Proposed Scheme. The consequential cumulative effect of these developments on LCAs and viewpoints is described below.

The developments are shown on Volume 5: Map Book – Cross topic maps, Maps CT-13.

9.4.109 There are no committed developments which are assumed to be under construction at the same time as the Proposed Scheme and therefore, there are no consequential cumulative effects on LCAs and viewpoints.

Other mitigation measures

9.4.110 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

9.4.111 These effects will be temporary and reversible in nature lasting only for the duration of the construction works. Any residual effects will 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.

9.5 Permanent effects arising during operation

9.5.1 The specific elements of the Proposed Scheme that have been taken into account in determining the effects on landscape and visual receptors are listed as follows:

- modifications to the agricultural landform with new embankments and cutting, overhead line equipment, high speed trains, boundary fencing and noise fence barriers;
- retained cutting through Stoneleigh Business Park and at Canley Brook, with the realignment of Canley Brook;
- new built form with the River Avon, Finham Brook and Canley Brook viaducts including their approach embankments, footpath and farm access overbridges;
- new built form with the Furzen Hill and Crackley auto-transformer stations and the extension to the National Grid Berkswell substation and Burton Green auto-transformer feeder station;
- new built form with the Burton Green green tunnel porous portal structures, realigned Kenilworth Greenway and Burton Green retaining structure; and
- the realignments of the A445 Leicester Lane, B4113 Stoneleigh Road, B4115 Ashow Road, Dalehouse Lane, A429 Kenilworth Road and B4101 Waste Lane.

Avoidance and mitigation measures

9.5.2 The operational assessment of impacts and effects is based on year 1 (2026), year 15 (2041) and year 60 (2086) of the Proposed Scheme. A process of iterative design and assessment has been employed to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that have been incorporated into the design of the Proposed Scheme include:

- the adoption of a green infrastructure approach in the design of the landscape environment around the Proposed Scheme to ensure the creation of a well-connected landscape that helps to alleviate flooding and benefits biodiversity and recreation;
- embankments and cuttings, both for the railway and highway realignments, that have been shaped to integrate the Proposed Scheme into the character of the surrounding landscape;
- where it is considered that a noise fence barrier will create a visual impact on neighbouring residences, a landscape bund will be provided where reasonably practicable;
- planting, including native broad-leaved woodland, shrub and hedgerows, to screen the Proposed Scheme from neighbouring residences and users of adjacent PRoW and to aid integration of the Proposed Scheme into the landscape; and
- selection of species that will reflect tree and shrub species native to the local landscape and take into account possible climate change impacts associated with the quality and availability of water and the potential increase in pests and diseases.

9.5.3 Specific design measures to aid the integration of the Proposed Scheme within the landscape include:

- retained cutting through Stoneleigh and Stoneleigh Business Park and at Burton Green to reduce the land required for the Proposed Scheme on either side of the route;
- planting of hedges on both sides of the B4113 Stoneleigh Road green overbridge to enable landscape connectivity;
- establishment of woodland edge management zones across the route, including at Broadwells Wood, Crackley Wood, Black Waste Wood and adjacent Hodgett's Lane to enable retention of existing vegetation where possible and a more integrated transition between the Proposed Scheme and retained vegetation; and
- substantial areas of new planting, ecological mitigation areas and advance planting adjacent to Broadwells Wood to aid integration and more readily screen the Proposed Scheme.

9.5.4 These measures have been taken account of in the assessment of the operational effects below.

Assessment of impacts and effects

9.5.5 The likely significant effects on the landscape character and viewpoints in operation will arise from new engineered landforms cutting across the existing landscape; the introduction of new viaducts with associated infrastructure; the introduction of noise fence barriers which will create a linear feature; permanent severance of land; the introduction of highway infrastructure, including road bridges, into the rural environment; the introduction of overhead line equipment; and the introduction of regular high speed trains. At a number of locations, views of the Proposed Scheme will be obscured by the rising landform, retention of intervening hedgerows and trees, and the fact that the route of the Proposed Scheme will be within a cutting. In most cases, effects will reduce over time as planting established as part of the Proposed Scheme matures.

Landscape assessment

9.5.6 This section describes the significant effects on LCAs during year 1, year 15 and year 60 of operation. Non-significant effects on LCAs are presented in Volume 5: Appendix LV-001-018 Part 4.

9.5.7 The assessment of effects in year 15 assumes proposed planting has grown by approximately 450mm a year (i.e. trees will be 7-7.5m high). The assessment of effects in year 60 assumes all planting has reached its fully mature height.

Bubbenhall Plateau Farmlands Landscape Character Area

9.5.8 The assessment of operational impacts on this LCA has included consideration of scheme operation within the areas of Offchurch and Cubbington (CFA17) and Stoneleigh, Kenilworth and Burton Green (CFA18). Within this LCA, the Proposed Scheme will be mainly in retained cutting through South Cubbington Wood and across the fields, passing beneath the D2212 Coventry Road overbridge before continuing on into this area in retained cutting. The reduction in tranquillity due to Proposed Scheme, partial loss of key vegetation and change to the landform will result in a medium magnitude of change in year 1 of operation.

9.5.9 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation.

9.5.10 By year 15 of operation, the new planting adjacent the B4453 Rugby Road and D2213 Coventry Road and as part of the hedgerow reinstatement will have established. This will aid in partially reducing the massing and scale of the overbridges and reflecting the character of the roadside vegetation. However, the presence of the Proposed Scheme within a mainly agricultural landscape and partial loss of ancient woodland will remain at variance with the existing character. Therefore the magnitude of change will remain at medium in year 15.

9.5.11 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 15 of operation.

9.5.12 By year 60 of operation, the new planting adjacent the B4453 Rugby Road and D2213 Coventry Road and within the fields will have matured. This will reflect the existing landscape character. However, the presence of the high speed train will remain at

variance with the agricultural land use. Therefore, the magnitude of change will remain at medium in year 60 and the effect unchanged.

Stoneleigh Parklands Landscape Character Area

9.5.13 The Proposed Scheme will cross a large extent of this LCA from the A445 Leicester Lane to Black Waste Wood at Burton Green. The route will vary between cutting and retained cutting (Stoneleigh Business Park) and on embankment. Viaducts with noise fence barriers and overbridges will be new structures that cross watercourses or existing transport routes. Landscape effects of the Proposed Scheme will include:

- the introduction of major infrastructure across a predominantly agricultural landscape and which will be prominent across the LCA, although largely characteristic of the existing road and rail infrastructure;
- the introduction of major infrastructure through the Stoneleigh Business Park which will result in a minor alteration to the character and layout of the site;
- extensive cutting between the A46 Kenilworth Bypass and Dalehouse Lane which will be at variance to the existing undulating landform;
- the realignment to the Canley Brook which will result in prominent changes to the landform;
- the introduction of new built form between Kenilworth and Coventry at Gibbet Hill, with the Crackley auto-transformer station and access road. In conjunction with Canley Brook retaining wall, the built form will be at variance with the existing open fields and the sense of separation between Kenilworth and Coventry;
- a new embankment up to approximately 8m in height, crossing Broadwells Wood, which due to its scale and mass will be at variance to the gently undulating fields, although largely characteristic of the embankments of the Kenilworth Greenway;
- a reduction in the extent of ancient woodlands within the LCA, which is a partial loss to this key woodland character;
- realignments of roads which will entirely reflect the existing road character; and
- new built form with the Burton Green green porous portal structure within Black Waste Wood.

9.5.14 There will be a reduction in tranquillity of the character area due to the introduction of high speed trains within a predominantly agricultural area.

9.5.15 Therefore, due to the partial variance to the landform, loss of key characteristic woodland and sense of separation between Kenilworth and Coventry, the magnitude of change is considered to be medium in year 1 of operation.

9.5.16 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation.

9.5.17 By year 15 of operation, planting will have established to aid in integrating the road realignments, new overbridges and reducing the mass and scale of the viaduct approach embankments. These elements will reflect the existing character of roadside vegetation within the LCA.

9.5.18 However, due to the continued influence of the high speed trains, the presence of the viaducts with noise fence barriers, loss to ancient woodland, overhead line equipment, and a reduced sense of separation between Kenilworth and Coventry at Gibbet Hill, the magnitude of change will remain as medium in years 15 and 60 of operation and the effect will be unchanged.

Coventry Rural Fringe Landscape Character Area

9.5.19 The Proposed Scheme will cross the LCA from the west of Cromwell Lane, Burton Green to the B4101 Waste Lane, being in green tunnel and retained cutting. Landscape effects of the Proposed Scheme will include:

- realignment of the Kenilworth Greenway, with partial loss of key vegetation and variance to the generally flat landform;
- Burton Green green tunnel porous portal, which will introduce additional built form into the rural landscape;
- an extension to the National Grid Berskwell substation and a new Burton Green auto-transformer feeder station, considered to be largely reflect the existing infrastructure character of the National Grid Berskwell substation;
- a new overbridge on the B4101 Waste Lane, in the context of the existing road; and
- introduction of high speed trains, overhead line equipment and boundary fencing; which will be prominent elements at variance with the agricultural character of the area.

9.5.20 There will be a reduction in tranquillity of the character area due to the introduction of high speed trains within an agricultural area.

9.5.21 Therefore, due to the partial loss of key vegetation, new built form within the agricultural area and variance to this land with high speed trains, the magnitude of change is considered to be medium.

9.5.22 The medium magnitude of change, assessed alongside the high sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation.

9.5.23 By year 15 of operation, planting will have established and will aid in integrating some components of the Proposed Scheme within the landscape. This will include reducing the scale and linearity of the retained cutting and reflecting the existing character of the B4101 Waste Lane overbridge and Kenilworth Greenway.

9.5.24 However, due to the continued influence of the high speed trains, the overhead line equipment and the reduction in tranquillity of the area, the magnitude of change will remain as medium in years 15 and 60 of operation and the effect will be unchanged.

Balsall Common Rural Landscape Character Area

9.5.25 The assessment of operational impacts on this LCA has included consideration of scheme operation within both Stoneleigh, Kenilworth and Burton Green area (CFA18) and Balsall Common and Hampton-in-Arden area (CFA23). Within the Stoneleigh, Kenilworth and Burton Green area, the Proposed Scheme will pass through the fields either side of the B4101 Waste Lane. Landscape effects of the Proposed Scheme on this LCA within this area will include:

- the introduction of high speed trains within retained cutting, overhead line equipment and boundary fencing; which will be largely inconspicuous; and
- the realignment of the B4101, which is considered to reflect the existing road character.

9.5.26 Within the Balsall Common and Hampton-in-Arden area (CFA23), the Proposed Scheme crosses largely on embankment and will result in substantial changes in the character of the area and a reduction in the tranquillity. Therefore the magnitude of change is considered to be high in year 1 of operation.

9.5.27 The high magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation.

9.5.28 By year 15 of operation, planting will have established sufficiently to achieve greater landscape integration of the Proposed Scheme into the rural landscape by reducing the influence of engineered landforms and partially screening overhead line equipment and trains on embankment.

9.5.29 However, due to the continued influence of new structures and the changes to the tranquillity of the area, the magnitude of change will remain medium in year 15 of operation and the effects will remain the same.

9.5.30 By year 60 of operation, the maturity of planting will further integrate the Proposed Scheme into the landscape resulting in effects becoming non-significant. These are reported in Volume 5: Appendix LV-001-018 and Volume 5: Appendix LV-001-024.

Visual assessment

9.5.31 This section describes the significant effects on visual receptors during year 1, year 15 and year 60 of operation. Non-significant effects on visual receptors are presented in Volume 5: Appendix LV-001-018 Part 4.

9.5.32 For each viewpoint the following assessments have been undertaken:

- effects during winter of year 1 of operation;
- effects during summer of year 1 of operation;
- effects during summer of year 15 of operation; and
- effects during summer of year 60 of operation.

9.5.33 Where significant effects have been identified, an assessment of effects at night-time arising from additional lighting has also been undertaken.

9.5.34 The number identifies the viewpoint locations which are shown in Volume 5: Map Books – Landscape and visual assessment, Maps LV-08-072b to LV-08-077. In each case, the middle number (xxx.X.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational 4: Transport and 6: Employment.

9.5.35 Where a viewpoint may represent multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity may be lower than those reported.

9.5.36 The view of the Proposed Scheme from viewpoint 266.3.003 (illustrated in the photomontage shown in Figure LV-01-117 (Volume 2 CFA18 Map Book)) will not be significantly affected due to the fact the intervening vegetation along the River Avon will largely screen the Proposed Scheme.

9.5.37 The view of the Proposed Scheme from viewpoint 273.3.004 (illustrated in the photomontage shown in Figure LV-01-119 (Volume 2 CFA18 Map Book)) will not be significantly affected due to the rising landform in the foreground of the view screening the majority of the Proposed Scheme.

9.5.38 The view of the Proposed Scheme from viewpoint 274.4.002 (illustrated in the photomontage shown in Figure LV-01-120 (Volume 2 CFA18 Map Book)) will not be significantly affected due to the fact the Proposed Scheme will largely reflect the character of existing views.

9.5.39 The view of the Proposed Scheme from viewpoint 280.2.002 (illustrated in the photomontage shown in Figure LV-01-122 (Volume 2 CFA18 Map Book)) will not be significantly affected due to the fact it will largely reflect the existing landscape character and the oblique angle of view.

Viewpoint 261.2.001: View north-east from A445 Leicester Lane Cottages

9.5.40 The realignment of the A445 Leicester Lane onto embankment with the fields and new planting on the embankment slopes will be visible in foreground. This embankment will also be visible in the middle ground, rising to approximately 9m above existing ground level at the A445 Leicester Lane overbridge. Although set within the context of exiting views of vehicles, the increased elevation of these within the field of view will result in a noticeable deterioration in the view. Additionally, the embankment will foreshorten views across the fields due to its height. Therefore, the magnitude of change is considered to be medium.

9.5.41 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.42 In summer of year 1 of operation (and in years 15 and 60), the garden vegetation will largely filter views of the Proposed Scheme. This will reduce the effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 262.2.004: View east and west from Furzen Hill Cottages adjacent to the A445 Leicester Lane

9.5.43 To the east, the realigned A445 Leicester Lane, situated on embankment, will be visible in the foreground, along with the reprofiled landform. Compared to existing views of fields, this infrastructure will result in a marked deterioration to the view.

To the west, the existing A445 Leicester Lane will remain visible in the foreground of the view. Above the roadside vegetation, and viewed obliquely, the upper sections of the Furzen Hill auto-transformer station and the overhead line equipment connecting to that above the track, will be visible in the middle ground. This will introduce new infrastructure within the view and be at variance with existing views of fields and woodlands. Due to the additional of new infrastructure within the view and in close proximity to the receptor, the magnitude of change is high.

9.5.44 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.45 In summer of year 1 of operation, views to the east of the realigned A445 Leicester Lane will be partially filtered by garden vegetation and as views to the west are at an oblique angle, the magnitude of change is considered to be medium.

9.5.46 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the summer of year 1 of operation.

9.5.47 By year 15 and beyond to year 60 of operation, proposed planting along the embankment and existing A445 Leicester Lane will have established and matured, largely filtering views of the Proposed Scheme. This will reduce the effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 263.2.003: View north-east from Stone House Farm

9.5.48 The reprofiled landform, reduction in woodland, and new planting and boundary fencing will be visible in the middle ground. The reduction in woodland is a partial loss to a key character of the view. The reprofiled landform will contrast with existing views of generally flat terrain. The new planting and boundary fencing will contrast with existing views of open fields. The view will be partially filtered by existing garden vegetation and therefore, the magnitude of change is considered to be medium.

9.5.49 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.50 In summer of year 1 of operation (and beyond to years 15 and 60), the garden vegetation will largely filter views of the Proposed Scheme. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 264.3.003: View south-west from the track (green lane) between Stareton and the A445 Leicester Lane

9.5.51 The new planting within the fields will be visible in the foreground of the view. The reduction in woodland and the new planting and boundary fencing crossing the fields, adjacent to the top of the cutting, will be visible in the middle ground. Additionally, the view will include the reprofiled landform, forming the false cutting. The reduction of woodland and change from views of open fields and generally flat terrain will be a partial alteration to the key characteristics of the view. Therefore, the magnitude of change is considered to be medium.

9.5.52 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.53 In summer of year 1 of operation, the view is considered to remain as for winter due to the open character of the view. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged, at moderate adverse.

9.5.54 By year 15 and beyond to year 60, the proposed planting adjacent the top of the cutting and within the fields will have established and largely replicate the character of existing views of fields bordered by vegetation. This will reduce the effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoints 266.6.007: View south-west from Stoneleigh Business Park and 267.6.007: View north-east from Stoneleigh Park (both future baseline)

9.5.55 As set out in Section 9.3, the development/redevelopment of Stoneleigh Park is assumed to be completed and occupied in advance of the operational activity.

9.5.56 The raised earthworks and new planting, the upper sections of overhead line equipment and the Stoneleigh Park accommodation bridge will be visible in the foreground. These elements will be continuously highly visible and at variance with views of the mature vegetation bordering the business park. Therefore, the magnitude of change is considered to be high.

9.5.57 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in moderate adverse effect in the winter of year 1 of operation.

9.5.58 In summer, the views will remains as for winter due to the lack of intervening elements. Therefore the magnitude is considered to remain as high and the overall effect will remain unchanged.

9.5.59 By year 15 (and beyond to year 60) the planting along the raised earthworks will have established, largely filter views of the overhead line equipment. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 267.2.006: View north-east from East Lodge and residential properties on Eastgate within Stoneleigh Park

9.5.60 The raised earthworks and upper sections of the overhead line equipment will be visible in the middle ground of the view, although partially filtered by intervening vegetation along Avenue M (internal road network). Therefore the magnitude of change is considered to be medium.

9.5.61 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.62 In the summer of year 1 of operation (and beyond to years 15 and 60), the foreground vegetation is likely to further screen views of the Proposed Scheme. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 268.3.005: View south-west from PRoW (Footpath) W158

9.5.63 The parapet of the River Avon viaduct, with trains and overhead line equipment above this, will be visible in the middle ground. However, this change will only affect a small

part of the view, which will remain as a wooded ridge line. Therefore, the magnitude of change is considered to be medium.

9.5.64 The view of the Proposed Scheme from this location during operation is illustrated on the photomontage shown in Figure LV-01-118 (Volume 2, CFA18 Map Book).

9.5.65 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.66 In summer of year 1 of operation, the open views of the viaduct, trains and overhead line equipment will remain. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.67 By year 15 the new planting adjacent the River Avon viaduct and on the approach embankments will have established. However, this will not be of a sufficient height to filter views of the viaduct, trains and overhead line equipment. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.68 By year 60, the planting will have matured to largely filter views of the viaduct, trains and overhead line equipment, with the exception of a small extent of the field of view, where the viaduct crosses the River Avon. This will reduce the effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 269.3.001: View north-east from PRoW (Footpath) K29 (Coventry Way/Centenary Way)

9.5.69 The Footpath K29 overbridge, the width of the cutting and the new planting within the fields adjacent the top of the cutting will be visible in the foreground and the middle ground. This is a major alteration to views of open fields and gently undulating landform. Therefore the magnitude of change is considered to be high.

9.5.70 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.71 In the summer of year 1 of operation, the open character of the view from the receptor will remain. Therefore, the magnitude of change will be medium, meaning the overall effect will remain unchanged at major adverse.

9.5.72 By year 15 of operation, the proposed planting along the top of the cutting will have established and partially filter views of the width of cutting and the Footpath K29 overbridge. As the change from views of gently undulating open fields will remain noticeable, the magnitude of change is considered to be medium.

9.5.73 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the summer of year 15 of operation.

9.5.74 By year 60 of operation, planting will have matured to largely filter views of the width of cutting and the Footpath K29 overbridge. This will reduce the effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 269.3.005: View north-east from Kenilworth Golf Course (future baseline)

9.5.75 As set out in Section 9.3, this development is assumed to be completed and occupied in advance of year 1 of operation of the Proposed Scheme.

9.5.76 The new planting within the fields, the boundary fencing alongside the top of the cutting and the width of the cutting will be visible in the foreground and the middle ground. This is a substantial change from the views of undulating landform and open fields, although the views will be partially filtered by vegetation bordering the golf course. Therefore, the magnitude of change is considered to be medium.

9.5.77 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.78 In the summer of year 1 of operation (and in years 15 and 60), the view is considered to be largely filtered by the golf course vegetation. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 270.2.003: View west from Kingswood Farmhouse

9.5.79 The removal of New Kingswood Farm, the Footpath K29 overbridge, the width of the cutting and the new planting within the fields adjacent the top of the cutting will be visible in the middle ground. This will be a noticeable alteration to key elements within the view, although partially filtered by vegetation in the foreground. Therefore the magnitude of change is considered to be medium.

9.5.80 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.81 In the summer of year 1 of operation (and beyond to years 15 and 60), the view is considered to be largely filtered by the vegetation in the foreground. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 270.2.005: View south-west from Four Winds

9.5.82 The ecological mitigation area, new boundary fencing and realigned Dalehouse Lane will be visible in the middle ground. The view will be partially filtered by garden vegetation in the foreground and while these are new elements they are considered to be largely characteristic of existing views of Dalehouse Lane and agricultural land use. Therefore, the magnitude of change is considered to be medium.

9.5.83 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.84 In the summer of year 1 of operation (and beyond to years 15 and 60), the foreground vegetation is likely to further screen views. This will reduce the effect to being non-significant. This is reported in Appendix LV-001-018 Part 4.

Viewpoint 271.2.001: View east from Dale House Farm

9.5.85 The new planting, Finham Brook viaduct, 4m noise fence barriers and the upper sections of the overhead line equipment will be visible in the foreground. These elements are considered to represent a substantial change compared to existing views

of fields and in close proximity to the receptor. Therefore, the magnitude of change is considered to be high.

9.5.86 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.87 In the summer of year 1 of operation, the view is considered to remain as per winter due to the close proximity of the Proposed Scheme within the direct frame of view. Therefore, the magnitude of change is considered to remain high, meaning the overall effect will remain unchanged at major adverse.

9.5.88 By year 15 and beyond to year 60 of operation, the new planting will have established and matured to largely filter views of Finham Brook viaduct. However, the planting will also foreshorten existing views across the fields. Therefore the magnitude of change will remain high, meaning the overall effect will remain unchanged at major adverse.

Viewpoint 271.2.002: View north from Millburn Grange Farm

9.5.89 The Millburn Grange Farm accommodation overbridge and approach embankments, the new planting and the Coventry to Leamington Spa Line overbridge will be visible in the foreground. While new elements within the view, they are considered to be in the context of existing views of the Coventry to Leamington Spa Line and will be partially filtered by intervening buildings. Therefore the magnitude of change is considered to be medium.

9.5.90 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.91 In the summer of year 1 of operation, views will remain as per winter due to the proximity of the Proposed Scheme and scale of the embankments and overbridges. Therefore, the magnitude of change will remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.92 By year 15 and beyond to year 60 of operation, the new planting in the foreground will have established and matured to largely filter the overbridges and embankments. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 271.2.003: View north-east from residential properties along Highland Road

9.5.93 The raised earthworks and new planting will be visible in the middle ground, cutting across the gently undulating open fields and will be a partial alteration to this characteristic landform. The views will be partially filtered by intervening vegetation within the fields and along the Finham Brook. Therefore, the magnitude of change will be medium.

9.5.94 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.95 In the summer of year 1 of operation (and beyond to years 15 and 60), the intervening vegetation will largely filter views of the Proposed Scheme. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 273.2.001: View north from residential properties in Crackley Crescent

9.5.96 The realignment of Canley Brook and within a small extent of the view, overhead line equipment, trains and the noise fence barriers on the Canley Brook viaduct will be visible in the middle ground. These views will be partially filtered by intervening vegetation within the adjacent fields. Therefore, the magnitude of change is considered to be medium.

9.5.97 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.98 In the summer of year 1 of operation (and beyond to years 15 and 60), the intervening vegetation is likely to further screen views. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 273.3.002: View north from PRoW (bridleway) W164

9.5.99 The regraded landform for the realignment of the Canley Brook will be visible in the foreground of the view. This will include the loss of hedgerows from within the fields. The Canley Brook viaduct, with noise fence barriers, the upper sections of overhead line equipment and approach embankments will be visible in the middle ground. The viaduct will be highly visible within the view and a major alteration to existing views of fields, which are open in character and without any built form or infrastructure. Therefore, the magnitude of change is considered to be high.

9.5.100 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.101 In the summer of year 1 of operation, views will remain as per winter due to the proximity of the Proposed Scheme and open views of the Canley Brook viaduct. Therefore, the magnitude of change is will remain high, meaning the overall effect will remain unchanged.

9.5.102 By year 15 proposed planting will have established to reduce the mass of the embankments, replicating the existing field vegetation and integrating the realigned Canley Brook within the landscape. However, the open views of the Canley viaduct, noise fence barriers and overhead line equipment will retain a noticeable deterioration in the view. Therefore the magnitude of change is medium.

9.5.103 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the summer of year 15 of operation.

9.5.104 By year 60, the planting will have matured to reduce the extent of the viaduct within the field of view. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 273.3.008: View north from the Coventry Way overbridge

9.5.105 The realigned A429 Kenilworth Road with the regraded landform crossing the undulating fields will be visible in the middle ground and background of the view. This will include the loss of hedgerows from the fields. These elements will be continuously highly visible due to the elevated location of the viewpoint, although views of the

A429 Kenilworth Road will be largely characteristic of existing views. The new earthworks and the loss of vegetation are a partial alteration to the key characteristic elements of undulating landform and hedgerows within the view. Therefore, the magnitude of change is considered to be medium.

9.5.106 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.107 In the summer of year 1 of operation, the view will remain as for the winter due to the elevated location of the viewpoint. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.108 By year 15, and beyond to year 60, the planting adjacent to the cutting will have established and matured replicating the existing vegetated character within the fields and reduce the scale of the earthworks. This will reduce the effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 274.4.005: View south-west from Cryfield Grange Road

9.5.109 The loss of vegetation from within the fields, the regraded landform adjacent to the Canley Brook retaining wall and the upper sections of the overhead line equipment between Crackley auto-transformer station and the track will be visible in the middle ground. These elements will be characteristic of existing views of fields with built form within them. The views will be set against the background views of Kenilworth and vehicles on the realigned A429 Kenilworth Road. Therefore the magnitude of change is medium.

9.5.110 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.111 In the summer of year 1 of operation, the view will remain as per the winter due to the elevated location of the receptor and open character of the foreground. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.112 By year 15 and beyond to year 60, planting will have established and replicate existing views of vegetation and integrate the earthworks. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoints 274.2.007: View south-west from residential properties along the A429 Kenilworth Road and 274.2.008: View south-west from residences along Cryfield Grange Road

9.5.113 The loss of vegetation from within the fields, reprofiled landform and new built form of the Crackley auto-transformer station will be visible in the middle ground although partially filtered by intervening vegetation. Therefore the magnitude of change will be medium.

9.5.114 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.115 In the summer of years 1, 15 and 60 of operation, the garden vegetation will largely screen views. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoints 275.2.001: View north-east from Birches Wood Farm and 276.3.001: View east from PRoW (bridleway) W165x

9.5.116 The boundary fencing, loss of ancient woodland from Crackley Wood and new planting within the fields will be visible in the middle ground. The partial loss of woodland will alter a key characteristic of the view. Therefore the magnitude of change is medium.

9.5.117 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.118 In the summer of year 1 of operation, the view will remain as for the winter due to the open character of the fields in the foreground of the view. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.119 By year 15 and beyond to year 60,the new planting will have established to largely filter views of the boundary fence line and reflect the character of existing views of vegetation. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 277.2.001: View north-west from residential properties in Rye Meadow

9.5.120 The boundary fencing and the raised earthworks will be visible in the middle ground, crossing the fields across a wide extent of the field of view. Additionally, the upper sections of the overhead line equipment and train will be visible. These elements will be partially filtered by garden vegetation in the foreground. Therefore the magnitude of change is medium.

9.5.121 The view of the Proposed Scheme from this location during operation is illustrated on the photomontage shown in Figure LV-01-121 (Volume 2, CFA18 Map Book).

9.5.122 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.123 In the summer of year 1 of operation, vegetation in the foreground is likely to further filter views of the earthworks; however views of the overhead line equipment will remain. Therefore, the magnitude of change is considered to remain medium, meaning the overall effect will remain unchanged at moderate adverse.

9.5.124 By year 15 and beyond to year 60, the new planting along the top of the false cutting will have established to largely filter views of the Proposed Scheme. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4. The view of the Proposed Scheme from this location during year 15 of operation is illustrated on the photomontage shown in Figure LV-01-247 (Volume 2: CFA18 Map Book).

Viewpoints 277.3.006: View north-east from the Kenilworth Greenway (part of the Coventry Way) and 277.3.007: View north-east from PRoW (Footpath) W168

9.5.125 The new planting within the fields adjacent the PRoW and on the regraded earthworks will be visible in the foreground of the view. The scale of the earthworks, to approximately 8m above existing ground level, will be a major alteration to the character of gently undulating landform and screen middle ground and background views. Therefore the magnitude of change is high.

9.5.126 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects in the winter of year 1 of operation.

9.5.127 In the summer of year 1 of operation, due to the scale of the earthworks the views will remain as per winter. Therefore the magnitude of change will remain high and the overall effect unchanged at major adverse.

9.5.128 By years 15 and 60 of operation, the new planting will have established and reduce the scale of the earthworks. However the view will remain altered from open views across the fields to being foreshortened by the new planting. Therefore the magnitude of change will remain high and the overall effects unchanged at major adverse.

Viewpoint 278.2.001: View south from South Hurst Farmhouse and South Hirst

9.5.129 The new planting within the fields will be visible in the foreground of the view and largely reflect the existing character of fields and vegetation. The upper sections of overhead line equipment will be visible in middle ground, although partially filtered by intervening vegetation within the fields. Therefore, the magnitude of change is considered to be medium.

9.5.130 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.131 In the summer of year 1 of operation (and in years 15 and 60), the intervening vegetation will largely filter views of the Proposed Scheme. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 279.2.004: View north-east from residential properties along Cromwell Lane and Red Lane

9.5.132 The new alignment of the Kenilworth Greenway, loss of vegetation from Black Waste Wood and new planting will be located within the foreground and middle ground of the view. The loss of the key characteristic woodland from the view is a partial alteration, while the realigned Kenilworth Greenway is largely characteristic of the existing view. Additionally, retained vegetation adjacent the boundary of these residences will partially filter views of the Proposed Scheme. Therefore the magnitude of change is considered to be medium.

9.5.133 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.134 In the summer of year 1 of operation, the loss of vegetation from Black Waste Wood will retain the medium magnitude of change, and the overall effects will remain unchanged at moderate adverse.

9.5.135 By year 15 and beyond to year 60, planting undertaken as part of the Proposed Scheme will have established to largely reflect existing views. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 280.3.001: View south-west from PRoW (Footpath) W168

9.5.136 The realignment of the PRoW, regraded landform and the railway drainage balancing pond will be visible in the foreground of the view. The embankments of the false cutting and the boundary fencing along the top of this will be visible in the middle ground of the view and due to the scale, approximately 8m above existing ground level, will largely obscure the background of the view. The form of the embankment crossing gently undulating fields will be a major alteration to the existing gently undulating landform character and background views of a wooded ridge line. Therefore, the magnitude of change is considered to be high.

9.5.137 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.138 In the summer of year 1 of operation, the view will remain as for the winter due to the open view towards the Proposed Scheme and the scale and mass of the embankment. Therefore, the magnitude of change will remain high and the effect unchanged.

9.5.139 By years 15 and 60 of operation, the new planting will have established to largely filter views of the boundary fencing on the top of the false cutting. However, the scale and mass of the embankment will still result in a noticeable deterioration in the view. Therefore, the magnitude of change will be medium and the overall effect unchanged at major adverse.

Viewpoint 280.2.012: View south from Bockendon Grange

9.5.140 The raised earthworks forming the false cutting and boundary fencing will be visible in the background and partially filtered by the rising landform in the middle ground. The embankment will largely screen the vegetated ridgeline of the Kenilworth Greenway in the background of the view and therefore result in a noticeable deterioration. Therefore the magnitude of change is medium.

9.5.141 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in winter year 1 of operation.

9.5.142 In the summer of year 1 of operation the view will remain as per winter due to the generally open character of the fields in the foreground and middle ground of the view. Therefore the magnitude of change will remain medium and the overall effect unchanged at moderate adverse

9.5.143 By year 15 of operation and beyond to year 60, the new planting along the top of the false cutting will largely filter views of the boundary fencing and replicate existing views of a vegetated ridge line. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 282.2.001: View south-west from residential properties on Hodgett's Lane

9.5.144 The loss of vegetation along the Kenilworth Greenway which will be more visible due to the loss of the Burton Green village hall, will be a partial alteration to key elements of the view, within the context of views of vehicles on Hodgett's Lane in the foreground. Therefore, the magnitude of change is considered to be medium.

9.5.145 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.146 In the summer of year 1 of operation, the views will remain as for the winter due to the open character of the fields in the middle ground and limited screening by roadside vegetation. Therefore, the magnitude of change will remain medium and the effect unchanged.

9.5.147 By year 15 and beyond to year 60, the new planting will have established to largely reflect the character of existing views of the Kenilworth Greenway. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018, Part 4.

Viewpoint 282.3.006: View south-west from PRoW (Footpath) M186

9.5.148 The new planting will be visible in the foreground of the view. The loss of hedgerows, the upper sections of overhead line equipment, the extent of cutting and the Footpath M186 overbridge will be highly visible in the middle ground. These elements introduce new built form, alterations to the terrain and loss of key characteristic vegetation. Therefore, the magnitude of change is considered to be high.

9.5.149 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.150 In the summer of year 1, the view will remain as for the winter due to the open views and proximity of the viewpoint. Therefore, the magnitude of change will remain high and the effect unchanged.

9.5.151 By year 15 and beyond to year 60, the new planting will largely filter views of the overhead line equipment and Footpath M186 overbridge. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoint 282.2.008: View south-west from residential properties along Hodgett's Lane

9.5.152 The realigned Kenilworth Greenway and loss of vegetation will be visible in close proximity to the viewpoint, in the foreground. The loss of key characteristic vegetation will enable more open views across the Kenilworth Greenway of the adjacent fields and of Little Poors Wood. This is a major alteration to the view and therefore, the magnitude of change is considered to be high.

9.5.153 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.154 In the summer of year 1, the view is considered to remain as for the winter due to the proximity of the Proposed Scheme. Therefore, the magnitude of change will remain high and the effect unchanged.

9.5.155 By year 15 of operation and beyond to year 60, the new planting will have established on the embankments of the Kenilworth Greenway and largely replicate the existing views. This will reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Viewpoints 282.2.009: View north-east from Little Beanit Farm and 282.6.012: View north from Little Beanit Farm Holiday Cottages

9.5.156 The Little Beanit Farm studio lets development is assumed to be built and occupied in advance of operation of the Proposed Scheme.

9.5.157 Due to the reduction in roadside vegetation, the boundary fencing and realigned B4101 Waste Lane and overbridge will be visible in the foreground. This will result in partially filtered views of traffic at a higher elevation compared to the current largely filtered views of this road. Therefore, the magnitude of change is medium.

9.5.158 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.159 In the summer, the views will remain as per winter. Therefore, the magnitude will remain high and the overall effects unchanged at moderate adverse.

9.5.160 By years 15 and beyond to year 60, new planting will have established to reflect existing views and generally screen views of vehicles. This will reduce effects below a level considered to be significant. These are reported in Volume 5: Appendix LV-001-018 Part 4.

Cumulative effects

9.5.161 Section 2.1 and Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the operation of the Proposed Scheme. The developments are shown in Volume 5, Map Book CT-13. There are no known developments which are assumed to be in operation at the same time as the Proposed Scheme, and therefore there are no consequential cumulative effects on the LCAs and viewpoints.

Other mitigation measures

9.5.162 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, which will be considered during the detail design stage. 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

9.5.163 In most cases, significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. Therefore on the basis that the proposed other mitigation measures are delivered, the following residual effects will remain at year 15 of operation:

- adverse effects on the character of the Bubbenhall Plateau Farmlands LCA due to the extent of the loss of ancient woodland from South Cubbington Wood and presence of the Proposed Scheme;
- adverse effects on the character of the Stoneleigh Parklands LCA due to the loss of ancient woodland, changes to landform and introduction of major infrastructure which reduces the separation between Kenilworth and Coventry;
- adverse effects on the character of the Coventry Rural Fringe LCA due to the presence of high speed trains within a predominantly agricultural landscape;
- adverse effects on the Balsall Common LCA due to the introduction of high speed trains, new structures, localised loss of ancient woodland and new engineered landform contrasting with a generally undulating terrain;
- adverse effects on residences at Dale House Farm (271.2.001) due to the close proximity of the Proposed Scheme, the scale and mass of viaducts, and open views of trains and overhead line equipment; and
- adverse effects on recreational users of PRoW (Footpath) W158 (268.3.005), PRoW (Footpath) K29 (269.3.001), PRoW (Bridleway) W164 (273.3.002), the Kenilworth Greenway (part of the Coventry Way) (277.3.006), PRoW (Footpath) W168 (277.3.007) and PRoW (Footpath) W168a (280.3.001).

9.5.164 In some instances the effects on views will reduce from significant to non-significant by year 60 of operation with the further maturing of proposed planting, which include:

- effects on the Balsall Common LCA;
- recreational users of PRoW (Footpath) W158 (268.3.005);
- recreational users of PRoW (Footpath) K29 (269.3.001); and
- recreational users of PRoW (Bridleway) W164 (273.3.002).

10 Socio-economics

10.1 Introduction

10.1.1 The section reports the likely significant economic and employment effects during the construction and operation of the Proposed Scheme.

10.1.2 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.

10.1.3 The beneficial and adverse socio-economic effects of the Proposed Scheme are reported at two different levels: route-wide; and CFA. Effects on levels of employment are reported at a route-wide level in Volume 3. Localised effects on businesses and observations on potential local economic effects are reported within each CFA report.

Construction

10.1.4 The proposed construction works will 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;
- effects on the amenity (e.g. air quality and construction dust, noise and vibration, construction traffic and visual impacts) which could affect business operations. Any resulting effects on employment are reported at a routewide level (Volume 3); and
- potential employment opportunities arising from construction in the local area (including in adjacent CFA).

Operation

10.1.5 The operation of the Proposed Scheme will have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

10.2 Scope, assumptions and limitations

10.2.1 The assessment scope, key assumptions and limitations for the socio-economics assessment are set out in Section 8.8 of Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

10.2.2 There have been no variations to the socio-economic assessment methodology arising from engagement with stakeholders and community organisations.

10.3 Environmental baseline

Existing baseline

Study area description

10.3.1 Section 2 of this report provides a general overview of the Stoneleigh, Kenilworth and Burton Green area, which includes data of specific relevance to socio-economics notably demographic and employment data. The following provides a brief overview in terms of employment, economic structure, labour market, and business premises availability in the area[46].

10.3.2 The Stoneleigh, Kenilworth and Burton Green area lies mostly within the area covered by WDC. The Proposed Scheme will impact on Stoneleigh Park, which is classified as a 'Major Developed Site in the Green Belt[47]'. Development will only be permitted at Stoneleigh Park where it consists of uses related to the promotion of agriculture and associated activities, equestrianism and the well-being of the countryside and its inhabitants. A masterplan has been prepared for Stoneleigh Park which proposes to improve on and expand existing activities, and redevelop the site as a rural innovation science park[48].

10.3.3 Parts of the Stoneleigh, Kenilworth and Burton Green area lie within SMBC (around Burton Green) and CCC (around Gibbet Hill, the University of Warwick Campus, Westwood Heath and Tile Hill). Due to the geographic distribution of the resources involved, WDC has been used to assess the baseline characteristics.

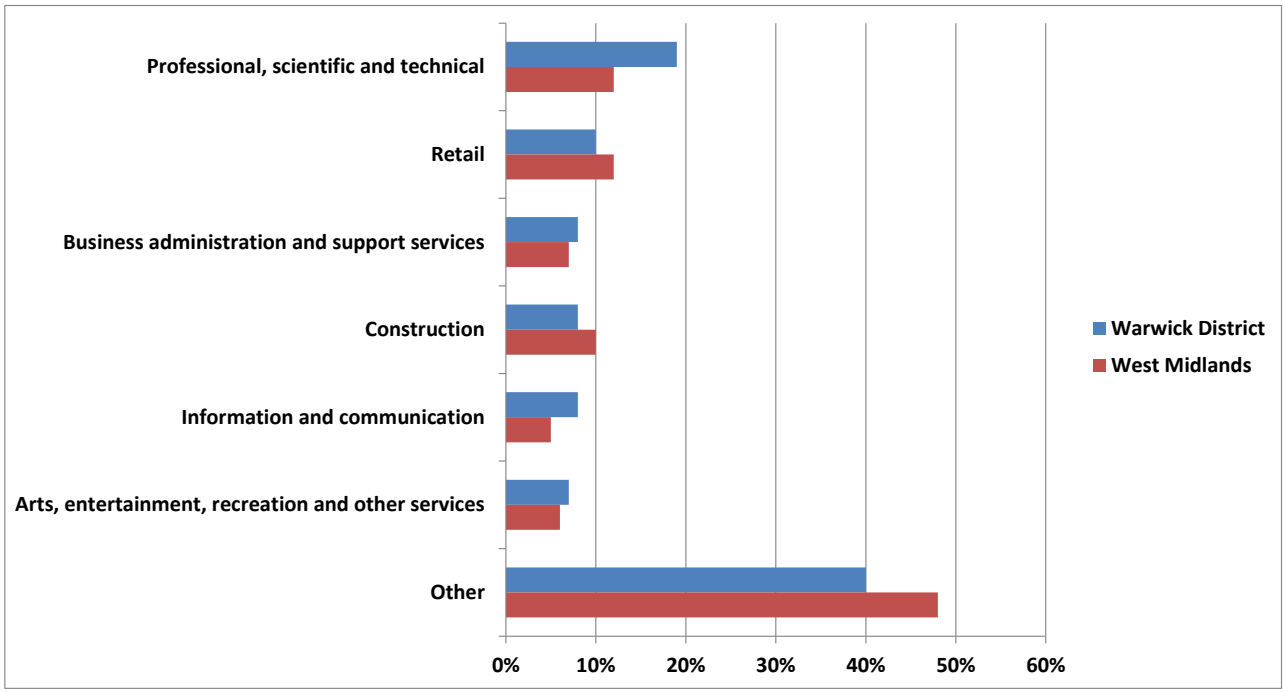
10.3.4 Where possible, baseline data has been gathered on demographic character areas (DCA)[49] to provide a profile of local communities. The area contains four DCA: Stoneleigh, Kenilworth East, Warwick University and Tile Hill (Volume 5: Appendix SE-002-103 shows the location of the DCA). Stoneleigh DCA contains Stoneleigh village, Stoneleigh Park and Coventry Airport; Kenilworth East DCA covers the east of Kenilworth, the area of Kenilworth closest to the proposed route; Tile Hill DCA covers the area around Tile Hill Station and Warwick University DCA covers the area around Warwick University and Westwood Heath.

Business and labour market

10.3.5 In terms of business activity, in 2012, WDC had a larger proportion of professional, scientific and technical services businesses (19%) than the West Midlands regional average (12%) and the English average (14%). Similarly at 8% information and communication account for a greater proportion of businesses in WDC than the wider region at 5%[50]. This is shown in Figure 6[51].

[46] Further information on the socio-economics baseline, with regard to business and labour market profile within the area is contained in Volume 5: Appendix SE-001-000.
[47] Warwick District Council (2007), *Warwick District Local Plan.* Warwick District Council, Warwick.
[48] Lasalle Investment Management (2012), *Revitalising Stoneleigh Park*. Lasalle Investment Management, London.
[49] DCA have been determined through an understanding of local context and aim to be aligned as closely as possible to groups of lower super output areas (LSOAs).
[50] Office for National Statistics (ONS) (2012), *UK Business: Activity, Size and Location 2011*, ONS, London. Please note 2011 data has been used to provide an appropriate comparison with 2011 Census data.
[51] The figure presents the proportion of businesses within each business sector in the district but not the proportion of employment by sector.

Figure 6: Business sector composition in Warwick District and the West Midlands[52]

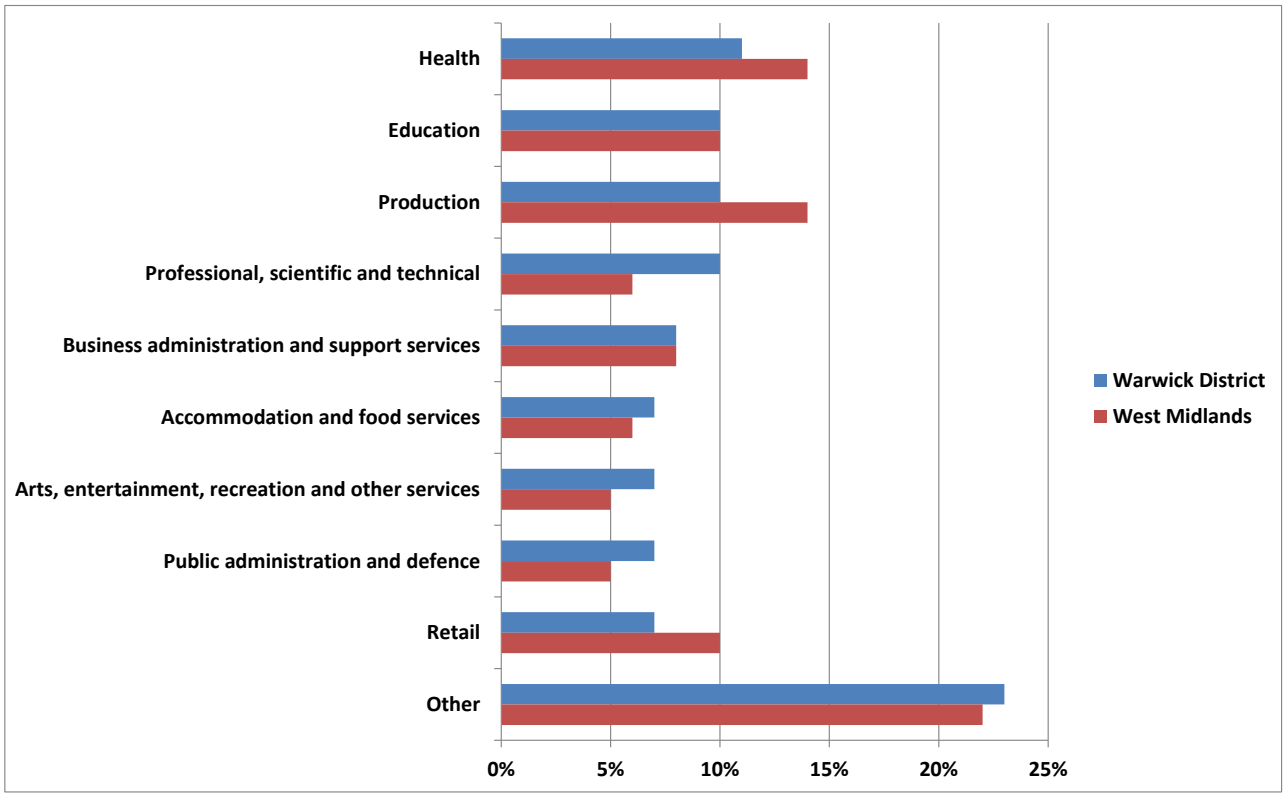


10.3.6 Approximately 81,000 people worked in WDC area while 8,200 worked within Stoneleigh DCA, 1,300 in Kenilworth East DCA, 7,300 in Warwick University DCA and 700 in Tile Hill DCA[53].

10.3.7 According to the ONS Business Register and Employment Survey 2011, the sector with the highest proportion of employment in WDC was health, though at 11% this makes up a smaller proportion of employment than the West Midlands (14%) and England average (13%). Professional, scientific and technical makes up 10% of the district employment, higher than for the West Midlands (6%) and England (8%). A further key sector for employment is education (10%) which makes up the same proportion of the labour force in the West Midlands and England (both 10%)[54]. This is shown in Figure 7. Key sectors for Stoneleigh DCA include transport (28%), arts, entertainment, recreation and other services (15%) and professional, scientific and technical (12%). For Kenilworth DCA, key sectors include production (13%) and professional, scientific and technical (12%) and for Warwick University DCA key sectors include arts, entertainment, recreation and other services (20%) and professional, scientific and technical (14%). For Tile Hill the key sectors include production (32%), business administration and support services (16%) and construction (13%).

[52] 'Other' includes agriculture, forestry and fishing; production; motor trades; wholesale; transport and storage; accommodation and food services; finance and insurance; property; public administration and defence; and education.
[53] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.
[54] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.

Figure 7: Proportion of employment by industry in Warwick District Council and the West Midlands[55]



10.3.8 According to the 2011 Census[56], the employment rate[57] within WDC in 2011 was 68% (70,000 people), which is higher than that recorded for both the West Midlands (62%) and England (65%). The employment rate varies across the Stoneleigh, Kenilworth and Burton Green area where Kenilworth East DCA and Tile Hill DCA had an employment rate of 71% and 64% respectively while Stoneleigh DCA and Warwick University DCA had lower employments rates of 38% and 37% reflecting their student population[58]. The unemployment rate in WDC was 5% which was lower than the West Midlands (9%) and England (7%). The unemployment rate in Kenilworth East DCA was 4%, Tile Hill DCA was 6%, Stoneleigh DCA was 7% and Warwick University was 10%.

10.3.9 According to the 2011 Census, 38% of WDC residents aged 16 and over were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 23% in West Midlands and 27% in England, while 16% of residents had no qualifications, a level lower than that recorded both for the West Midlands (27%) and England (22%). Qualification levels varied across the DCA. In Kenilworth East DCA 46% of residents had National NVQ4 and above compared to 36% in Stoneleigh DCA and 29% in both Warwick University DCA and Tile Hill DCA. In Warwick University DCA, 6% of residents had no qualifications compared to 12% for Kenilworth East DCA, 7% for Stoneleigh DCA and 23% for Tile Hill DCA[59].

[55] 'Other' includes agriculture, forestry and fishing; motor trades; wholesale; transport and storage; information and communication and financial and insurance.
[56] ONS (2012), *Census 2011*. ONS, London.
[57] The proportion of working age (16-74 year olds) residents who are in employment. Employment comprises the proportion of the total resident population who are 'in employment' and includes full-time students who are employed.
[58] ONS (2012), *Census 2011*. ONS, London.
[59] ONS (2012), *Census 2011*, ONS, London.

10.3.10 Stoneleigh DCA is characterised by a high concentration of employment in the transport sector, while Tile Hill DCA has a heavy focus on production[60] employment. Kenilworth East DCA and Warwick University DCA have high skills levels along with unemployment below the regional and national averages.

Property

10.3.11 A 2009 Employment Land Review[61] found that WDC had 59 hectares of land available.

10.3.12 Average vacancy rate for industrial and warehousing property in WDC in July 2013 has been assessed as 6% based on marketed space against known stock[62]. Overall, this suggests relatively good availability of alternative accommodation.

Future baseline

Construction (2017)

10.3.13 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017. Elements of the planned mixed use re-development within Stoneleigh Park (Planning Ref: W/12/0766) are located on land required by the Proposed Scheme and will be unable to proceed. This includes a visitor centre, office space, retail and an equine centre and could potentially have created approximately 600 jobs. The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast.

Operation (2026)

10.3.14 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2026. Implementation of all outstanding development consents and land allocations would result in approximately an additional 1,100 jobs[63] between 2017 and 2026. The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast.

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 In order to avoid or minimise the environmental impacts during construction, the Proposed Scheme design includes provisions to maintain access to businesses during the construction phase.

10.4.2 The draft CoCP includes a range of provisions that will help mitigate socio-economic effects associated with construction within this local area, including:

- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises; (draft CoCP Section 5);

[60] Production, as per ONS definition, is comprised of the mining, quarrying and utilities, and manufacturing sectors.
[61] Warwick District Council (2009), *Warwick District Employment Land Review*, GVA Grimley, London.
[62] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA).
[63] Potential employment has been estimated through employment floor space and the Homes and Communities Agency (HCA) *Employment Densities Guide 2nd Edition* (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas.

- reducing nuisance through sensitive layout of construction sites (draft CoCP Section 5);
- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (draft CoCP Section 13);
- contractors being required to monitor and manage flood risk and other extreme weather events which may affect socio-economic resources during resources during construction (draft CoCP, Sections 5 and 16); and
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (draft CoCP Section 14).

Assessment of impacts and effects

Temporary effects

Change in business amenity value

10.4.3 Businesses within the area may experience air quality, noise and vibration, visual or construction traffic impacts as a result of the construction of the Proposed Scheme. Taken in combination, the residual effects from these other topic assessments may amount to a significant change in amenity, which leads to a possible loss of trade for the affected businesses. Any resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3).

10.4.4 Stoneleigh Park is subject to significant noise and visual effects as a result of on-going construction works for two years and two months related to the Stoneleigh Park retaining wall. The sensitivity of this establishment is considered to be high as the Park includes a hotel and a number of outdoor uses including shows, such as the Kenilworth Show. These uses are considered to be susceptible to changes in amenity from construction works that are potentially likely to discourage use. Given the combination of other environmental effects and the high sensitivity, the Proposed Scheme is assessed as having a significant amenity effect on Stoneleigh Park.

Isolation

10.4.5 No non-agricultural businesses[64] have been identified within this area, which are expected to experience significant isolation effects as a result of the Proposed Scheme.

Construction employment

10.4.6 The main construction compounds for the Stoneleigh, Kenilworth and Burton Green area (the A46 Kenilworth Bypass overbridge compound) will be located to the east of the A46 Kenilworth Bypass and a further 19 satellite compounds to support construction activity. The use of these sites could result in the creation of up to 1,800 person years of construction employment opportunities[65], or approximately 180 full-

[64] Possible employment loss in agricultural businesses as a result of the Proposed Scheme is being estimated at the route-wide level.
[65] 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.

time equivalent jobs[66], 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 overall direct construction employment creation is described as part of the route-wide assessment (see Volume 3).

10.4.7 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 this indirect construction employment creation has been assessed as part of the route-wide assessment (see Volume 3).

Cumulative effects

10.4.8 No committed schemes have been identified that are considered to interact with the Proposed Scheme.

10.4.9 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

10.4.10 Combined effects arise where business establishments are affected by other environmental effects (from noise, vibration, air quality, visual and construction traffic) such that their ability to trade is disadvantaged thereby potentially prejudicing jobs in business establishments affected. These effects are identified in this section and assessed in the route-wide assessment (see Volume 3).

Permanent effects

Businesses

10.4.11 Businesses directly affected, i.e. those that lie within land which will be used for the construction of the Proposed Scheme, are reported in groups where possible to form defined resources, based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses/resources are clustered together.

10.4.12 In all, 16 business accommodation units within the Stoneleigh, Kenilworth and Burton Green area will be directly impacted upon by the Proposed Scheme; together these form one defined resource within Stoneleigh Park. In addition, had the implementation of the Masterplan for the current site proceeded, it may have resulted in approximately a further 600 jobs (although it is likely given the general availability of land in the area in the area, that these jobs could be accommodated elsewhere). HS2 Ltd will continue to discuss ways in which the redevelopment of the site can be realised with the presence of the Proposed Scheme over the medium to long-term. This resource will be subject to potentially significant effects on business activity and employment (see Table 20).

[66] Based on the convention that 10 employment years is equivalent to one full-time-equivalent job.

Table 20: Resources with potentially significant direct effects

Resource	Description of business activity
Stoneleigh Park	Conferences, events and food processing-related activities

Impact magnitude

10.4.13 The magnitude of impact focuses on the number of jobs which are affected (either through displacement or possible loss) by the Proposed Scheme. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

10.4.14 The following was taken into account when considering the sensitivity of resources:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effect

10.4.15 Taking account of the sensitivity of the resource and the magnitude of impact, the significance of the resultant effects is set out in Table 21.

Table 21: Effect significance of resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Stoneleigh Park	High	Low	Moderate adverse

10.4.16 Construction will require the demolition of a number of structures towards the north-east of the Park which are believed to provide employment uses. It may be possible to relocate these structures elsewhere on the Stoneleigh Park site; however, this cannot be assumed and thus there may be some loss of economic activity and employment. The effect on this resource and its employees is assessed to be a permanent moderate adverse and will, therefore, be significant.

10.4.17 It is estimated that land required for the construction of the Proposed Scheme will result in the displacement or possible loss of approximately 100 jobs[67] within this area. Taking into account the availability of alternative premises and the total employed within the district (approximately 40,000), the displacement or possible loss of jobs is considered to be modest compared to the scale of economic activity and opportunity in the area.

Cumulative effects

10.4.18 No committed schemes have been identified that are considered to interact with the Proposed Scheme.

[67] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) *Employment Densities Guide 2nd Edition* (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary from actual employment at the sites.

10.4.19 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

Other mitigation measures

10.4.20 The assessment has concluded there are significant adverse effects arising during construction. Businesses displaced by the Proposed Scheme will be fully compensated within the provisions of the National Compensation Code. HS2 Ltd recognises the importance of displaced businesses being able to relocate to new premises and will therefore provide additional support over and above statutory requirements to facilitate this process.

10.4.21 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd is committed to working with its suppliers to build a skilled workforce that fuels further economic growth across the UK.

Summary of likely residual significant effects

10.4.22 Likely significant residual effects are shown on Volume 5 Map Book – Socio-economics, Maps SE01-058 to SE01-061a.

10.4.23 The Proposed Scheme will require the demolition of a number of structures towards the north east of Stoneleigh Park, resulting in some permanent loss of economic activity and employment. During construction, customers may be discouraged from using the Stoneleigh Park as a result of construction activity.

10.5 Effects arising during operation

Avoidance and mitigation measures

10.5.1 No mitigation measures are required during operation within this area.

Assessment of impacts and effects

Resources with direct effects

10.5.2 There are no resources considered likely to experience significant direct effects during the operational phase of the Proposed Scheme within this area.

Change in business amenity

10.5.3 No non-agricultural businesses have been identified within this area, which are expected to experience significant amenity effects as a result of the Proposed Scheme.

Operational employment

10.5.4 Operational employment will be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. These are considered unlikely to be accessed by residents of this area.

10.5.5 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.

10.5.6 The impact of operational employment creation has been assessed as part of the route-wide assessment (see Volume 3).

Other mitigation measures

10.5.7 The assessment has concluded that operational effects within the area will be either negligible or beneficial and therefore mitigation is not required.

Summary of likely residual significant effects

10.5.8 There are no significant effects arising during operation.

11 Sound, noise and vibration

11.1 Introduction

11.1.1 This section reports the assessment of the likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme for the Stoneleigh, Kenilworth and Burton Green area on:

- people, primarily where they live ('residential receptors') in terms of a) individual dwellings and b) on a wider community basis, including any shared community open areas[68]; 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'[69].

11.1.2 The assessment of likely significant effects from noise and vibration on agricultural, community, cultural heritage or ecological receptors and the assessment of tranquillity are presented in Sections 3, 5, 6, 7 and 9 of this report respectively.

11.1.3 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 community areas 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.

11.1.4 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 e.g. resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

11.1.5 This section sets out the means to avoid or reduce the adverse effects that may occur.

11.1.6 The approaches to assessing sound, noise and vibration and appropriate mitigation are outlined in Volume 1 and scope and methodology are defined in the following documents:

- Scope and Methodology Report (SMR) (Appendix CT-001-000/1); and
- SMR addendum (Appendix CT-001-000/2).

[68] 'Shared community open areas' are those that the emerging 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 to local green space) that is nearby.

[69] Quiet areas are defined in the Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity (further information is provided in Volume 5: Appendix SV-001-000).

11.1.7 More detailed information and mapping regarding the sound, noise and vibration assessment for Stoneleigh, Kenilworth and Burton Green is available in the relevant appendices in Volume 5:

- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000);
- sound, noise and vibration baseline (Appendix SV-002-018);
- sound, noise and vibration construction assessment (Appendix SV-003-018);
- sound, noise and vibration operation assessment (Appendix SV-004-018); and
- Map Series SV-01, SV-02, SV-03 and SV-04 (Volume 5, Sound, noise and vibration Map book).

11.2 Environmental baseline

Existing baseline

11.2.1 Most of the principal roads through the study area, namely the A46 Kenilworth Bypass, A445 Leamington Road, B4115 and A429 Coventry Road/Kenilworth Road, run in a south-west to north-east direction, with small rural roads connecting Stoneleigh with Gibbet Hill and Coventry, and Burton Green with Kenilworth. Away from these main transportation sources the sound climate is one of local road traffic, agricultural activities, and natural sounds.

11.2.2 In the residential area of Burton Green the sound environment is dominated by local road traffic on Cromwell Road. Aircraft may also be heard passing overhead. When local traffic is subdued, natural sound sources dominate. Daytime sound levels in this area are typically 60 to 65dB[70], reducing to 50dB at night[71]. In the more agricultural areas south-east of Burton Green, distant road traffic from the A429 Kenilworth Road dominates, with the sporadic contribution from aircraft flying overhead. At properties away from main roads, daytime levels are typically 55 to 60dB and night-time levels around 50dB.

11.2.3 In Crackley, the sound environment is characterised by nearby transportation sources, namely road traffic on the A429 Coventry Road and occasional local traffic on Woodland Road, Highland Road and Inchbrook Road. The Coventry to Leamington Spa line also passes through the area running parallel to the A429 Coventry Road, between the eastern edge of Kenilworth and Coventry. In the surrounding area adjacent to the line, short-duration noise events from the passage of trains are a regular occurrence. In areas along the A429, daytime sound levels are typically 60 to 65dB, dropping by around 10dB overnight. At the eastern edges of the residential area, daytime noise levels are typically around 50dB, reducing to around 45dB at night. A similar sound environment is present in the nearby rural residential areas of Gibbet Hill and Cryfield Grange, on the south-western edge of Coventry.

11.2.4 The rural area between Stoneleigh and Coventry is traversed by the A46 Kenilworth Bypass. The sound environment is dominated by the continuous sound of road traffic

[70] Quoted dB values at residential areas refer to the 16 hour daytime (07:00 to 23:00) equivalent continuous sound pressure level, $L_{pAeq,16hr}$.
[71] Night-time sound levels refer to the 8 hour night-time (23:00 to 07:00) equivalent continuous sound pressure level, $L_{pAeq,8hr}$.

on the A46, as well as traffic on Stoneleigh Road in Stareton, and Dalehouse Lane and Crew Lane in Kenilworth during both day and night-time. Sound levels in the vicinity are typically 60 to 65dB during the daytime, reducing to 50 to 55dB at night. Away from the main roads, the sound environment is characterised by natural sounds, combined with agricultural sounds and sporadic aircraft.

11.2.5 The area between Stoneleigh and the A445 Leamington Road is predominantly agricultural. Here, natural sounds dominate, with contributions from local traffic on the B4113 Stoneleigh Road and the B4115. Within the village of Stoneleigh, typical sound levels are 50 to 55dB during the day and between 45 dB and 50dB at night-time. Near the main roads and in the proximity of Stoneleigh Park Industrial Estate, daytime sound levels are typically around 60dB, reducing to 45 to 50dB at night. In the rural, quieter areas away from major roads, the sound levels are lower during the night.

11.2.6 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for this area in Volume 5: Appendix SV-002-018.

11.2.7 It is likely that the majority of receptors adjacent to the line of route are not currently subject to appreciable vibration[72]. Vibration at all receptors from the Proposed Scheme has therefore been assessed using specific thresholds, below which receptors will not be affected by vibration. Further information is provided in Volume 1, Section 8.

Future baseline

11.2.8 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads[73], tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

Construction (2017)

11.2.9 The assessment of noise from construction activities assumes a baseline year of 2017 which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline (2012/13) and the future baseline year of 2017. The assessment of noise from construction traffic assumes a baseline year of 2021, representative of the middle of the construction period when the construction traffic flows are expected to be at their peak. Further information can be found in the Traffic and Transport assessment.

Operation (2026)

11.2.10 The assessment is based upon the predicted change in sound levels that result from the Proposed Scheme. The assessment initially considered a worst case (that would overestimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2012/2013. Where significant effects were identified on this basis, the effects have been assessed using a baseline year of 2026 to coincide

[72] Further information is available in the Volume 5: Appendix SV-001-000, the SMR and its Addendum.
[73] Tyre noise typically becomes the dominant sound source for steady road traffic at speeds above approximately 30mph.

with the proposed start of passenger services. The future baseline is for the sound environment that would exist in 2026 without the Proposed Scheme.

11.3 Effects arising during construction

Local assumptions and limitations

Local assumptions

11.3.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report.

11.3.2 Although it is anticipated that there may be some short periods of night-time working during road possession periods, it is expected that the noise effects would be limited in duration and hence are not considered to be significant. The management and control processes in the draft CoCP would reduce any adverse noise effects.

Local limitations

11.3.3 At a number of locations within this area, the land or property owners did not permit baseline sound level monitoring to be undertaken at their premises. However, sufficient information has been obtained to undertake the assessment. Further information is provided in Volume 5: Appendix SV-002-018.

Avoidance and mitigation measures

11.3.4 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) will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties;
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings[74]; and then
  - screening: for example local screening of equipment or perimeter hoarding;
- where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing will be offered in accordance with the draft CoCP's noise insulation and temporary re-housing policy;
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise, including control of working hours, and provide a further assessment of

[74] Warning signals that consist of bursts of noise.

construction noise and vibration including confirmation of noise insulation/temporary re-housing provision;

- contractors will undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data will be provided regularly to and be reviewed by the Nominated Undertaker and will be made available to the local authorities; and
- contractors will 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.

11.3.5 In addition to this mitigation, taller screening as described in the draft CoCP[75] has been assumed along the edge of the construction site boundary adjacent to the residential community areas at: Stoneleigh Park; Burton Green; along theA445 Leicester Lane (on both sides of the Proposed Scheme); along the B4113 Stoneleigh Road near Stareton (on both sides of the Proposed Scheme); along Dalehouse Lane (on both sides of the Proposed Scheme); along the A429 Kenilworth Road (on both sides of the Proposed Scheme); along B4101 Waste Lane (on both sides of the Proposed Scheme).

11.3.6 Noise insulation will be offered for qualifying buildings as defined in the draft CoCP's noise insulation and temporary re-housing policy. Noise insulation or ultimately temporary re-housing will avoid residents being significantly affected[76] by levels of construction noise inside their dwellings. The assessment reported in this section provides an estimate of the buildings that are likely to qualify for such measures.

11.3.7 Qualification for noise insulation and temporary re-housing will be identified as part of seeking prior consent from the local authorities under Section 61 of the CoPA. Qualifying buildings will be identified early enough so that noise insulation can be installed, or temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria. Noise insulation, where required, will 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

Residential receptors: direct effects – individual dwellings

11.3.8 Taking account of the avoidance and mitigation measures set out in the previous paragraphs, four residential buildings closest to the works (two along Hodgett's Lane and two at the eastern boundary of Stoneleigh Park adjacent to Stoneleigh Road) are forecast to experience noise levels higher than the noise insulation trigger levels as defined in the draft CoCP. For daytime construction the trigger level is 75dB[77] measured outdoors, or the existing ambient if this is already above this level.

[75] As described in the draft CoCP, provided as necessary by solid temporary hoarding, temporary earth stockpiles, screening close to the activities or other means to provide equivalent noise reduction.
[76] Information is provided in the emerging National Planning Practice Guidance – Noise http://planningguidance.planningportal.gov.uk e.g. the table summarising the noise exposure hierarchy including a 'significant observed adverse effect'.
[77] $L_{pAeq,0800\text{-}1800}$ measured at the facade.

11.3.9 The mitigation measures, including noise insulation, will reduce noise inside all dwellings, such that it does not reach a level where it would significantly affect [76] residents.

Residential receptors: direct effects – communities

11.3.10 The avoidance and mitigation measures in this area will avoid airborne construction noise adverse effects[76] on the majority of receptors and communities. Residual temporary noise or vibration adverse effects are identified in rest of this section.

11.3.11 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.

11.3.12 In locations with lower existing sound levels[78], construction noise effects[76] are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life. These effects are considered to be significant when assessed on a community basis taking account of the local context[79] as identified in Table 22.

11.3.13 Vibro-compaction is likely to result in appreciable ground-borne vibration at a small number of dwellings, situated closest to these activities. These receptors will also be exposed to appreciable noise from the construction of the Proposed Scheme. The significance of the identified vibration effects has been assessed in combination with the airborne noise also identified at these receptors as set out in Table 22.

Table 22: Direct adverse effects on residential communities and shared open areas that are considered to be significant on a community basis

Significant effect number (see Volume 5 Appendix SV-003-018)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed approximate duration of impact
CSV18-C01	Combined construction noise and ground-borne vibration	Day	Burton Green. Approximately 15 dwellings on both Hodgett's Lane and Cromwell Lane.	Demolition activities, utility diversions, and ground engineering works associated with the Burton Green cut and cover tunnel with typical and highest monthly noise levels of around 65dB and 75dB[80] and typical and highest monthly vibration levels of between 0.2m/$s^{1.75}$ and 0.5m/$s^{1.75}$	Up to 1 year 4 months
CSV18-C02	Construction noise	Day	Burton Green Approximately 40 dwellings on both Hodgett's Lane and Cromwell Lane.	Demolition activities, utility diversions, and ground engineering works associated with the Burton Green cut and cover tunnel with typical and highest monthly noise levels of 60-65dB and 65-75dB[80] respectively.	Up to 1 year 4 months
CSV18-C03	Construction noise	Day	Burton Green Approximately 20 dwellings on Red Lane.	Earthworks associated with the Brockenden cutting landscaping with typical and highest monthly noise levels of around 60dB and 65dB[80] respectively.	1 month

[78] Further information is provided in Volume 5: Appendix SV-001-000.
[79] Further information is provided in SV-001-000 and SV-003-018.
[80] Equivalent continuous sound level at the facade, $L_{pAeq,\ 0700\text{-}1900}$.

Residential receptors: indirect effects

11.3.14 Construction traffic is likely to cause adverse noise effects on residential receptors on Waste Lane located immediately adjacent to the road (CSV18-C04). Properties are forecast to experience an increase in outdoor noise levels of around 3dB during the peak months (further information on traffic flows is provided in Section 12 of Volume 2: Traffic and Transport).

11.3.15 These adverse effects[76] would be a change in the acoustic character of the area such that there is a perceived change in the quality of life and are considered significant when assessed on a community basis taking account of the local context[79].

Non-residential receptors: direct effects

11.3.16 Significant construction noise or vibration effects have been identified on a worst-case basis on the following non-residential receptors:

- Two Oaks Day Nursery (CSV18-N01), located on Red Lane on the eastern edge of Burton Green. Significant noise effect has been identified due to daytime construction noise from earthworks associated with the Brockenden cutting with forecast noise levels rising at times to around 65dB[81]; and
- Office space, commercial properties and an ambulance station located on the north eastern boundary of Stoneleigh Park (CSV18-N02, CSV18-N03 and CSV18-N04). Significant noise effect has been identified due to daytime construction noise rising at times to around 70dB[81] from ground engineering construction activities associated with Stoneleigh Park retaining wall.

Non-residential receptors: indirect effects

11.3.17 Significant noise effects on non-residential receptors arising from construction traffic are unlikely to occur in this area.

Cumulative effects from the Proposed Scheme and other committed development

11.3.18 This assessment has considered the potential cumulative construction noise effects of the proposed scheme and other committed developments. In this area, no development is anticipated to be built at the same time as the Proposed Scheme and accordingly, construction noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

Summary of likely residual significant effects

11.3.19 The avoidance and mitigation measures reduce noise inside all dwellings from the construction activities such that it is does not reach a level where it would significantly affect[76] residents.

[81] Equivalent continuous sound level at the facade, $L_{pAeq,\ 0700\text{-}1900}$.

11.3.20 The measures reduce any adverse effects from construction noise outdoors on the majority of residential communities such that they are not considered significant except at the residential communities along the following roads that are closest to the works:

- Hodgett's lane and Cromwell lane, Burton Green; and
- Red Lane, Burton Green.

11.3.21 On a worst-case basis, noise from specific construction activities has been identified as resulting in significant residual temporary effects on Two Oaks Day Nursery located in Burton Green, and commercial properties, office space and an ambulance station to the north east of Stoneleigh Park.

11.3.22 Construction traffic on Waste Lane is likely to cause significant noise effects on adjacent residential and non-residential receptors where it passes through the outskirts of Catchems Corner.

11.3.23 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

11.4 Effects arising during operation

Local assumptions and limitations

Local assumptions – service pattern

11.4.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based on the highest likely train flows, including the Phase Two services. Trains are expected to be 400m long during peak hours and a mix of 200m and 400m long trains at other times.

11.4.2 The expected passenger service frequency for both Phase One, and Phase One with Phase Two services, is described in Volume 1[82]. As a reasonable worst case, this assessment is based upon the service pattern for Monday to Saturday including Phase Two services. Passenger services will start at or after 05:00 from the terminal stations and in this area will progressively increase to the number of trains per hour in each direction on the main lines set out in Table 23. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by 24:00. Train speeds are shown in Table 23.

[82] The change in noise and vibration effects between the different passenger services is assessed in Volume 1.

Table 23: Train flows and speeds

Description of line	Time period for peak daytime flows	Number of trains per hour in each direction with Phase Two services (Phase One only trains per hour in each direction is set out in brackets)	Speed
Main line between London and the north	0700-2100 hours	18 (14)	330kph for timetabled trains (assumed 90% of services), and 360kph for 10% of services

Local assumptions – tunnelled sections

11.4.3 Tunnel portals are likely to include mechanical ventilation equipment. It is likely that this equipment will only operate for limited testing periods during the daytime[83], or in the event of an emergency.

Avoidance and mitigation measures

11.4.4 The development of the Proposed Scheme has, as far as reasonably practicable, kept the alignment low in the ground and away from main communities. These avoidance measures have protected many communities from likely significant noise or vibration effects.

Airborne noise

11.4.5 HS2 trains will be quieter than the relevant current European Union specifications. 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 will be specified to reduce noise, as will 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. Further information is provided in Volume 5: Appendix SV-001-000.

11.4.6 To avoid or reduce significant airborne noise effects, the Proposed Scheme incorporates noise barriers in the form of landscape earthworks, noise fence barriers and/or 'low-level' barriers on viaducts. Noise barrier locations are shown on Volume 2: Map Book – Sound, noise and vibration Map series SV-05.

11.4.7 Generally, the assessment has been based on noise barriers having a noise reduction performance equivalent to a noise fence barrier with a top level 3m above the top of the rail, which is acoustically absorbent on the railway side, and which is located 5m to the side of the outer rail. In practice, barriers may differ from this description, but will provide the same acoustic performance. For example, where noise barriers are in the form of landscape earthworks they will need to be higher above rail level to achieve similar noise attenuation to a 3m barrier because the crest of the earthwork will be further than 5m from the outer rail.

11.4.8 The Proposed Scheme incorporates 'low-level' barriers into the design of viaducts. Where needed to avoid or reduce significant airborne noise effects, these barriers are designed to provide noise reduction that is equivalent to a 2m high absorptive noise

[83] For example, HS1 vent shaft fans are tested monthly.

barrier located on the parapet of the viaduct. Locating these 'low-level' barriers close to the rail also reduces visual impact.

11.4.9 The Proposed Scheme also includes taller (4m high) noise barriers and a 3m high solid parapet on Finham Brook viaduct to further reduce adverse noise effects around Crackley.

11.4.10 Noise effects are reduced in other locations along the line 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). The location of these barriers is shown on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05.

11.4.11 The tunnel portals will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

11.4.12 Significant noise effects from the operational static sources such as mechanical ventilation at tunnel portals and line-side equipment will be avoided through their design and the specification of noise emission requirements (for further information please see Volume 5: Appendix SV-001-000).

11.4.13 Noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996[84] (the Regulations). The assessment reported in this section provides an estimate of the buildings that are likely to qualify under the Regulations. Qualification for noise insulation under the Regulations will be identified and noise insulation offered at the time that the Proposed Scheme becomes operational.

11.4.14 Where required, as well as improvements to noise insulation of windows facing the railway, ventilation will be provided so that windows can be kept closed to protect internal sound levels.

11.4.15 Following Government's emerging National Planning Practice Guidance[85], 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[86], 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[87]. 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[88], or the maximum noise level (dependent on the number of train passes) as a train passes exceeds the criterion[87], noise insulation will be offered for these additional buildings.

[84] Her Majesty's Stationery Office (1996), *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations*, London.
[85] National Planning Practice Guidance – Noise; http://planningguidance.planningportal.gov.uk.
[86] World Health Organization (2010), *Night-time Noise Guidelines for Europe*.
[87] 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).
[88] Equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings.

Ground-borne noise and vibration

11.4.16 Significant ground-borne noise or vibration effects will be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

11.4.17 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified a number of residential buildings close to the Proposed Scheme where the daytime forecast noise level does not exceed the threshold set in the Regulations but the forecast night-time noise level would exceed the WHO's Interim Target of 55dB[86], or the maximum noise level (dependent on the number of train passes) as a train passes exceeds the criterion[87]. It is estimated that these buildings will also be offered noise insulation as described previously in the Avoidance and mitigation measures section. These buildings are indicated on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05:

- Four Winds and Dale House, Dalehouse Lane, Kenilworth;
- Dale House Farmhouse, Dalehouse Lane, Kenilworth;
- South Hurst Cottage and Eskasoni, Crackley Lane, Kenilworth; and
- Little Beanit Farm, Waste Lane, Balsall Common.

11.4.18 The mitigation measures including noise insulation will reduce noise inside all dwellings such that it will not reach a level where it would significantly affect residents.

Residential receptors: direct effects – communities

11.4.19 The mitigation measures in this area will avoid airborne noise adverse effects on the majority of receptors, and at the following residential communities:

- Kenilworth (including Crackley);
- Stoneleigh (except as shown in Table 24)
- Stareton;
- Gibbet Hill; and
- Westwood Heath.

11.4.20 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2 Map book) shows the long term 40dB[89] night-time sound level contour from the operation of trains on the Proposed Scheme. The extent of the 40dB night-time sound level contour is equivalent to, or slightly larger than, the 50dB daytime contour[90]. In general, below these levels adverse effects are not expected.

[89] Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$).
[90] With the train flows described in the assumptions section of this CFA Report, the daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

11.4.21 Above 40dB during the night and 50dB during the day the effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the scheme are presented on Map Series SV-05 (Volume 2 Map Book).

11.4.22 The changes in noise levels are likely to affect the acoustic character of the area such that there is a perceived change in the quality of life and are considered to be significant when assessed on a community basis[91] taking account of the local context[92] as identified in Table 24.

Table 24: Direct adverse effects on residential communities and shared open areas that are considered significant on a community basis

Significant effect number (see Map series SV-05)	Source of significant effect	Time of day	Location and details
OSV18-C01	Airborne noise increase from new train services	Daytime/ night-time	Stoneleigh: approximately five dwellings in the vicinity of Eastgate closest to the Proposed Scheme. Forecast increases in sound from the railway are likely to cause a moderate adverse effect on the acoustic character of the area around these dwellings. There are no shared open spaces identified as being affected in this community area.
OSV18-C02	Airborne noise increase from new train services	Daytime/ night-time	Burton Green: approximately 35 dwellings in the vicinity of Cromwell Lane and Red Lane closest to the Proposed Scheme. Forecast increases in sound from the railway are likely to cause a moderate adverse effect on the acoustic character of the area around the closest properties. The effect on the acoustic character of residential areas that are located further from the railway would be minor. There are no shared open spaces identified as being affected in this community area.
OSV18-C03/OSV23-C01[93]	Airborne noise increase from new train services	Daytime/ night-time	Beechwood[93]: approximately 50 dwellings in the vicinity of Waste Lane, Old Waste Lane and Hodgett's Lane closest to the Proposed Scheme and their shared external community spaces. Forecast increases in sound from the railway are likely to cause a moderate adverse effect on the acoustic character of the area around the closest properties, reducing to a minor effect at those further from the Proposed Scheme.

Residential receptors: indirect effects

11.4.23 The assessment of operational noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

Non-residential receptors: direct effects

11.4.24 The assessment of operational noise and vibration indicates that significant effects are likely on the non-residential receptors identified in Table 25.

11.4.25 The assessment of effects on non-residential receptors has been undertaken on a reasonable worst-case basis taking account of public available information about each receptor. Further information can be found in Volume 5: Appendix SV-004-018.

[91] Further information is contained in Volume 1.
[92] Further information is provided in SV-001-000 and SV-004-018.
[93] Effects on properties in Beechwood are also described in Volume 2: CFA report number 23 as the community area described herein straddles the CFA boundary.

Table 25: Likely significant noise or vibration effects on non-residential receptors arising from operation of the Proposed Scheme

Significant effect number (see Map series SV-05)	Type of significant effect and source	Time of day	Location and details
OSV18-N01	Moderate airborne noise effect outside buildings and a risk of disturbing activities inside them due to the operation of train services.	Daytime	Commercial properties, office space and an ambulance station at Stoneleigh Park located closest to the route

Non-residential receptors: indirect effects

11.4.26 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

Summary of likely significant residual effects

11.4.27 The mitigation measures reduce noise inside all dwellings such that it does not reach a level where it would significantly affect[76] residents.

11.4.28 The mitigation measures in this area will avoid noise and vibration adverse effects[76] on the majority of receptors and communities including shared open areas. However, taking account of the avoidance and mitigation measures and the local context, the residual permanent noise effects[76] on the acoustic character of the communities at: Eastgate, Stoneleigh; Burton Green (on Red Lane and Cromwell Road); and Beechwood (on Waste Lane, Old Waste Lane and Hodgett's Lane) are considered significant.

11.4.29 On a reasonable worst-case basis a significant noise effect has been identified on the commercial properties, office space and an ambulance station at Stoneleigh Park that are located closest to the route.

11.4.30 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

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12 Traffic and transport

12.1 Introduction

12.1.1 This traffic and transport 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 Stoneleigh, Kenilworth and Burton Green area.

12.1.2 With regard to traffic and transport, the main issues are increased traffic as a result of implementation of the Proposed Scheme, road realignments and consequential temporary road closures, and temporary and permanent realignments of PRoW.

12.1.3 The effects on traffic and transport have been assessed quantitatively, based on baseline traffic conditions and future traffic projection scenarios.

12.1.4 A detailed report on traffic and transport and surveys undertaken within this area is contained in Volume 5: Appendix TR-001-000, Transport Assessment.

12.1.5 Figure 2 shows the location of the key transport infrastructure in this area.

12.1.6 Engagement has been undertaken with the key transport authorities including Warwickshire County Council (WCC), and the Highways Agency (HA).

12.2 Scope, assumptions and limitations

12.2.1 The assessment scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

12.2.2 The study area includes roads potentially affected by the scheme including the A445 Leicester Lane, Stareton Road, the B4113 Stoneleigh Road, the B4115 Ashow Road, the A46 Kenilworth Bypass, Dalehouse Lane, the A429 Kenilworth Road, Crackley Lane, Cromwell Lane and the B4101 Waste Lane.

12.2.3 A number of transport modelling tools have been used to inform the assessment including the Department for Transport's traffic forecasting tool, Trip End Model Presentation Program (TEMPRO), for forecasting road traffic growth in the area. The assessment covers the morning (08:00-09:00) and evening (17:00-18:00) peak periods for an average weekday.

12.3 Environmental baseline

Existing baseline

12.3.1 Existing conditions in the WCC area have been determined through site visits, specially commissioned transport surveys, and liaison with Warwickshire transport authorities and stakeholders to source transport models, information on public transport, and PRoW and accident data.

12.3.2 Traffic surveys of roads crossing the route or potentially affected were undertaken in June, July and November 2012, with additional surveys undertaken in May and June

2013, comprising junction turning counts and queue surveys, as well as automatic traffic counts. This was supplemented by traffic and transport data obtained from other sources, including from the Highways Agency and survey information held by the local authorities. The highway peak hours in the study area, based on the above data, were 08:00-09:00 and 17:00-18:00.

12.3.3 PRoW surveys were undertaken in August and September 2012 to establish the nature of the PRoW and their usage by pedestrians, cyclists and equestrians (non-motorised users). The surveys included PRoW and roads that will cross the route of the Proposed Scheme and additional PRoW and roads that will be affected by the Proposed Scheme. The Proposed Scheme affects 13 PRoW within the Stoneleigh, Kenilworth and Burton Green area and crosses each of these. Six of the PRoW were used by less than ten people a day. The routes with the greatest usage were Kenilworth Greenway with 552 users per day and W165x with 198 users per day. The Proposed Scheme crosses two roads with footways.

12.3.4 There is one strategic route that passes through the area. The A46 Kenilworth Bypass crosses the Proposed Scheme in a south-west/north-east direction and is accessed in the area via the A46/A452 Kenilworth Road/Leamington Road roundabout and from the B4113 Stoneleigh Road.

12.3.5 The main local roads affected by the Proposed Scheme are the A445 Leicester Lane, which crosses the proposed Scheme in a south-west/north-east direction and connects Cubbington in the south-west with Bubbenhall in the north-east; Stareton Road, which has a broadly west/east alignment and links the village of Stareton with the B4113 Stoneleigh Road in the west and Coventry Road in the east; the B4113 Stoneleigh Road, which travels in a broadly south/north direction and provides a link between Blackdown, Stareton and Coventry; the B4115 Ashow Road, which runs broadly parallel to the B4113 Stoneleigh Road, provides access to the A46 Kenilworth Bypass in the south-west and joins the B4113 Stoneleigh Road just outside Coventry; Dalehouse Lane, which travels broadly in a west/east direction and connects Kenilworth in the west with Stoneleigh Road in the east; the A429 Kenilworth Road, which has a roughly south/north alignment and connects Kenilworth with Coventry; Crackley Lane, which runs in a south/north direction connecting several farms; Cromwell Lane, which travels in a roughly south/north direction and leads into the western outskirts of Coventry; and the B4101 Waste Lane, which has a broadly west/east alignment and lies to the south of Balsall Common.

12.3.6 Safety and accident data for the road network subject to assessment has been obtained from WCC for the three year period of mid 2009 to mid 2012. This has been assessed and no significant accident clusters have been identified within the area.

12.3.7 There are 12 public bus services that pass through the Stoneleigh, Kenilworth and Burton Green area. These services provide a combined maximum service frequency of approximately 20 buses per hour between Monday and Friday. The communities served by bus services, which will be affected by the Proposed Scheme include:

- bus number, 11, 16 – Kenilworth, Leamington and Coventry;
- bus number 87 – Burton Green and Coventry;

- bus number 548 – Ashow and Stoneleigh to Leamington;
- bus number 539 – Kenilworth and Stoneleigh to Coventry; and
- bus number U1, U2, U12, U17, X15, X17, X18, University of Warwick, Leamington, Kenilworth, Sydenham, Blackdown and Coventry.

12.3.8 Local rail services are accessible via Leamington Spa station and Coventry station. Both railway stations are located slightly outside the boundary of this study area, to the south and north respectively, providing access to local services between Coventry and Leamington Spa.

12.3.9 There are no navigable waterways affected by the Proposed Scheme in this area. Consequently this topic is not considered further in this assessment.

Future baseline

12.3.10 The future baseline traffic volumes have been calculated by applying growth factors based on TEMPRO for the years of assessment 2021, 2026 and extrapolation to 2041, and taking account of any major locally consented schemes. No other changes to the traffic and transport baseline are anticipated in this area.

Construction

12.3.11 Construction activities have been assessed against 2021 baseline traffic flows, irrespective of when they occur during the construction period. Future baseline traffic volumes in the peak hours are forecast to grow by around 8% by 2021 compared to 2012.

Operation (2026)

12.3.12 Future baseline traffic volumes in the peak hours are forecast to grow by around 17% by 2026 compared to 2012.

Operation (2041)

12.3.13 Future baseline traffic volumes in the peak hours are forecast to grow by around 38% by 2041 compared to 2012.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The following measures (as described in Section 2.3) have been included as part of the engineering design of the Proposed Scheme in the Stoneleigh, Kenilworth and Burton Green area and will avoid or reduce effects on transport users:

- construction materials and equipment will be transported along haul roads adjacent to the Proposed Scheme alignment, where reasonably practicable, to reduce lorry movements on the public highway;
- the majority of roads crossing the Proposed Scheme will be kept open during construction resulting in limited diversions of traffic onto alternative routes;
- road closures will be limited to overnight and/or weekends where reasonably practicable;

- Cromwell Lane remains single lane working to accommodate Kenilworth Greenway, it will become traffic light controlled;
- the Proposed Scheme includes permanent realignments of PRoW and temporary re-routeing as necessary to limit loss of amenity;
- HGV routeing along the strategic road network and using designated routes for access as shown in map TR-03-103 (Volume 5, Map Book, Traffic and transport);
- materials will be transported by rail, where reasonably practicable, to reduce the potential numbers of HGV trips that would otherwise be made on the highway network; and
- provision of on-site accommodation and welfare facilities to reduce daily travel by site workers.

12.4.2 The draft Code of Construction Practice (CoCP) (see Volume 5: Appendix CT-003-000) includes measures which seek to reduce the impacts and effects of deliveries of construction materials and equipment, including reducing construction lorry trips during peak background traffic periods. The draft CoCP includes HGV management and control measures.

12.4.3 Where reasonably practicable, the number of private car trips to and from each site (both workforce and visitors) will be reduced by encouraging alternative modes of transport or vehicle sharing. This will be supported by an over-arching framework travel plan[94] that will require travel plans to be used along with a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme. As part of this, a construction workforce travel plan will be put into operation with the aim of reducing workforce commuting by private car, especially sole occupancy car travel. Where reasonably practicable, particularly in a rural context, this will encourage the use of sustainable modes of transport or vehicle sharing.

12.4.4 The measures in the CoCP will include controls on vehicle types, hours of site operation, and routes for heavy goods vehicles, to reduce the impact of road based construction traffic. In order to achieve this, generic and site-specific traffic management measures will be implemented during the construction of the Proposed Scheme on or adjacent to public roads, footpaths and other PRoW affected by the Proposed Scheme as necessary.

12.4.5 Specific measures will include:

- core site operating hours will be 08:00-18:00 on weekdays and 08:00-13:00 on Saturdays and site staff and workers will therefore generally arrive before the morning peak hour and depart after the evening peak hour (although the assessment has assumed that some of the work journeys to the construction sites take place within the morning and evening peak hours to reflect a

[94] Construction and operational travel plans will promote the use of sustainable transport modes as appropriate to the location and types of trip. They will include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

reasonable worst-case scenario) (draft CoCP, Section 5). Sites associated with tunnelling works (Cromwell Lane Compound) will be operational 24 hours a day, it is envisaged that the shift changeover times will not coincide with the highway peak hours; and

- excavated material will be reused where reasonably practicable along the alignment of the Proposed Scheme which will reduce the effects of construction vehicles on the public highway (draft CoCP, Section 15).

12.4.6 The need for rail possessions will be managed so that these take place for limited durations overnight and at weekends and where reasonably practicable only partial closure of the line will be required, therefore maintaining passenger services, to reduce impacts on rail travellers. Rail replacement services will be provided as necessary during rail possessions.

Assessment of impacts and effects

Temporary effects

12.4.7 The following section considers the impacts on traffic and transport and the consequential effects resulting from construction of the Proposed Scheme.

12.4.8 The temporary traffic and transport impacts within this CFA will be:

- construction vehicle movements to/from the main construction compound and satellite construction compounds;
- road realignments and associated overnight and/or weekend diversions;
- traffic management on the A46 and Cromwell Lane; and
- PRoW diversions.

12.4.9 Construction vehicle movements required to construct the Proposed Scheme include the delivery of plant and materials, movement of excavated materials and site worker trips.

12.4.10 Details of construction compounds are provided in Section 2.3, Construction of the Proposed Scheme. The duration of when there will be busy transport activity at each site is shown in Table 26. Some compounds only have traffic movements to other locations within the construction area. This represents the periods when the construction traffic flows will be greater than 50% of the peak flows. Also shown is the estimated number of daily vehicle trips during the peak month of activity, the lower end of the range shows the average number of trips in the busy period and the upper end the peak month flows. The assessment scenario has assumed the peak month for the combination of activities, i.e. not necessarily the peak activity at each individual site.

Table 26: Typical vehicle trip generation for construction site compounds in this area

Compound type	Location	Access to/from compound	Indicative start/set up date	Estimated duration of use (years)	Estimated duration with busy vehicle movements (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Satellite	A445 Leicester Lane Overbridge Compound	A445 Leicester Lane, Westhill Road, Bericote Road, A452 Leamington Road, and then onto the A46 and M40	2018	1	10	35	25-30
Satellite	Stoneleigh Park Retaining Wall Compound	B4113 Stoneleigh Road, Bericote Road, A452 Leamington Road, and then onto the A46 and M40	2020	2	24	195-215	110-130
Satellite	River Avon Viaduct Compound (south)	Track/haul route via Stoneleigh Road Overbridge Compound	-	-	-	Few external movements	
Main	A46 Kenilworth Bypass Overbridge Main Compound	B4115 Ashow Road, Stoneleigh Road, A46 to join the M40	2017	5years 6 months	23	145-190	45-55
Satellite	River Avon Viaduct Compound (north)	Track/haul route via A46 Kenilworth Bypass Overbridge Main Compound	-	-	-	Few external movements	
Satellite	Finham Brook Viaduct Compound	Dalehouse Lane, Stoneleigh Road, A46 to join the M40	2018	2	13	60	45-50
Satellite	A46 Kenilworth Bypass Overbridge Compound	Track/haul route via Finham Brook Viaduct Compound	-	-	-	Few external movements	
Satellite	Footpath K29 Overbridge Compound	Track/haul route via Finham Brook Viaduct Compound	-	-	-	Few external movements	
Satellite	Coventry-Leamington Spa Line Overbridge Compound (south-west)	A429 Kenilworth Road, Stoneleigh Road, A46 to join the M40	2018	4	14	145-170	100-110
Satellite	Coventry-Leamington Spa Line Overbridge Compound (south-east)	Track/haul route via Coventry-Leamington Rail Overbridge Compound (south-west)	-	-	-	Few external movements	

Compound type	Location	Access to/from compound	Indicative start/set up date	Estimated duration of use (years)	Estimated duration with busy vehicle movements (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Satellite	Canley Brook Viaduct Compound	Track/haul route to A429 Kenilworth Road, Stoneleigh Road, A46 to join M40	-	-	-	Few external movements	
Satellite	Crackley Lane Overbridge Compound	Track/haul route to A429 Kenilworth Road, Stoneleigh Road, A46 to join M40	2018	3	37	50-85	45-60
Satellite	Cromwell Lane Compound	Cromwell Lane, Hob Lane, Windmill Lane, Kelsey Lane, A452, A45 west to the M42	2018	3.5	36	140-165	60-75
Satellite	B4101 Waste Lane Overbridge Compound	B4101 Waste Lane, Kelsey Lane, A452, A45 west to the M42	2019	3,5	14	35	20-30
Road head	A46 Kenilworth Bypass southbound roadhead	B4115 Ashow Road, Stoneleigh Road, A46 Kenilworth Bypass southbound to join the M40 or northbound to A45 to join the M42	2019	3	36	-	365
Road head	A429 Kenilworth Road roadhead	A429 Kenilworth Road, Stoneleigh Road, A46 to join the M40 or A45 to join the M42	2020	3	35	-	350
Road head	B4101 Waste Lane east and westbound roadhead	B4101 Waste Lane, Kelsey Lane, A452, A45 west to the M42	2021	1	9	-	65

12.4.11 Details of the construction phasing are provided in Section 2.3, Construction of the Proposed Scheme. The construction assessment considers the traffic and transport impacts and effects in three peak periods of construction activity, based on the proposed phasing of the works. The peak periods have been identified as month 32 to 33 (2018 Quarter 4 to 2019 Quarter 1), month 48 to 53 (2020 Quarter 2 to 3) and 56 (2020 Quarter 4). There will be six compounds in operation in each of these periods. Where impacts are significant in any of these periods they are identified, together with the effects of other significant changes.

12.4.12 It is envisaged that the M40 motorway via the A46 and the M42 via the A45 will provide the primary HGV access and egress routes.

12.4.13 Construction of the Proposed Scheme will result in changes in traffic flows and delays to vehicle users due to increased traffic flows from workers and construction vehicles accessing compounds and also temporary road closures and diversions.

12.4.14 There will be overnight and/or weekend closures on the A445 Leicester Lane, Stareton Road, the B4113 Stoneleigh Road, the B4115 Ashow Road, the A429 Kenilworth Road, Dalehouse Lane, Crackley Lane and the B4101 Waste Lane. The effect of the off peak closures on traffic flows and delays to vehicle occupant, in terms of the diversions and traffic congestion[95], will not be significant.

12.4.15 In addition to these off peak closures, traffic management will be in place on the A46 Kenilworth Bypass and single lane working with traffic light control will be implemented on Cromwell Lane. These measures will not significantly affect traffic congestion in this area.

12.4.16 Changes in traffic flows will lead to a significant increase in delay and congestion and increased journey time for vehicle users in the following locations:

- A452 Kenilworth Road/B4101 Kelsey Lane (minor adverse effect);
- A429 Kenilworth Road/Gibbett Hill Road/Stoneleigh Road (major adverse effect);
- A452 Kenilworth Road/B4115 Coventry Road junction (major adverse effect);
- A452 Leamington Road/Bericote Road junction (minor adverse effect);
- Bericote Road/Westhill Road/B4113 Stoneleigh Road junction (major adverse effect);
- Kenilworth Road/A445 Leicester Lane junction (minor adverse effect);
- A45 Birmingham Road/A452 Kenilworth Road junction (major adverse effect);
- A46 Kenilworth By-Pass/A452 Leamington Road junction (minor adverse effect); and
- A46/Stoneleigh Road junction (major adverse effect).

12.4.17 Construction of the Proposed Scheme is forecast to result in substantial increases in daily traffic flow (i.e. more than 30% for HGV or all vehicles) causing a significant increase in traffic-related severance[96] for non-motorised users, making it more difficult to cross the roads in the following locations:

[95] In assessing significant effects of traffic changes on congestion and delays, a major adverse effect occurs where traffic flows at a junction will be beyond or very close to capacity with the Proposed Scheme and the increases in traffic due to the Proposed Scheme will be such as to substantially increase queues and delays on a routine basis at peak times. A moderate adverse effect will occur when traffic flows at a junction will be approaching or at capacity with the Proposed Scheme and modest increases in traffic will increase the frequency of queues and more substantial delays. A minor adverse effect occurs when traffic flows at a junction are not generally exceeding capacity with the Proposed Scheme but the increase in flows will result in occasional queues and delays or small increases in existing delays.

[96] In the context of this Traffic and Transport section, Severance is used to relate to a change in ease of access for non-motorised users due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for non-motorised users to cross. A reference to severance does not imply a route is closed to access.

- B4113 Stoneleigh Road, between the Stoneleigh Business Park access road in the north-east and the Bericote Road/Westhill Road junction in the south-west (minor adverse effect due to increase in HGV traffic);
- A46 Kenilworth Bypass, between the A45 in the north-east and the A452 Leamington Road in the south-west (minor adverse effect due to increase in HGV traffic);
- A429 Kenilworth Road, between the A45 in the north-east and the Farm Access Road immediately to the east of Kenilworth (major adverse effect due to increase in HGV traffic);
- B4101 Waste Lane, between Kenilworth Greenway in the east and the A452 Kenilworth Road in Basall (major adverse effect due to increase in HGV traffic);
- Cromwell Lane/Hob Lane, between Hodgett's Lane in the north and Windmill Lane in the west (minor adverse effect due to increase in HGV traffic);
- A45 Dunchurch Highway, between the A4114 in the north and Broad Lane in the south (moderate adverse effect due to increase in HGV traffic);
- A46 Kenilworth Bypass/A452 Leamington Road junction (moderate adverse effect due to increase in HGV traffic);
- A45 Dunchurch Highway/A46 Kenilworth Bypass junction (moderate adverse effect due to increase in HGV traffic);
- Dalehouse Lane/Stoneleigh Road junction (minor adverse effect due to increase in HGV traffic);
- A452 Kenilworth Road/B4115 Ashow Road junction (minor adverse effect due to increase in HGV traffic);
- Cornets End Lane/B4102 Meriden Road/A452 Kenilworth Road junction (moderate adverse effect due to increase in HGV traffic);
- B4113 Stoneleigh Road/Westhill Road/Bericote Road junction (major adverse effect due to increase in HGV traffic);
- A452 Kenilworth Road/Bericote Road junction (moderate adverse effect due to increase in HGV traffic);
- B4101 Waste Lane/Windmill Lane junction (major adverse effect due to increase in HGV traffic); and
- A452 Kenilworth Road/B4101 Waste Lane junction (major adverse effect due to increase in HGV traffic).

12.4.18 Utility works (including diversions) have been assessed where they are major works and where the traffic and transport impacts from the works separately, or in combination with other works, is greater than other construction activities arising from such works within the area. More minor utility works are expected to result in only localised traffic and pedestrian diversions that will be of short term duration. No additional significant effects are expected.

12.4.19 The effect on accident and safety risks will not be significant. There are no locations where there are existing highway safety issues and where there will be substantial increases in traffic during construction.

12.4.20 It is not expected that the construction of the Proposed Scheme will require any bus route diversions, as road closures will generally only be overnight when bus services will not be operational.

12.4.21 Civil engineering works to construct the Coventry to Kenilworth rail overbridge will necessitate temporary track possessions potentially affecting rail users passing through the Stoneleigh, Kenilworth and Burton Green area. Track possessions will be limited to a small number of weekend and 24 hour possessions. The impact of these works on rail passengers will not be significant. Rail replacement services will be provided, if necessary, when rail possessions are in place.

12.4.22 Construction of the proposed scheme is not expected to result in any temporary loss of pedestrian links to or between public transport services. There are no stations or interchanges affected by the Proposed Scheme in this area.

12.4.23 There will be a minor adverse effect on non-motorised users from severance on one PRoW (K29) as a result of a temporary diversion of 550m during construction of the Proposed Scheme resulting in an increased travel distance. The usage of this PRoW is less than 90 per day. The impacts arising from permanent PRoW realignments are reported in the Section 12.5.

12.4.24 The Proposed Scheme will have a minor adverse effect on the ambience of five PRoW. These are: W167, where the journey ambience will be adversely affected by the construction of the Proposed Scheme; W165x where users will have to cross roads utilised by construction traffic; and W171, W164 and W168 where construction vehicles will operate alongside the PRoW.

Cumulative effects

12.4.25 The assessment includes cumulative effects of planned development during construction by taking this into account within the background traffic growth.

12.4.26 The assessment also includes in-combination effects by taking into account traffic and transport impacts of works being undertaken in neighbouring CFA areas. Construction traffic flows of 245 inbound cars/LGV per day and 250 outbound and 600 HGV per day in both directions generated from CFA17 (Offchurch and Cubbington) and CFA23 (Balsall Common and Hampton in Arden) in the adjacent CFAs have been included in the assessment for this area.

Permanent effects

12.4.27 Any permanent effects of construction have been considered in the assessments of operation for traffic and transport in Section 12.5. This is because the impacts and effects of the forecast increases in travel demand and the wider impacts and effects of operation need to be considered together.

Other mitigation measures

12.4.28 The implementation of the draft CoCP (Volume 5: Appendix CT-003-000/1) in combination with the construction workforce travel plan will, to some degree,

mitigate the transport related effects during construction of the Proposed Scheme. The reductions in effects arising from the travel plan measures have not been included in the assessment, which will mean the effects may be over-stated.

12.4.29 No further traffic and transport mitigation measures during construction of the Proposed Scheme are considered necessary, based on the outcomes of this assessment.

Summary of likely residual significant effects

12.4.30 The most intensive peak periods of construction will cause increases in traffic that will affect pedestrians, cyclists and equestrians crossing and using the B4113 Stoneleigh Road, between the Stoneleigh Business Park access road in the north-east and the Bericote Road/Westhill Road junction in the south-west; A46 Kenilworth Bypass, between the A45 in the north-east and the A452 Leamington Road in the south-west; A429 Kenilworth Road, between the A45 in the north-east and the Farm Access Road immediately to the east of Kenilworth; B4101 Waste Lane, between Kenilworth Greenway in the east and the A452 Kenilworth Road in Basall; Cromwell Lane/Hob Lane, between Hodgett's Lane in the north and Windmill Lane in the west; A45 Dunchurch Highway, between the A4114 in the north and Broad Lane in the south; A46 Kenilworth Bypass/A452 Leamington Road junction; A45 Dunchurch Highway/A46 Kenilworth Bypass junction; Dalehouse Lane/Stoneleigh Road junction; A452 Kenilworth Road/B4115 Ashow Road junction; Cornets End Lane/B4102 Meriden Road/A452 Kenilworth Road junction; B4113 Stoneleigh Road/Westhill Road/Bericote Road junction; A452 Kenilworth Road/Bericote Road junction; B4101 Waste Lane/Windmill Lane junction; and A452 Kenilworth Road/B4101 Waste Lane junction.

12.4.31 Increased traffic will cause additional congestion, increasing delays for road users on the A452 Kenilworth Road/B4101 Waste Lane junction; A429 Kenilworth Road/Gibbett Hill Road/Stoneleigh Road junction; A452 Kenilworth Road/B4115 Coventry Road junction; A452 Leamington Road/Bericote Road junction; Bericote Road/Westhill Road/B4113 Stoneleigh Road; Kenilworth Road/A445 Leicester Lane junction; A45 Birmingham Road/A452 Kenilworth Road junction; and the A46 Kenilworth By-Pass/A452 Leamington Road junction.

12.4.32 One PRoW (K29) will be temporarily affected and users will be diverted during the construction period, resulting in modestly increased walking distances. Permanent PRoW diversions will also occur and are reported in Section 12.5.

12.4.33 The journey ambience of five PRoW (W167, W165x, W171, W164 and W168) will be temporary affected due to the construction of the Proposed Scheme, users.

12.4.34 The significant effects that will result from construction of the Proposed Scheme are shown in Map TR-03-103 (Volume 5, Map Book, Traffic and Transport).

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 The following measures have been included as part of the design of the Proposed Scheme and will avoid or reduce impacts on transport users:

- retaining the majority of roads crossing the Proposed Scheme in, or very close to their current location; and
- retaining PRoW crossing the Proposed Scheme, with localised realignments kept to a minimum where reasonably practicable.

Assessment of impacts and effects

12.5.2 This section considers the impacts on traffic and transport and the consequential effects resulting from operation of the Proposed Scheme (as described in Section 2.4, Operation of the Proposed Scheme).

12.5.3 The operational traffic and transport impacts within this CFA will include:

- realignment of roads;
- permanent PRoW realignments; and
- traffic accessing the areas of the Proposed Scheme for maintenance purposes.

12.5.4 In 2041, traffic flows are expected to be similar to those forecast without the Proposed Scheme. The only changes to traffic will be occasional traffic that may access areas of the Proposed Scheme for maintenance purposes. These infrequent vehicle movements are expected to be very low and will therefore have no significant effect, including no effects on travel times or on non-motorised users.

12.5.5 The effect on accident and safety risks will not be significant as there are no substantial increases in traffic due to the operation of the Proposed Scheme.

12.5.6 The Proposed Scheme will have no effect on the 12 bus services; bus route numbers 548, X15, X18, U1, U12, X17, U2, U17, 11, 16, 539 and 87; which will cross the alignment of the Proposed Scheme. There will be no significant effects on public transport within this area.

12.5.7 Thirteen PRoW will be realigned within this area. Of these, six PRoW (K29, W168, M182, M186, M184 and Kenilworth Greenway) will be realigned by less than 100m. The Proposed Scheme will have a minor adverse effect on seven PRoW (W171, W164, W165x, W167, W169, M187 and M198) with increased journey length for users. Of these, six PRoW (W171, W164, W165x, W169, M187 and M198) will be realigned by less than 500m. However, the realignment of W167 will be approximately 800m longer.

Cumulative effects

12.5.8 The assessment includes for the cumulative effects of planned development during operation by taking this into account within the background traffic growth.

12.5.9 The assessment also considers in-combination effects by taking into account traffic and transport movements from nearby areas. However, there are no impacts from other areas.

Other mitigation measures

12.5.10 No further mitigation measures for the operation of the Proposed Scheme are considered necessary based on the outcomes of this assessment.

Summary of likely significant residual effects

12.5.11 Seven PRoW (W171, W164, W165x, W167, W169, M187 and M198) will be diverted and this will increase journey times for pedestrians, cyclists and equestrians.

12.5.12 The significant effects that will result from the Proposed Scheme are shown in Map TR-04-103 (Volume 5, Map Book, Traffic and Transport)

13 Water resources and flood risk assessment

13.1 Introduction

13.1.1 This section provides a description of the current and future baseline for water resources including surface water, groundwater and the baseline conditions for flood risk. It then reports on the likely impacts and significant effects on these aspects as a result of the construction and operation of the Proposed Scheme.

13.1.2 The main environmental features of relevance to water resources and flood risk that are present across the Stoneleigh, Kenilworth and Burton Green area (CFA18) include:

- the River Avon, classified as a main river, will be crossed the Proposed Scheme, as will Finham and Canley Brook which are also main rivers;
- ordinary watercourses that will be intersected by the route including three tributaries of Canley Brook;
- the Bromsgrove Sandstone Formation, Kenilworth Sandstone Group, Ashow Formation and the Tile Hill Mudstone Formation which are classified as Principal aquifers;
- a number of Secondary aquifers;
- numerous minor springs present within the study area; and
- one public and three licensed groundwater abstractions present across the Stoneleigh, Kenilworth and Burton Green area.

13.1.3 Key environmental issues relating to water resources and flood risk include:

- the potential impact of watercourses crossings in this study area, specifically the River Avon viaduct at Sowe Mouth Plantation, Finham Brook viaduct at Dalehouse Farm and Canley Brook viaduct upstream of Crackley Bridge;
- the potential impact of culvert crossings over three tributaries of Canley Brook at Birches Wood Farm, Broadwells and Burton Green/Black Waste Wood;
- the need to divert a 1km section of the Canley Brook and regrade a 200m section of the existing channel upstream of Crackley Bridge, and two of its tributaries at Birches Wood Farm and at Burton Green/Black Waste Wood;
- the potential impact on groundwater flow to issues, springs and on groundwater dependent ecological receptors in the area; and
- potential flood risk impact caused by increased surface water runoff rates as a result of reduced infiltration capacity of the ground caused by the works, and the interruption of existing surface water runoff flow paths.

13.1.4 Volume 5: Appendix WR-001-000 contains a report on the route-wide effects including:

- generic assessments on a route-wide basis;

- stakeholder engagement;
- in-combination effects;
- a draft operation and maintenance plan for water resources and flood risk;
- Water Framework Directive (WFD)[97] compliance assessment; and
- a route-wide Flood Risk Assessment (FRA).

13.1.5 Detailed reports on water resources and flood risk within the Stoneleigh, Kenilworth and Burton Green area are also contained in the Volume 5 Appendices. These include:

- Appendix WR-002-018 Water Resources Assessment report;
- Appendix WR-003-018 Flood Risk Assessment; and
- Appendix WR-004-011: Stoneleigh, Kenilworth and Burton Green River Modelling Report.

13.1.6 Map series WR-01, WR-03, WR-05 and WR-06 showing details referred to in this report and those in Volume 5 are all contained in Volume 5: Map Book – Water resources.

13.1.7 Discussions have been held with the Environment Agency, Warwickshire County Council (WCC) as the Lead Local Flood Authority (LLFA), the Canal & River Trust (formerly British Waterways) and Warwickshire Wildlife Trust.

13.2 Scope, assumptions and limitations

13.2.1 The assessment scope, key assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and in the SMR and its addendum (Volume 5: Appendices CT-001-000/1 and CT-001-000/2), and appendices presented in Volume 5: Appendix WR-002-018. This report follows the standard assessment methodology.

13.2.2 The spatial scope of the assessment was based upon the identification of surface water and groundwater features within 1km of the centre line of the route, except where there is clearly no hydraulic connectivity. For surface water features in urban areas, the extent was reduced to 500m. Outside of these distances it is unlikely that direct impacts upon the water environment will be attributable to the Proposed Scheme. Where works extend more than 200m from the centreline, for example stations and depots, a professional judgement was made in selecting the appropriate limit to the extension in spatial scope required. For the purposes of this assessment this is defined as the study area.

13.2.3 Due to the number of ponds and other water features present within the study area, only those potentially affected by the Proposed Scheme have been detailed in the baseline in this assessment.

13.2.4 Site visits were undertaken in June 2013 with the Environment Agency and Warwickshire County Council for the following locations along the route: Canley

[97] *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*, Strasbourg, European Parliament and European Council.

Brook upstream of Crackley Bridge, Finham Brook at Dalehouse Farm and the River Avon at Sowe Mouth Plantation.

13.2.5 Water Framework Directive (WFD) classification data has been made available by the Environment Agency. For surface water bodies that do not have a WFD status class shown in the relevant River Basin Management Plan (RBMP), the status class has been taken as the status class for the first downstream water body for which a status class is reported. Where groundwater does not have a WFD status class shown in the relevant River Basin Management Plan (RBMP), these are referred to as 'not assessed by the Environment Agency' in the summary of geology and hydrogeology in Table 28.

13.2.6 Groundwater level data from the Environment Agency and other monitored locations such as private abstractions are limited in the study area. It is assumed that groundwater levels vary in a similar fashion to topography throughout the study area, with groundwater level contours roughly parallel to topographic contours. In the absence of more detailed information, it has been generally assumed that groundwater levels are within 1m of the ground surface.

13.2.7 The limitations associated with flood risk within this study area are described in detail in Volume 5: Appendix WR-003-018.

13.3 Environmental baseline

Existing baseline surface water resources

Surface water features

13.3.1 All water bodies within this study area fall within the Warwickshire Avon sub-catchment; this includes the River Avon, River Sowe, Finham Brook and Canley Brook. This sub-catchment falls within the Severn River Basin District (RBD) as set out within the RBMP[98]. A small area of land in the far northern part of the Stoneleigh, Kenilworth and Burton Green area drains to the Tame, Anker and Mease management sub-catchment that falls within the Humber RBD as set out within the RBMP[99].

13.3.2 The current surface water baseline is shown in Volume 5: Map Book – Water resources, Maps WR-01-30 and WR-01-31 and all surface water features within the study area are assessed within Volume 5, Appendix WR-002-018. Table 27 includes features potentially affected by the Proposed Scheme.

[98] Environment Agency (2009), *River Basin Management Plan, Severn River Basin District.*
[99] Environment Agency (2009), *River Basin Management Plane, Humber River Basin District.*

Table 27: Surface water features potentially affected by the Proposed Scheme

Water Feature	Location description (map reference[100])	Watercourse classification[101]	WFD water body name and number and current overall status	WFD status objective (by 2027* as per Severn River Basin Management Plan (RBMP) unless stated)	Receptor value[102]
River Avon	At Sowe Mouth Plantation (SWC-CFA18-001)	Main river	River Avon (Warks) confluence River Sowe to confluence River Leam (GB109054043840) Poor status	Good Status	High
Finham Brook	At Dalehouse Farm (SWC-CFA18-002)	Main river	Finham Brook confluence Canley Brook to confluence River Sowe (GB109054044480) Moderate status	Good Status	High
Canley Brook	Upstream of Crackley Bridge (SWC-CFA18-003)	Main river	Canley Brook source to confluence with Finham Brook (GB109054044520) Moderate Status	Good Status	High
Tributary of Canley Brook	At Birches Wood Farm (SWC-CFA-004)	Ordinary watercourse			Moderate
Pond directly on line of Proposed Scheme	South of South Hurst Farm (SWC-CFA18-005)	Not applicable	Not applicable	Not applicable	Low
Tributary of Canley Brook	At Broadwells Wood (SWC-CFA18-006)	Ordinary watercourse	Canley Brook source to confluence with Finham Brook (GB109054044520) Moderate status	Good Status	Moderate
Tributary of Canley Brook	At Burton Green/Black Waste Wood (SWC-CFA18-007)	Ordinary watercourse			Moderate
A further seventeen ponds within the study area	Located within the land required for the construction and operation of the Proposed Scheme	Not applicable	Not applicable	Not applicable	Low

Water Framework Directive status

13.3.3 There are three WFD water bodies in this area. The River Avon, Finham Brook and Canley Brook will be intersected by the Proposed Scheme and are all classified as main rivers. Tributaries of Canley Brook which are classified WFD water bodies are also intersected by the Proposed Scheme. The overall WFD status of the River Avon is

[100] Map references taken from Volume 5: Map Book water resources, Maps WR-01-030 and WR-01-031.
[101] Watercourse classifications: Section 113 of the Water Resources Act 1991 defines a main river as a watercourse that is shown as such on a main river map. Section 72 of the Land Drainage Act 1991 defines an ordinary watercourse as 'a watercourse that is not part of a main river'. Section 221 of the Water Resources Act 1991 defines a watercourse as including all rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows'. Main rivers are larger rivers and streams designated by Defra on the main river map and are regulated by the Environment Agency.
[102] For examples of receptor value see Table 43 in the addendum to the SMR.

Poor. The overall WFD status of Finham Brook and Canley Brook is Moderate. The WFD status objective for all these water bodies is Good Status by 2027.

13.3.4 The WFD status and objectives of water bodies that are not crossed by the route are shown in Volume 5: Appendix WR-002-018.

Abstractions and permitted discharges

13.3.5 There are eight licensed surface water abstractions within the study area, according to data from the Environment Agency[103].

13.3.6 Information from Warwick District Council indicates that there are no unlicensed abstractions from surface water used for potable supply in their records.

13.3.7 There is potential for other unlicensed abstractions to exist as a licence is not required for abstractions volumes below 20 cubic metres per day.

13.3.8 Envirocheck data indicate that there are 29 current permitted surface water discharges within the study area (details in Volume 5: Appendix WR-002-018).

Existing baseline groundwater resources

Geology and hydrogeology

13.3.9 The location of abstractions and geological formations are shown on Volume 5: Map WR-02-018.

13.3.10 A summary of the superficial and bedrock geology and hydrogeology is presented in Table 28. Unless otherwise stated, the geological groups listed are all crossed by the route.

[103] Surface water abstractions for public supply are not included.

Table 28: Summary of geology and hydrogeology

Geology	Distribution	Formation description	Aquifer classification	WFD water body and current overall status	WFD status objective (by 2027* as per RBMP)	Receptor value
Superficial deposits						
Alluvium	Deposits associated with River Avon, Finham Brook and Canley Brook within this study area	Clay, silt, sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River terrace deposits	Located in the south of this study area will be crossed by the route at the River Avon	Sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bagington Sand and Gravel (not crossed by route)	Deposit located to the west of the route in this study area near Kenilworth	Sand and gravel with lenses of silt and clay	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Oadby Till	Located in Burton Green in the north of this study area	Diamicton with lenses of sands, gravel, clay and silt	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Mid Pleistocene Till (not crossed by route)	Located east of the route next to Finham Brook in this study area	Diamicton, clay with flints	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Glaciofluvial deposits	Several small pockets of glaciofluvial deposits located throughout this study area	Sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Bromsgrove Sandstone Formation	Outcrops in the south of this study area	Sandstones, commonly pebbly or conglomeratic at the bases of beds, interbedded siltstones and mudstones	Principal aquifer	Warwickshire Avon PT Sandstone Warwick/Avon Confined GB40901G300700 Poor Status	Good	High

Geology	Distribution	Formation description	Aquifer classification	WFD water body and current overall status	WFD status objective (by 2027* as per RBMP)	Receptor value
Kenilworth Sandstone Group (including Gibbet Hill Conglomerate)	Outcrops in the centre of this study area and runs along the south eastern side of the Proposed Scheme. Conglomerate can be found on the eastern side of the outcrop	Sandstone with subordinate beds of mudstone. Gibbet Hill Conglomerate is also present at the base of this formation	Principal aquifer	Warwickshire Avon Coal Measures Coventry GB40902G302200 Poor Status	Good	High
Ashow Formation	Outcrops in the south east of this study area	Mudstone with subordinate beds of fine to medium grained sandstone	Principal aquifer	Warwickshire Avon Coal Measures Coventry GB40902G302200 Poor Status	Good	High
Tile Hill Mudstone Formation	Underlies the northern extent of this study area	Mudstone with rare conglomeratic lenses	Principal aquifer	Warwickshire Avon Coal Measures Coventry GB40902G302200 Poor Status	Good	High
Mercia Mudstone Group	A narrow band of dolomitic siltstone of the Mercia Mudstone Group located around Furzen Hill Farm on Coventry Road, 2km north-east of Cubbington Mudstone located along the northern and southern boundaries of this study area	Mudstone with subordinate bands of siltstone, halite and sandstones	Secondary undifferentiated and Secondary B aquifer	Warwickshire Avon PT Sandstone Warwick/Avon Confined GB40901G300700 Poor Status	Good	Moderate

* Year may vary in different RBMPs.

Superficial deposits

13.3.11 There are several superficial deposits within the study area. Alluvium is common throughout the area and is confined to the surface watercourses and their tributaries. Oadby Till is present within the north of the study area and several pockets of river terrace deposits and glaciofluvial deposits can also be found throughout the study area.

13.3.12 The groundwater vulnerability of the Secondary A aquifers is high and the Oadby Till has low vulnerability.

Bedrock aquifers

13.3.13 Bromsgrove Sandstone Formation, Kenilworth Sandstone Group, Tile Hill Mudstone Formation and Ashow Formation are predominantly composed of sandstones and mudstones and are classified as Principal aquifers.

13.3.14 Mercia Mudstone Group – Mudstone is classified as a Secondary B aquifer and Mercia Mudstone Group – Dolomitic Siltstone is classified as a Secondary undifferentiated aquifer.

Water Framework Directive status

13.3.15 No WFD classification has been given by the Environment Agency to the superficial deposits.

13.3.16 The overall WFD status of groundwater in the study area is summarised in Table 28.

13.3.17 The study area lies primarily within the Warwickshire Avon Coal Measures Coventry Groundwater Body (GB40902G302200) which is classified as At Risk and currently of overall Poor Status.

13.3.18 The southernmost part of the study area, from Furzen Hill Farm on the B4115 Ashow Road, 2km north-east of Cubbington to Stareton is within the Warwickshire Avon PT Sandstone Warwick/Avon Confined Groundwater Body (GB40901G300700). This has overall Poor Status and is classified as At Risk.

13.3.19 The reason for the poor status is given in the RBMP for the Severn River Basin District[104], which states that: 'for groundwater quality, the main reasons for Poor Status are high or rising nitrate concentrations with failures for pesticides and other chemicals. The main reason for poor quantitative status is that abstraction levels – mainly for drinking water – exceed the rate at which aquifers recharge.'

Abstractions and permitted discharges

13.3.20 The locations of licensed abstractions within the study area are shown in Volume 5: Appendix WR-002-018, Table 4. The locations are shown in Volume 5: Map WR-02-018.

13.3.21 The Environment Agency reports that there are four licensed groundwater abstractions, including one public groundwater abstraction, within the study area.

13.3.22 There are Source Protection Zones (SPZs) associated with the public abstraction in this study area. SPZ1, 2, and 3 are all present within the study area. The route will cross through a SPZ3 between Stoneleigh and Burton Green. Further details are provided in Volume 5: Appendix WR-002-018.

13.3.23 No unlicensed potable abstractions have been identified by Warwick District Council within the study area.

[104] Environment Agency (2009), *River Basin Management Plan, Severn River Basin District.*

13.3.24 There is the potential for unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20 cubic metres per day.

13.3.25 Envirocheck data indicate that there are five current permitted discharges to groundwater within the study area (further details are provided in Volume 5: Appendix WR-002-018).

Surface water/groundwater interaction

13.3.26 Surface water/groundwater interaction is widespread throughout the study area in the form of springs, issues (generally a less defined area of rising groundwater than a spring), ponds, sinks and watercourses. Locations of these features are detailed in Volume 5: Appendix WR-002-018, Table 6.

13.3.27 Ponds which may potentially be affected by the Proposed Scheme are summarised in Table 27 and listed in full in Table 6 of Volume 5: Appendix WR-002-018. These ponds are assumed to be in hydraulic connectivity with groundwater, unless further assessment suggests that the ponds are situated upon low permeability strata, or lined with an impermeable layer.

Water dependent habitats

13.3.28 There are five potentially water dependent statutory ecological designations in the study area. These are:

- Knowle Hill Local Nature Reserve (LNR);
- Kenilworth Common LNR (also a Local Wildlife Site (LWS));
- Wainbody Wood and Stivichall Common, Kenilworth Road Spinney LNR;
- Tocil Wood and Meadow LNR; and
- Crackley Wood LNR (also an ancient woodland and LWS).

13.3.29 In addition a number of potentially water dependent, non-statutory designated ecological sites exist within the Stoneleigh, Kenilworth and Burton Green study area. These are detailed in Table 7 of Volume 5: Appendix WR-002-018 and include:

- River Avon and tributaries LWS;
- Broadwells Wood ancient woodland and LWS; and
- Black Waste Wood LWS.

13.3.30 Further information on the above ecological receptors is given in Section 7.

Existing baseline flood risk

River flooding

13.3.31 The agreed data set for river flooding is the Environment Agency Flood Zone Mapping[105]. This mapping has been supplemented with the use of site-specific

[105] Environment Agency, What's in your backyard: Risk of Flooding from Rivers and Sea, http://www.environment-agency.gov.uk/homeandleisure/37837.aspx, accessed: 24 September 2013.

hydraulic modelling at locations where the Proposed Scheme will cross watercourses shown on OS mapping.

13.3.32 The route will pass adjacent to the River Avon floodplain along the north eastern edge of Stoneleigh Park before crossing over the River Avon on a viaduct just downstream of the confluence with the River Sowe. The width of the modelled 1 in 100 (1%) annual probability event floodplain (allowing for climate change) to be crossed by the route is approximately 80m and the catchment area of the River Avon at the location of the crossing is approximately 600km^2. The River Sowe floodplain is immediately to the south of the settlement of Stoneleigh however there are no properties within the Flood Zone 3 extent. The River Avon floodplain encroaches into Stoneleigh Park; however, there are no vulnerable receptors within the flood extent.

13.3.33 Finham Brook flows through Kenilworth and the route will cross the watercourse about half a kilometre downstream of the settlement. Approximately 200m downstream of the edge of the settlement of Kenilworth is the confluence of the Finham Brook and the Canley Brook. The combined catchment area of the two watercourses at the crossing location is 63km^2. The width of the modelled 1 in 100 (1%) annual probability event floodplain (allowing for climate change) at the crossing location is approximately 80m. The land use within the floodplain near the route and downstream of the crossing is generally classed as less vulnerable being open grassland or agricultural land. However, there are residential properties within the flood extent within Kenilworth and therefore the land use within this area is classed as more vulnerable.

13.3.34 The Canley Brook flows south from Canley and flows past the location of the Proposed Scheme adjacent to the A429 north of Crackley. The catchment area draining to this location is 24km^2. The width of the modelled 1 in 100 (1%) annual probability event floodplain (allowing for climate change) that the route will cross is approximately 100m; however, the Proposed Scheme involves realignment of the watercourse. There are no residential properties within Flood Zone 3 near the route, the land is generally used for agriculture and therefore is classed as less vulnerable.

13.3.35 The Environment Agency mapping and the Warwickshire PFRA[106] indicate that river flooding has occurred historically where the route crosses the River Avon and 900m upstream. The date of flooding is not provided. The Warwickshire SFRA[107] does not provide any records of historic river flooding within the study area.

Surface water flooding

13.3.36 The agreed dataset for surface water flooding is the Environment Agency Flood Map for Surface Water (FMfSW), as shown on Volume 5: Maps WR-01-030 and 031.

13.3.37 Their maps have been reviewed to form the basis of the assessment of the impact on the risk of surface water flooding.

13.3.38 The FMfSW show the effects of two rainfall events, the 1 in 30 (3.3%) and the 1 in 200 (0.5%) annual probability. The areas susceptible to surface water flooding during the 1

[106] Warwickshire County Council (2011), *Warwickshire Preliminary Flood Risk Assessment*. Completed by Royal Haskoning on behalf of Warwickshire County Council.
[107] Warwick District Council (2013), *Warwick Level 1 Strategic Flood Risk Assessment*. Volume 1 Produced by Mouchel.

in 200 (0.5%) annual probability event are shown on Volume 5: Maps WR-01-030 and 031. The maps show areas currently at risk of surface water flooding and where surface water is generally collected in rural low points in topography such as following open drainage channel networks associated with the watercourses in the area.

13.3.39 Six areas identified to be at risk of surface water flooding are classed to be at a high risk. These are detailed in Table 3 of the FRA (Volume 5: WR-003-18). The areas at risk of surface water flooding can be categorised into three types:

- areas associated with watercourses;
- overland flow paths; or
- isolated areas (e.g. low spots where water collects).

13.3.40 Flooding in areas that are associated with watercourses is generally considered to be dominated by river flood risk. Therefore these areas at risk are discussed in further detail in the river flooding sections above.

13.3.41 In this study area there are seven locations where overland flow paths are evident on the FMfSW. These are located as follow:

- two are located either side of the route and cross the realigned of the B4115 (Volume 5: Map WR-01-030, E5);
- two are located either side of the Proposed Scheme parallel to the Kenilworth Bypass (Volume 5: Map WR-01-030, D5);
- two areas are located to the east and west of Millburn Grange (Volume 5: Map WR-01-030, C5); and
- one is located immediately west of the Broadwells Wood culvert crossing (Volume 5: Map WR-01-031, E6).

13.3.42 The Warwick SFRA indicates two incidents of flooding along the route of the Proposed Scheme at Stoneleigh Park and 700m east of the route in Stoneleigh. Neither the date nor source of these events is known; however, owing to the location of these events, it is possible the source could have been surface water. The SFRA also indicates a location of surface water flooding approximately 700m south of the route at Burton Green. The date if this incident of flooding is unknown. The Environment Agency mapping and Warwickshire PFRA do not provide any records of historic surface water flooding within the study area.

Sewer flooding

13.3.43 The agreed datasets for sewer flooding are the Warwickshire Strategic Flood Risk Assessment (SFRA)[108], the Warwickshire Preliminary Flood Risk Assessment (PFRA)[109]. In this location, Severn Trent Water asset mapping has also been used.

[108] Warwickshire County Council (2008), *Strategic Flood Risk Assessment for Local Development Framework, Level 1 Volume 1*, Produced by Halcrow Group Limited on behalf of Warwickshire County Council.
[109] Warwickshire County Council (2011), *Warwickshire Preliminary Flood Risk Assessment (PFRA)*, produced by Royal Haskoning on behalf of Warwickshire County Council.

13.3.44 There are three locations where the Proposed Scheme will cross the sewer network, with two of these locations also having nearby inspection covers and hence being potential surcharge locations. However, at these two locations the track will be within a tunnel and hence there will be no flow paths for flooding to the Proposed Scheme from this source, nor will the Proposed Scheme affect the risk to other areas.

13.3.45 The Warwick SFRA indicates two incidents of flooding which were at the location of the Proposed Scheme at Stoneleigh Park and 700m east of the route in Stoneleigh. Neither the date nor source of these events is known; however, owing to the location of these events, it is possible the source could have been sewer flooding. The Warwickshire PFRA does not provide any records of sewer flooding either at the location of the route, or within the study area.

Artificial water bodies

13.3.46 The agreed dataset for reservoir flooding is the Environment Agency reservoir inundation map[110].

13.3.47 Flooding from artificial drainage systems may occur from failure of a retaining structure that impounds water or during events that are below the design capacity of the system, if the system capacity is temporarily reduced for example due to blockage by debris. Reservoirs are the only man made feature that have been identified within the FRA (see Volume 5: Appendix WR-003-018) as being a potential source of flood risk, as there are no canals in this study area.

13.3.48 There are five water bodies listed in the Environment Agency reservoir inundation mapping that pose a flood risk to the Proposed Scheme. These reservoirs, Naseby Reservoir, Sulby Reservoir, Stanford Reservoir, Park Farm Reservoir, and Coombe Pool Reservoir, pose a risk to areas near the River Avon, as described below. However, the data provided does not indicate flood depths, flow velocities or the time taken for onset of flooding after a breach takes place. The locations at risk are shown on Volume 5: Map Book Water resources, Map WR-01-030 and 031.

13.3.49 The route runs alongside the River Avon 900m upstream of the River Avon viaduct, which is likely to act as a flow path for reservoir flooding from Naseby Reservoir, Sulby Reservoir, Stanford Reservoir or Park Farm Reservoir. At this location the inundation extent covers a slightly greater extent than the Flood Zone mapping. The route also crosses the River Avon. At this location, the width of the inundation is less than the width of Flood Zones 2 and 3 which has been shown to not to affect the route.

13.3.50 Due to the strict regulations and high level of maintenance associated with reservoirs, breaching is considered very unlikely and the works associated with the Proposed Scheme will not increase the risk of failure. The Proposed Scheme will not increase the risk of flooding from this source, therefore the risk from this source of flooding is categorised as low.

[110] Environment Agency, What's in your backyard: Risk of Flooding from Reservoirs, http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=reservoir, accessed: 24 September 2013.

13.3.51 The Environment Agency Mapping, Warwickshire SFRA, the Warwickshire PFRA indicate that there have been no historical incidents of reservoir or canal flooding either at the location of the route or within the study area.

Groundwater flooding

13.3.52 The agreed data sets for groundwater flooding are WCC PFRA[111] and the WCC SFRA[112].

13.3.53 The WCC SFRA and PFRA do not report any instances of groundwater flooding, nor are any areas within this CFA classified as being at high risk of flooding. Groundwater flooding is therefore considered to be a low risk within the study area.

Future baseline

13.3.54 Section 2.1 and Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the operation of the Proposed Scheme. The potential cumulative effects arising from committed developments in relation to water resources and flood risk have been considered as part of this assessment of the construction and operation of the Proposed Scheme.

13.3.55 All committed developments are required to comply with the NPPF[113], development plans and other legislation and guidance. As such committed developments are not expected to have a material effect on the water resources and flood risk baseline.

13.3.56 WFD future status objectives are set out in Table 27 and Table 28. This potential change in baseline is not considered to result in significant changes to the reported effects from the Proposed Scheme.

13.3.57 For the reasons stated above for construction, the cumulative development will not result in a change in significance of the effects from operation of the Proposed Scheme.

Climate change

13.3.58 Current projections to the 2080s indicate that climate change may affect the future baseline against which the impacts of the Proposed Scheme on surface water and groundwater resources have been assessed. There may be changes in the flow and water quality characteristics of surface water and groundwater bodies as a result of changes in climate. However, except for flood flows described in this section, these changes are not considered to result in the reported effects from the Proposed Scheme changing in significance.

13.3.59 Current projections indicate that there will be more frequent, higher intensity rainfall events in the future. The probability and severity of surface water flooding could therefore increase as surface water drainage systems fail to cope with more frequent,

[111] Warwickshire County Council (2008), *Strategic Flood Risk Assessment for Local Development Framework, Level 1 Volume 1*, Produced by Halcrow Group Limited on behalf of Warwickshire County Council.
[112] Warwickshire County Council (2011), *Warwickshire Preliminary Flood Risk Assessment (PFRA)*, produced by Royal Haskoning on behalf of Warwickshire County Council.
[113] Department of Communities and Local Government (2012), *National Planning Policy Framework*.

higher intensity storms. Peak river flows during flood events are expected to increase, potentially causing greater depths and extents of flooding.

13.3.60 When considering the influence that climate change may have on the future baseline against which impacts from the Proposed Scheme on flood risk have been evaluated, the assessment has used the recommended precautionary sensitivity ranges of key parameters, as given in Table 5 in the Technical Guidance to the NPPF[114]. The sensitivity testing undertaken allows for variations in climate change factors included in other national guidance.

13.3.61 Further information on the potential additional impacts of climate change for water resources and flood risk is provided in Sections 7 and 8 of Volume 1 and Table 13 of Volume 5: Appendix CT-009-000.

13.4 Effects arising during construction

Avoidance and mitigation measures

13.4.1 The general approach to mitigation is set out in Volume 1.

13.4.2 The following measures will reduce potentially significant adverse effects on water resources and flood risk to levels that will not be significant. Further details are shown in Volume 5: Appendices WR-002-018 and WR-003-018.

13.4.3 Railway drainage will be managed using sustainable drainage techniques. In the study area surface water discharges are proposed to:

- the River Avon at Sowe Mouth and at Sowe Mouth Plantation (Volume 5: Map WR-01-030, reference SWC-CFA18-001);
- a tributary of the River Avon, near the A445 Leicester Lane;
- Canley Brook upstream of Crackley Wood (Volume 5: Map WR-01-031, reference SWC-CFA18-003);
- a tributary of Canley Brook, Birches Wood Farm (Volume 5: Map WR-01-031, reference SWC-CFA18-004); and
- a tributary of Canley Brook at Broadwells Wood (Volume 5: Map WR-01-031, reference SWC-CFA18-006).

13.4.4 Drainage has been designed to reduce the rate and volume of run-off from the railway and to avoid an increase in flood risk. The balancing ponds will provide mitigation to ensure that rainfall run-off from the Proposed Scheme including the IMD will be released in a controlled manner to the receiving watercourses reducing the potential for adverse impact on the water quality and flow of the receiving watercourse. The balancing ponds, shown on Maps CT-06-093 to CT-06-100 (Volume 2, CFA18 Map Book), will be designed where practicable to discharge at existing run-off rates and will accommodate for events up and including the 1 in 100 (1%) annual probability including an allowance for climate change.

[114] Department of Communities and Local Government (2012), *Technical Guidance to the National Planning Policy Framework*.

13.4.5 It is proposed to culvert sections of the tributaries of Canley Brook at Birches Wood Farm, Broadwells Wood and Burton Green/Black Waste Wood (Volume 5: Map WR-01-031, SWC-CFA18-004, SWC-CFA18-006 and SWC-CFA18-007).

13.4.6 Culvert length will be minimised wherever possible and will be designed with invert levels below the firm bed of the watercourse to negate the impact on flows and sediment transfer. Where there is loss of length due to straightening, the aim, where possible, will be to offset this by increasing channel length up or downstream of the culvert to at least match the lost length of channel. Culverts will be designed in line with Construction Industry Research and Information Association (CIRIA)[115] and Environment Agency guidance and in consultation with the Environment Agency. The mitigation specifically for the ecology of the watercourses is considered in Section 7, Ecology.

13.4.7 The Proposed Scheme will realign a section of Canley Brook, upstream of Crackley Bridge (Volume 5: Map WR-01-031, SWC-CFA18-003), and sections of two its tributaries at Birches Wood Farm and Burton Green/Black Waste Wood (Volume 5: Map WR-01-031, SWC-CFA18-004 and 007).

13.4.8 The realignment of Canley Brook will involve the creation of approximately 1km of new meandering channel, to enable the route to cross the watercourse on a single viaduct. Approximately 200m of the existing Canley Brook channel will be regraded and used as an outflow channel from the balancing pond; the existing flow direction will be reversed. At Birches Wood Farm (Volume 5: Map WR-01-031, SWC-CFA18-004), the channel will be regraded and realigned to enable it to pass beneath the route in a new culvert.

13.4.9 At Burton Green/Black Waste Wood (Volume 5: Map WR-01-031, SWC-CFA18-007), the channel is to be realigned and culverted to avoid the green tunnel. Consideration will be given within the detailed design to the objectives of the WFD as described in the RBMP. This may include the use of soft engineering solutions for bank design, and the inclusion of natural forms such as berms or incorporation of a two-stage channel, riffles and pools and marginal planting, where reasonably practicable. Consideration will be given at detailed design phase to seek opportunities to reduce flood risk at the Canley Brook, where reasonably practicable, in consultation with the Environment Agency.

13.4.10 Three viaducts are located within this area. These are over the River Avon, Finham Brook and Canley Brook. These avoid the requirement for culverts and, therefore, allow the watercourse to remain within its existing channel.

13.4.11 Realignments of two major roads (A445 Leicester Lane and A429 Kenilworth Road) and three minor roads (Stareton Road, B4113 Stoneleigh Road and the B4115 Ashow Road) are required as part of the Proposed Scheme in the study area. The watercourses receiving road run-off are as follows:

- tributaries of the River Avon (for the A455 Leicester Lane, the B4113 Stoneleigh Road and Stareton Road); and

[115] Construction Industry Research and Information Association (2010), *C689 Culvert Design and Operation Guide C689*.

- the River Avon at Sowe Mouth (for the B4115 Ashow Road) and Canley Brook (for the A429 Kenilworth Road).

13.4.12 Appropriate sustainable drainage will be provided for minor roads to address the risks to the receiving watercourses (for both flow and water quality) and will be selected using the Design Manual for Roads and Bridges (particularly HA103/06[116]) and CIRIA[117] guidance. For the major roads (identified through the application of the SMR), detailed assessments will be made using the guidance from the Design Manual for Roads and Bridges through the detailed design phase. Initial assessments using the Highways Agency Water Risk Assessment Tool (HAWRAT) are shown in Volume 5: Appendix WR-002-018.

13.4.13 The route has been raised during the design process at six cuttings within the study area. These 'line raises' decrease the amount of drawdown required to dewater the cuttings, therefore reducing their zone of influence and consequently the extent of the impact from the following:

- at Glasshouse Wood cutting, a line raise of up to 5m has reduced the predicted extent of the zone of influence that will be created through dewatering of the aquifer; several ponds which might otherwise have experienced a lowering of water levels will not be affected;
- at the southern section of Kenilworth cutting, a line raise of up to 2m has reduced the predicted extent of the zone of influence that will be created through dewatering of the aquifer. This means that several ponds in the area which might otherwise have experienced a lowering of water levels will not be affected and the impact to Finham Brook has been reduced;
- at Bockenden cutting, a line raise of up to 3m has reduced the predicted extent of the zone of influence that will be created through dewatering of the aquifer. This means that several ponds and an issue that might otherwise have experienced a lowering of water levels will not be affected; and
- at Burton Green green tunnel, Burton Green north cutting and Burton Green retaining structure, a line raise of up to 5m along the extent of the cuttings, has reduced the predicted extent of the zone of influence that will be created through dewatering of the aquifer. This means that several ponds and an issue in the area which might otherwise have experienced a lowering of water levels will not be affected and the potential impact to Black Waste Wood has been reduced.

13.4.14 Where the Proposed Scheme will interrupt surface water flow paths, drainage will be designed to intercept and manage this water. This is likely to involve collecting water in balancing ponds prior to discharging to the associated watercourse. This will allow the water to follow a similar path to the existing situation.

13.4.15 Sustainable drainage systems (SuDS) and infiltration trenches will be used to facilitate recharge to the groundwater to help maintain groundwater levels within the Principal

[116] DMRB. Volume 4 Section 2.
[117] CIRIA (2006), *c648 Control of water pollution from linear construction projects: Technical Guidance*.

and Secondary aquifers. These SuDS and infiltration trenches will be located in areas where gravity transfer is achievable, whilst having due regard to Environment Agency guidelines[118].

13.4.16 Stoneleigh Park retaining wall and Canley Brook retaining wall have both been designed with an impermeable base and sides, thereby limiting groundwater drainage effects during operation. Dewatering is likely to be required during construction and the potential effects of this on groundwater levels will be managed by the use of re-infiltration of pumped water. If needed, groundwater drainage will be provided on the upstream side of the retaining walls to avoid an increase of groundwater levels.

13.4.17 Replacement floodplain storage will be provided to mitigate the impact of the Proposed Scheme on river flood risk. At the River Avon crossing, replacement floodplain storage will be provided downstream of this structure to avoid an increase in flood risk. At the Finham Brook viaduct, replacement floodplain storage will be provided upstream of this structure to avoid an increase in flood risk.

13.4.18 Section 16 of the draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme (see Volume 5: Appendix CT-003-000/1). These will provide effective management and control of the impacts during the construction period.

13.4.19 The following measures in the draft CoCP Section 16 will reduce potentially significant adverse effects on water resources and flood risk to levels that will not be significant:

- stationary plant will be used with secondary containment measures such as plant nappies to retain any leakage of oil or fuel and reduce the risk of surface water or groundwater pollution;
- spill kits will also be provided where appropriate such as: the construction compounds, Furzen Hill and Crackley auto-transformer stations and the Burton Green auto-transformer feeder station to reduce the risk of groundwater pollution;
- the use of oil interceptors, if required, at site offices and work compounds; and
- appropriate measures such as use of bunds of non-erodible material or silt or sediment fences adjacent to watercourses.

13.4.20 Three of the satellite construction compounds within the study area are located in areas at risk from surface water flooding (River Avon viaduct (north) compound, A46 Kenilworth Bypass overbridge compounds and Coventry Leamington Spa Line overbridge (south-west) compound). In addition, all compounds have the potential to increase surface water flood risk due to reduced potential for infiltration that may result from an increase in impermeable ground. Whilst overland flow routes may be altered by the presence of the construction compounds, the proposed drainage system will collect and manage overland flow preventing a risk to the temporary works and adjacent areas. Surface water runoff from the construction compounds will

[118] Environment Agency (2013), *Groundwater: Protection: Principles and practice.*

be effectively managed (as described in the draft CoCP Section 16) such that the effects of surface water flooding will be negligible.

13.4.21 Measures identified in the draft CoCP Section 16, including detailed method statements, will ensure that there will be no effect on surface water quality or flows associated with construction; this will include release to surface water sewers in the surrounding receptors, principally the Severn Trent Water sewer network.

13.4.22 In accordance with the draft CoCP, Section 16, monitoring will be undertake 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 temporary and permanent mitigation measures.

Assessment of impacts and effects

13.4.23 This section describes the significant effects following the implementation of avoidance and mitigation measures.

13.4.24 Further details of the potential impacts that will have no significant effects are provided in the Water Resources Assessment report in Volume 5: Appendix WR-002-018 and FRA in Volume 5: Appendix WR-003-018.

13.4.25 An assessment of the impact on the WFD status is detailed within the WFD Compliance Assessment, contained within the route-wide Water Resources appendix (Volume 5: Appendix WR-001-000).

13.4.26 It is not considered that projected climate change effects, combined with the effects from the construction of the Proposed Scheme, will alter the significance of any of the reported effects on surface water and groundwater resources (see Volume 3: Route-wide effects assessment for further information).

Temporary effects

Surface water

13.4.27 The assessment shows that there will be no likely significant temporary adverse effects on surface water resources during the construction period.

13.4.28 As no significant effects on surface water features have been identified in the assessment, no significant effects on abstractions or discharges will arise.

Groundwater

13.4.29 The assessment shows that there will be no likely significant temporary adverse effects on groundwater, on licensed abstractions and permitted discharges, on surface water/groundwater interaction.

13.4.30 The assessment shows that there are no significant temporary adverse effects to water dependent ecological habitats.

Flood risk

13.4.31 The assessment has not identified an increase in flooding from any sources of flooding during the construction process, and therefore no significant temporary effects will arise.

Cumulative effects

13.4.32 No committed developments have been identified that will result in significant cumulative effects.

Permanent effects

Surface water

13.4.33 The assessment shows that there will be no likely permanent significant adverse effects on surface water features from the Proposed Scheme in the construction period.

13.4.34 Further details of the assessment, including the determination of effects that are not significant are provided in Volume 5: Appendix WR-002-018.

Groundwater

13.4.35 The assessment shows that there will be no likely permanent significant effects on groundwater, on abstractions and permitted discharges, or on surface water/groundwater interaction The assessment shows that there will be no likely permanent significant effects on water-dependent habitats.

Flood risk

13.4.36 The assessment has not identified an increase in flooding from any source as a result of the Proposed Scheme and therefore no significant temporary effects will arise.

13.4.37 Further details of the assessment, including the determination of the potential impacts that will not have likely significant effects, are provided in Volume 5: Appendix WR-003-018.

Cumulative effects

13.4.38 There are no committed developments that have been identified which will result in significant cumulative permanent effects.

Other mitigation measures

13.4.39 No other mitigation measures are envisaged for surface water, groundwater or flood risk.

Summary of likely residual significant effects

13.4.40 The assessment shows that there will be no residual significant effects on surface water, groundwater or flood risk during the construction period.

13.5 Effects arising from operation

Avoidance and mitigation measures

13.5.1 Generic examples of design measures that will mitigate potentially significant effects on the quality and flow characteristics of surface watercourses and groundwater bodies during operation and management of the Proposed Scheme are described in Volume 1.

13.5.2 The SuDS used for drainage from the Proposed Scheme, such as balancing ponds, may have an additional benefit of providing some treatment for water quality of the runoff before it is discharged into the environment.

13.5.3 Generic examples of management measures during operation and management of the Proposed Scheme that will reduce adverse effects on the quality and flow characteristics of surface water courses and groundwater bodies are described in Volume 1 and in the draft operation and maintenance plan for water resources and flood risk included in Volume 5: Appendix WR-001-000.

13.5.4 Operation and management of the Proposed Scheme is not likely to have a significant effect on the flood risk anywhere in the catchments through which it passes. Generic examples of management measures that will reduce flood risk are described in Volume 1.

Assessment of impacts and effects

13.5.5 There are considered to be no significant adverse effects to surface water, groundwater or flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

13.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources or groundwater resources and flood risk.

Summary of likely residual significant impacts

13.5.7 The assessment shows that there will be no residual significant effects on surface water, groundwater or flood risk during the operational period.

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